Non-payments in the Russian Economy and in Regions

Contents

Introduction

Many East European and former Soviet Union economies in the process of transition to the market economy encountered the problem of enterprise insolvency and a massive growth of inter-enterprise payment arrears. However, while a number of countries could settle the problem of payment arrears, diminish amounts and check the growth of outstanding debts, in Russia this problem persists.

At the same time, it may be asserted that a trend toward some decrease in the amounts of the total outstanding debts began to show. The turning point was 1998. Non-payment in real terms increased prior to and stabilized (diminished) after 1998 (see Fig. 1 to 3, Annex 1). The level of indebtedness attributed to the gross product grew till 1998 (Fig. 1, Annex 1) and declined over next years. The nominal level of indebtedness grew longer than the level of debts in real terms (see Fig. 2 and 3 respectively, Annex 1), however the last year saw it to stabilize.

As concerns the real level of indebtedness (and in terms of GDP), the decrease may be explained by the depreciation of accumulated debts related to high rates of inflation in the post-crisis period. In this case the stabilization of its nominal level is a more illustrative indicator. This stabilization means that either the growth of new payment arrears stopped, or became equal to amounts of repayment and write-offs of previously accumulated debts. It shall be noted that indebtedness may diminish either due to direct repayments, or write-offs. However, the amounts of write-offs are rather insignificant (see Table 17, Annex 1).

Factors behind changes in the indebtedness dynamics and the persistence of rather high levels of payment arrears require a more detailed research of both the theoretical and empirical aspects of the process of indebtedness generation.

Researchers name the following factors responsible for the generation and growth of payment arrears: the shortage of credit facilities often attributed to tighter monetary policies and contraction of liquidity (see, for instance, Calvo and Coricelli, 1994; Gavrilenkov, 1996; Delyagin, 1997; Ushijima, 1998), lack of current assets and low monetization of GDP (see, for instance, Shmelev, 1997; S. Ushijima, 1998), inefficiency of enterprises (see, for instance, Rostowski, 1993; Volkonski, Kantorovich, 1995, Klepach, 1997; Entov, Radygin, Mau, et al., 1998; Alekseev, 1998; Ivanova and Wyplosz, 1999, Pinto, Drebentsov, Morozov, 2000), budgetary failures (see, for instance, Entov, Radygin, Mau, et al., 1998; Ushijima, 1998; Alekseev, 1998, Pinto, Drebentsov, Morozov, 2000), tax evasion, direct embezzlement, and corruption (Karpov, 1997); the importance of bankruptcy institutes for the payment arrears problem was also emphasized (see, for instance, Rostowski[1], 1993).

The variety and even some controversy of the approaches to the explanation and understanding of the problem was caused, among other factors, by the fact that payment arrears problem is characteristic not only for developing and transition economic systems. Improper execution of obligations is an attribute of any market economy with specific settlement mechanisms (contract enforcement), where non-payments are not seen as a systemic problem. In this relation the economic literature often advances the thesis that the payment arrears problem in Russia is exaggerated. For instance, in the course of the study of levels of accumulated indebtedness (measured as the share in GDP) across different countries Alfandari and Schaffer (1996), Schaffer (1998) demonstrated that the aggregate level of inter-enterprise

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[1] The author argues that non-payments would become extinct in a natural way in case the state took a tougher stand toward the reforming of enterprises.

payment arrears (overdue commodity credit) in Russia was at or below respective averages observed in Western, Central and East European economies. Upon having analyzed the real data[2] the authors concluded that the greater share of non-payments registered in the Russian economy may be attributed to "late payments," not "bad payments." The authors ascribe bad payments to enterprises operating at the loss, while late payments are linked to temporary difficulties encountered by enterprises. The distinguishing feature of late payments is that eventually they will be made.

The question of debt characteristics make sense only in the situation of stationary functioning developed market economy. However, even in this case there may occur spasmodic and cumulative growth of non-payments (for instance, in periods of sharp bank crises). Transition economies may experience protracted build-up of overdue indebtedness causing even efficient companies to become non-payers. Therefore, the distinction between bad and late payments requires further determination.

This paper attempts to review main characteristics of payment arrears in a transition economy. The first section contains a system of theoretical models, each model describing the process of payment arrears originating due to specific features of development of the transition economy. The section presents a classification of major factors behind the generation of non-payments and a pattern of interaction between these factors. The second section contains the results of statistical testing of some theoretical hypotheses reviewed in the first section.

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[2] The authors base on the data provided by Goskomstat and World Bank.

SECTION 1. SYSTEM OF THEORETICAL MODELS

The phenomenon of non-payments has been actively discussed by various scholars. Three basic models embracing all major factors behind payment arrears may be singled out of the proposed approaches to the analysis of this problem. Behavioral factors related to the opportunistic behavior under asymmetric information, or reasons behind premeditated non-compliance with obligations, which may be also characterized as rational behavior of economic agents in situations where payment arrears become profitable, may be included in the first group. The second group includes factors related to the functioning of the banking sector. The third group includes concealed forms of subsidies of ineffective industries. Each group presents a qualitatively different characteristic of the problem. Below each group is analyzed in more thoroughly.

Model 1: Premeditated Causes of Indebtedness

The interaction between economic agents (including enterprises, organizations, their employees, the state (including its tax agencies) in the process of economic activities takes place under asymmetric information, what results from the fact that each contracting party has insufficient information about the financial standing of the other contractor. Asymmetry puts one of the contracting parties in a more advantageous position in comparison with the other, what results in a number of other problems: adverse selection, moral hazard, and the principal agent problem. Therefore, non-compliance with obligations may become the strategy of economic agents.

In case non-payments become profitable, there is a high probability that the majority of economic agents will resort to this strategy. It is also clear that in general this situation is profitable only to the party which does not pay while availing itself of the benefits it presents. This type of non-payments may be characterized as non-voluntary crediting, since the creditor does not give consent to it (the moral hazard problem) and include, for instance, wage arrears, especially in case the enterprise has sufficient financial resources but does not pay wages.

However, there may arise situations, where non-compliance may be profitable for both counteragents. These situations include tax evasion, embezzlement, and corruption. In case the management places its personal interests over the interests of the enterprise, non-payments may become an instrument ensuring the personal gain of its managers (the principal agent problem); therefore, as a result of a collusion the enterprise in the person of its management may refrain from demanding its counteragents to timely pay for received goods, while continuing deliveries. At the same time, the management as a way of excuse may inform its owners (the state, shareholders) that the payment arrears result from the lack of scruple on the part of the other contracting party.

In the situation where market institutes are underdeveloped these problems may acquire mass character. At the same time, the universal practices of payment arrears prevent the creditors from demanding defaulters to pay, in particular due to implicit commitments[3]. For instance, defaulters may excuse the non-compliance with the obligations to the creditors (other enterprises, organizations, banks, and the state

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[3] This phenomenon was studied by Polterovich (1999), who lists such a behavior of economic agents among institutional traps. The relation between the accumulated indebtedness and the propensity for its accumulation is mentioned by Calvo and Coricelli (1994), who introduce the concept of payment arrears costs; the authors assume that the more debts the firms have, the more they are inclined to further accumulate their indebtedness.

in the person of its tax agencies) by their own debtor indebtedness. As a result, the economic agents disposing of sufficient financial resources have the opportunity to default on the fulfillment of their obligations (or at least to delay the fulfillment) by concealing information on their real financial standing.

These problems arise, first of all, due to the lack of monitoring and control over the behavior of counteragents and the management (ineffectiveness of owners), weak economic and legal mechanisms (for instance, underdeveloped trade unions allow employers to infringe on the rights of employees via wage arrears), the lack of tough system of enforcement of contractual obligations.

An economic agent failing to meet its contractual obligations might trigger the process of mass refusal to fulfill their obligations on the part of both those able to pay, and the economic agents rendered insolvent by non-payments of their counteragents.

As soon as a precedent for unpunished non-fulfillment of obligations to creditors is set, it gives a signal to all other economic agents to reconsider their business relations. Financial intermediaries, i.e. credit financial organizations are most responsive to such signals, since slackening contractual obligations put them in the most critical position. Growth in universal payment arrears directly increases the risk of adverse selection and results in a massive rationing of credits.

The fact that partners continue deliveries to defaulters is outside the problem of adverse selection. The precedent of adverse selection may hardly occur twice between the same counteragents. The moral hazard problem also fails to explain the continuing deliveries on the part of creditors in case the latter are not interested to maintain business relations with defaulters. It is clear that in the perfect competitive environment there is a little probability that the "victim" once suffering due to non-fulfillment of contractual obligations on the part of its counteragent would agree to further cooperate with such a partner. However, in a number of cases the rejection of a customer may often result in the de facto bankruptcy under conditions of the post-Soviet highly monopolized and often monopsonic economy characterized by fixed and absolutely inflexible economic relations. At the same time, there may exist other factors related to the impossibility to suspend deliveries (regulated operations of natural monopolies, state-owned objects, inter-state deliveries), which result in the persistence of the adverse selection problem.

Accumulation of indebtedness may become a tool to exert pressure on the government in order to obtain additional benefits, such as reduction of tax payments, implementation of offset schemes, granting of soft credits.

The behavioral aspect of the generation of payment arrears was studied in Perotti (1998), Nikitin (2000). Perotti observes that non-restructured enterprises are forced not to terminate shipments to defaulters, what results in new debts. Since indebtedness is not repaid, its amount across all enterprises increases until reaching a certain critical level, when the state has to interfere by declaring certain amnesties and permitting offsets. Therefore, even enterprises with sufficient liquidity got an incentive to accumulate indebtedness in order to obtain soft credits. Enterprises pursue the "mutual guarantee" policy forcing the state to extend credits. It is only natural that the state interference fails to bring about a radical change in the situation and the vicious circle persists.

It is possible that the factor behind the persistence of such behavior of firms in the model offered by the author is the difficulties encountered in the process of separation of viable firms from non-viable ones, what results in the moral hazard problem. From the author's point of view, in this case monetary policies may emerge as the regulating factor behind non-payments. If restructuring costs are high, tight

monetary policies may force enterprises to refrain from restructuring and resort to payment arrears, since such behavior increases the number of insolvent firms and, as a result, makes more probable a universal offset.

Nikitin (2000) also analyzes the interaction between firms and the government. Basing on the dynamic game theoretical model of the non-payment crisis in the transition economy the author suggests that such crises result from the lack of faith in the disinflation policy. Firms expected that in the end the government would resort to offsets for firms, which accumulated payment arrears. According to the model, the firm takes the decision to terminate deliveries to defaulters taking into account a number of parameters, including the costs related to the withdrawal from the system of non-payments, the length of planning horizon, and the discounting factor.

It shall be noted that the existing models are based on the assumption that there exists a direct relation between non-payments and the availability of credit resources. The measures undertaken by the authorities in the sphere of monetary policies are the regulating factor. Contraction of bank crediting, tight monetary policies, and disinflation policy are among the factors behind the insolvency of enterprises most often mentioned in the literature on the question.

Model 2: Short Term Cash Gaps

The phenomenon of overdue indebtedness per se may be interpreted in many different ways. First of all, this phenomenon inevitably accompanies the functioning of commercial credit mechanisms: overdue indebtedness (sometimes on a large scale) is registered in practically all developed economies (this point of view is emphasized by Schaffer, 1998).

The transition period in the former Soviet Union and East European countries is characterized by a sharp contraction of participation of banks in the economic operations of the real sector, although this process may hardly be defined as a contraction of crediting. There were no crediting in the market terms in the planned economic systems. Banks mostly functioned as payment systems and solved the liquidity problems, while enterprises were not concerned with the repayment of bank loans. Therefore, the term "contraction of crediting" shall rather be understood as the marketization of crediting, what inevitably resulted in the flow of bank resources to sectors with highest capital productivity and minimal non-repayment risks. The GKO market has been such a sector of the financial market for a long time.

According to this hypothesis, small amounts of crediting, high interest rates, unpredictable inflation accounted for the fact that enterprises were unable to cover short term cash gaps occurring in the process of their economic operations at the expense of short term loans obtained on the financial market, what resulted in widespread commercial (commodity) credits.

The spreading of commercial credits may become attractive also in the situation, where mutual commercial credits cost less than banking credits. In any case, one of the enterprises would additionally benefit economizing on bank interest (in case the commodity credit is free).

Mutual profitability of commercial credit is the precondition for such a situation to emerge. In case one counteragent is a net creditor and the other contracting party is a net debtor the crediting party may seek benefits by maintaining its output volumes, retain (expand) its sales markets, etc. In both cases this party will pursue long term goals at the expense of short term ones, since the creditor in fact refrains from the chance to invest its financial resources on better terms.

However, in real life commercial crediting is complicated, first, by wider economic relations (the number of interacting enterprises is as a rule more than two, while the process of production and consumption is more complex); and, second, the asymmetry of information and the hazard of partners' unscrupulousness. On the other hand, long term partners may more easily resort to mutual crediting (deliveries on terms of deferred payments) than banks, since their long term business relations allow to minimize the risk of adverse selection.

The spreading of commercial credit may result in a number of effects. First, such crediting affects prices. As goods are delivered on terms of deferred payment, on the one hand, the seller may include interest on the commercial credit in the price, on the other hand, the elasticity of demand at contractual price may lower due to uncertain terms of credit repayment.

The less important role played by money and prices may emerge as the second effect resulting from the spread of commodity crediting, since it may facilitate the spreading of non-monetary payments (barter). In other words, the transaction demand for money declines. This fact accounts for the opportunity to produce and consume more (at least as measured in nominal contractual prices) than the money supply allows. At the same time, the function of money as a standard of value becomes less important. Enterprises are free to set any price of their products, since in this situation their goal function is not profit, but output. However, the reporting is still conducted in nominal prices, what results in the fact that enterprises suffer from excessive indicators of profitability due to growing tax liabilities. However, in case of tax evasion this price regulator also loses in importance.

In case exchange proportions are more important than prices, there emerges another problem, i.e. that of complicated control over the financial standing of both the enterprise itself and its counteragents. In this situation there arises the possibility that enterprises may continue their operations at the expense of decumulation of both their internal capitals and the capitals of its counteragents. Enterprises actually operating at a loss may prolong their existence by borrowing raw materials and showing negative profitability.

In the situation of mass mutual commodity crediting such fundamental indicators as profitability and non-repaid indebtedness, which, as a rule, are open for partners, in a certain sense can not perform their function as a reflection of their financial standing. As a result, it becomes more difficult to distinguish between "good" and "bad" firms. The same factor is responsible for the banks resorting to credit rationing apprehending adverse selection.

Therefore, commercial credit per se generates in a number of negative consequences: decreasing importance of money and prices, substitution of the goal function, decreasing importance of a number of financial indicators, more complicated monitoring of counteragents, and, as a result, the emergence of the potential for actual subsidizing of loss-making enterprises and further contraction of bank crediting. In case production chains do not include loss-making enterprises and the problems related to asymmetric information do not aggravate, the contraction of bank crediting and resulting spread of non-payments do not present a systemic problem, since in this case non-payments are just late payments.

A. Calvo and Fabrizio Coricelli (1994) adhere to the view that non-payments are characteristic both for loss-making and profitable enterprises. The authors argue that tighter monetary policy pursued by the government affects the process of enterprise restructuring (their adaptation to market environment and the opportunity to reject insolvent traditional customers). According to the authors, non-payments are a

systemic phenomenon, a necessary attribute of the economic equilibrium, a sort of equiponderant response of the system to the contraction of liquidity. In other words, on weak financial market sharp contraction of liquidity (liquid resources of enterprises) may result in an equilibrium, where inter-enterprise transaction progressively demonetize and non-payments become a norm. The authors argue that there exists a relation between the level of liquidity in the economy and payment arrears. Although the authors do not call for more moderate monetary policy, they observe that too tight monetary policies may result in negative consequences[4].

Perotti (1998) advances a similar point of view while analyzing the impact of the tightness of monetary policies on non-payments. The author argues that the relation between the number of enterprises striving to restructure and the tightening of monetary policies may be described in terms of the Laffer curve. The control of inflation rates forces enterprises to resort to internal financial resources refraining from bank credits.

The impact of non-payments on implementation of monetary policies and the effectiveness of equilibrium with non-payments were studied in Denisova (1999), Guriev, Pospelov, Shaposhnik (2000), Varshavski (2000). As a rule, these models view inter-enterprise payment arrears as a tool substituting bank credits. However, it shall be noted that in spite of the visible significance of bank crediting in the maintenance of current liquidity of enterprises the expansion of this process does not bring desired results in case real loss-making, often defined as non-market production[5], is the source of insolvency.

In case the economic chain includes loss-making enterprises, payment arrears may become a source for the existence of ineffective enterprises, what shall be attributed to a model of another type.

Model 3: Subsidies to Ineffective Enterprises

An enterprise begins to operate at a loss when it is not able to sell its products at a price covering costs and yielding a profit, or in other words, there is no effective demand for its products.

The solvency of any enterprise depend on the wish and resources of potential customers to purchase its products. The lack of demand for the products means that either the potential buyer is insolvent, or that these products are non-competitive (in terms of their prices, quality). Sales problems encountered by an enterprise result in the fact that it can not settle with its creditors and therefore decreases the (effective) demand for the products of its suppliers. Therefore, in case the buyer is another enterprise, the solvency of the former will depend, among other factors, on the wish and resources of the customers of the latter enterprise to purchase the products of the first enterprise. Ultimately, the solvency of any enterprise depends on resources allocated by its customers, as well as by the consumers (up to the final consumers), of goods produced by its buyers (in case they themselves are producers) for purchase of its products. In case such an enterprise is a link in a chain of production relations it may trigger the chain of payment arrears, especially if suppliers have no possibility to change the partner. Any changes in demand occurring in the production chain render all its preceding links insolvent (in the short run).

It shall be noted that in contradistinction to the Soviet planned economy, the market economy is more resistant to various demand shocks due to its higher

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[4] This point of view is supported by Drebentsov and Morozov (2000).
[5] See, for instance, Volkonski, Kantorovich (1995).

mobility, diversification, and lesser degree of monopolization. The lack of mobility observed in the Soviet planned economy was hazardous to the functioning of enterprises, since many of them proved to be inadequate to the new realities emerging in the process of transition to the market economy.

The enterprises failing to sell their products are potential bankrupts. In the environment, where contract enforcement mechanisms are in place, such enterprises are subjected to bankruptcy proceedings or restructuring in case they fail to settle with creditors. If such enterprises continue to exist, their losses shall be financed by someone else, otherwise they stop to fulfil their payment obligations (in this case their debts are financed by non-payments to creditors). In this case non-payments, according to Rostowski (1993), turn into the "channel" of financing of "bad" firms. Therefore, the problem of non-payments is often attributed to loss-making enterprises[6].

Seemingly, under the market economy there always exists a number of ineffective enterprises, therefore the problem of eliminating mass payment arrears may not be tied to the complete extinction of loss-making enterprises. However, the state may limit the adverse impact of non-payments generated by ineffective sectors on the economy at large by implementing structural economic policies. According to the third model, losses may generate payment arrears in case the enterprise finances negative results of its economic operations at the expense of non-payments to its creditors. In this case it is of no importance what factor is responsible for loss-making. It is important that losses develop in non-payments, which may be characterized as "bad debts" in contradistinction to "late payments."

It shall be noted that often hypotheses indicating sources of non-payment fail to explain their persistent growth. It remains unclear why the creditors of loss-making enterprises continue to deliver their products to defaulters practically for free, thus creating potential for long term persistence of indebtedness.

Macroeconomic Interaction Model. Cumulative Growth of Non-Payments

The preceding sections focused on the sources of payment arrears, strategies observed in the behavior of enterprises with "net non-payments" (balance of overdue payables and receivables). However, all three micro-economic models described above fail to explain the specific phenomenon of "non-voluntary" and cumulative growth in the amounts of overdue indebtedness. Such a phenomenon may also be observed in developed market economies in periods of credit crunch (Kindleberger, 1996).

In other words, in the situation where non-payments prevail, there may exist enterprises not necessarily having "net non-payments," which, however, are involved in the process of "transfer" of payment arrears and therefore registering a certain level of overall overdue indebtedness (equal to the amount of overdue payables and receivables). It shall be once more emphasized that while these enterprises may generate no payment arrears, they are involved in the process of their redistribution.

The processes of growth in non-payments caused both by the factors described in the framework of three above models, and by the cumulative growth in indebtedness may be studied in the framework of the general equilibrium model. However, this presentation focuses on the factors behind the initial generation of non-payments and leaves outside the processes of payment arrears spreading.

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[6] See, for instance, Rostowski (1993), Klepach (1997), Entov et al. (1998), Alekseev (1998), Ivanova and Wyplosz (1999), Lugovoi, Semenov (2000).

Factors behind the Persistence of Non-Payments

As it was noted above, there may be several factors behind the initial emergence of non-payments. In case both parties tolerate payment arrears their persistence may be explained by this fact. However this "crediting" is of non-voluntary nature, there naturally arises the question why the creditor does not demand that the debtor repay the indebtedness.

A factor behind this phenomenon is the effectiveness of such an economic and legal mechanism as "contractual obligations" (in other words, the development of such an institute of the market economy as the "contractual economy," or the enforcement of contracts).

It is well known that the Soviet-type economies did not encounter the problem of contractual obligations; there it was substituted by a system of personified responsibility for meeting planned targets in the framework of the command and administrative system (up to the Party-imposed penalties for personal non-compliance with centrally set obligations). Such a "personified" mechanism ensuring the enforcement of the compliance with obligations broke down at the same time as the whole system of management of the hierarchically organized economy based on the Party and Soviet principles collapsed.

While the mechanism described above was dismantled relatively fast, the search for a substituting mechanism suitable to ensure enforcement of compliance with obligations in the new economic environment proved to become a very serious problem. It is not a surprising development, since the construction of a new (not personified, but economic) mechanism for enforcing contractual obligations of economic agents may be carried out only if a number of prerequisites is in place: the legal infrastructure, adequate institutes (including those capable of self-organization at the micro-level), an effective system of law and contract enforcement coupled with the political will, the relevant macroeconomic environment, and a relatively prolonged period for the establishment of new relations.

Exactly the latter factor was responsible for the emergence of a certain "uncertainty period" in the behavior of economic agents after the old mechanisms had been dismantled, what directly affected the problem of payment arrears.

However, even in the situation, where the contractual law does not work, there is a possibility to prevent the emergence of non-payments (for instance, the implementation of such measures as pre-payment for shipped goods, or suspension of shipments after the first instance financial obligations were not properly met). However, in practice enterprises refrain from terminating deliveries.

Several factors may be responsible for the fact that partners continue to supply defaulters with their products. In case shipments are not terminated, either both parties are interested to maintain business relation, or the termination looks impossible.

The mutual interests of counteragents to continue deliveries may be explained, for instance, by their wish to maintain output volumes. This hypothesis agrees with the mutual crediting of enterprises in the situation of contracting bank crediting.

Another factor behind the mutual interest in payment arrears is related to asymmetric information problems. The complexity of monitoring of counteragents' financial standing in the situation of non-payments, unscrupulous behavior of the management (collusion of counteragents seeking concealed gains) may become the reasons behind the continuing deliveries to defaulters.

There are possible situations, where creditor enterprises can not stop deliveries. An example of such behavior are state-regulated operations of enterprises-monopolies, especially those in the fuel and energy sector.

Economic relations between enterprises consuming energy resources and energy monopolies have their specifics. For instance, the payment is usually effected upon the actual consumption of the resources. Therefore, enterprises operating in the fuel and energy sector often do not have a free hand to set the amounts of supplies, since both technical (indiscriminate power cutoffs) and political (it is prohibited to cut off state-owned objects) factors prevent them from the suspension of supplies. The precedent of power cutoffs has been set only since recently. As a result, monopolists having no levers to influence their debtors may agree to settle with defaulters via various less suitable financial methods and instruments (barter[7], offsets, promissory notes).

It shall be noted that similar systems are used not only in the relations between fuel and energy monopolies and their customers, but also by enterprises having well established business relations. Many of them refrain from requiring pre-payment even dealing with financially unreliable partners explaining the fact by their unwillingness to decrease volumes of output.

The liberal attitude taken by the state toward defaulting enterprises seems to be of a special importance. State interference results in the fact that monopolistic enterprises become non-voluntary creditors of ineffective enterprises and the state (state owned enterprises and organizations). The problem is aggravated due to the fact that the state also often defaults on its debts. The inability of the state to meet its target expenditures hinders it to undertake strict measures against "deliberate non-payers." As a rule, all previous measures aimed to decrease the level of indebtedness have been reduced to offsets of mutual claims, what failed to eliminate real factors behind the emergence of non-payments and only created incentives for non-payers to further accumulate their indebtedness.

The implementation of strict measures against non-payers (such as initiation of bankruptcy procedures) is also prevented by grave social consequences requiring the drastic interference on the part of the government. Mass bankruptcies may result in large scale labor redundancy and growth in unemployment. It seems that these considerations prevented the government from the implementation of such measures. As a result, no working mechanisms ensuring the legal settlement of the problem of non-fulfilled contracts have been set in place.

Therefore, the persistence of payment arrears becomes possible in the situation, where contact enforcement mechanisms are lacking. Rostowski (1993) argued that non-payments would become extinct in a natural way in case the state took a tougher stand on the issue.

Interaction between Models

Thus, three major sources of payment arrears were outlined above (premeditated non-compliance with obligations, bridging of short term cash gaps, financing of losses). Each of these factors characterizes a qualitatively different level of the problem. Meanwhile, between different factors there exist an interaction which is reflected by the possibility to transit from one model to another.

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[7] The problem of monopolists resorting to non-monetary types of transactions was studied in Guriev, Kvasov (1999). The authors argued that these instruments might be used for the purposes of price discrimination.

The asymmetric information and related problems, as well as deliberate non-payments (Model 1) are the omnipresent factors of varying perceptibility. As it was noted above, they may reach critical levels under weak market institutes. However, this model does not take into account that non-payments are a means to bridge short term cash gaps as a substitution of the bank crediting, or that non-payments present a concealed form of subsidies to loss-making firms. In this aspect the problem may be settled (moderated) by developing market institutions, toughening control and monitoring of operations carried out by individual firms and their managers, developing trade unions. Expansion of crediting, development of financial markets and restructuring of enterprises operating at a loss do not affect the source of the problem and do not facilitate its settlement.

The second model describes the situation, where payment arrears emerge as a result of "technical" shortages on the market of short term loans, conditionally defined as non-payments caused by the expansion of commodity crediting. This model assumes that no losses are financed via commodity crediting, while non-payments are "late payments." In case enterprises are capable to operate without losses in situations, where bank crediting is unavailable, non-payments are only an indirect problem, since they may trigger negative processes via weakened market institutes. At the same time, the spreading of non-payments, even as substitutes for bank crediting may create incentives for premeditated payment arrears and affect production effectiveness. Lowering effectiveness may result in the aggravation of crises and emergence of factors of the third type.

The problem may be described by the second model in case it may be settled by expanding bank crediting (and developing market institutes).

From the author's point of view, the deepest roots of non-payments are reviewed in the framework of the third model, which is based on the assumption that payment arrears emerge from such sources as loss-making production and non-market character of production at a number of enterprises. In this case the non-market character of production is understood as the disparity between market demand for and supply of goods produced by such enterprises. As it was noted above, in this case non-payments turn into the "channel" of financing of "bad" firms. The state, other firms, and the employees of the enterprise may present the sources of such financing. The problem of payment arrears may be characterized by the third model in case it can not be settled via the expansion of bank crediting.

It shall be noted that the models are not mutually exclusive, but mutually complementary ones. An enterprise may both premeditate (Model 1) and be forced (Models 2 and 3) to resort to non-payments. Moreover, some factors may trigger the emergence of others.

For instance, negative consequences of the existence of premeditated source of non-payments (Model 1) may create incentives for the spreading of payment arrears, what renders more difficult to single out "bad" and "good' firms and result in contraction of bank crediting (i.e. facilitate the factors included in the second model). Another negative consequence may become the lowering effectiveness of enterprises caused both by non-payments on the part of debtors and ineffective management, what may result in the aggravation of crises.

Therefore, problems related to the opportunistic behavior, contracting bank crediting, lowering general effectiveness of production may aggravate at the background of growth in non-payments caused by the factors contained in some other model. However, it is important to distinguish between different sources and indicators of non-payments.

Table 2 lists major sources of problems, their brief characteristics, and origins.

Table 1. Models (sources) of payment arrears, their characteristics and origins.

Model (source)	Indicators, characteristics	Origins
(Model 1) *Premeditated non-compliance with obligations (opportunistic behavior).*	1. Non-payments are a means to achieve concealed goals of economic agents. 2. Firms are capable to operate without losses. 3. Possible demonstrated loss-making results from: a) ineffective management (differing interests of owners and managers); b) concealment of true financial standing for greed of gain. 4. Non-payments may be both "late payments" and "bad debts."	1. Ineffective economic and legal institutes (contract, labor laws). The state takes a liberal attitude toward non-payers.. 2. Inadequate monitoring of the operations carried out by counteragents, management. 3. Ineffective ownership rights.
Model 2 *Constrained borrowing.*	1. Non-payments arise from the shortage of current capital experienced by producers. The producers are capable to settle with all creditors (excluding borrowings for the financing of capital investment) after the completion of the technological cycle. 2. Non-payments are "late payments" in contradistinction to "bad debts" ("bad debts" shall be reviewed as debts considerably depreciating by the time of repayment). 3. It is not excluded that enterprises may operate at a loss over some period of time; however, it is excluded that this loss is financed at the expense of the creditors (subsidizing of loss-making enterprises at the expense of external sources of financing).	1. Inapplicability of traditional methods allowing enterprises to bridge short term cash gaps. 2. High levels of credit rationing. 3. Tight monetary policy.
Model 3 *Ineffective production*	1. Non-payments are characterized by loss making production and transfer of the debt burden to creditors. 2. Non-payments are "bad debts" in contradistinction to "late payments." 3. Enterprises need financial resources for periods exceeding one technological cycle. The borrower can not settle with all creditors even after the completion of the technological cycle.	1. Non-market production. Enterprises incapable to produce competitive goods continue to function. 2. Insufficient financing of state procurement. 3. Losses do not result in substantial decrease in output volumes, since they are "transferred" to creditors. 4. Changes in economic environment affecting the effectiveness of production.

Lugovoi, Semenov (2000) advanced a variant of structuring of hypotheses about the emergence and persistence of non-payments (and their interaction), which fully agrees with the system of models presented in Table 2. The origins of non-payment may be of both non-voluntary nature (ineffectiveness, constrained bank crediting), and premeditated (for instance, opportunistic behavior). However, non-payments may persist only under ineffectively functioning market institutes.

Diagnosing the Problem: Analysis of Factors

This section analyzes the possibility to identify different types of sources of non-payments (characterized by the models) basing on an empirical research. The presence or absence of assumed relationships will permit to describe the process and diagnose the scope of the crisis. In this connection this section focuses on the analysis of the impact of different factors on and their relationships to non-payments, as well as the analysis of previously conducted empirical studies.

From our point of view, the most important aim of this analysis is to find out the criteria allowing to classify non-payments as "bad debts" (Model 3) or "late payments" (Model 2). The asymmetry of information is an omnipresent factor, while related problems (Model 1) may be characteristic of each aspect of the development of the non-payment problem. It is important to determine if the "border" between problems of short term financing of current assets and the financing of losses is "transgressed." The study of this problem may present the opportunity to work out

recommendations permitting to overcome the present situation and to search for levers allowing to manage the indebtedness at the level of the national economy.

Below the author reviews some factors assumed to be related to non-payments originating from different sources.

Amounts of Crediting

While the theory broadly substantiates the important role played by the factor of crediting in the problem of payment arrears, a certain vacuum is felt in the area of empirical testing of this hypothesis. It may be asserted that no empirical data (at least as concerns the data collected in Russia) presents direct evidence of the existence of such relationship. This hypothesis was mainly advanced as an alternative to the hypothesis that non-payments originate from loss-making. For instance, Alfandari and Schaffer (1996), Calvo and Coricelli (1994) conducted the testing at Russian and Romanian enterprises respectively. The results of the testing and the methodology of research will be reviewed below.

At the same time, it seems that the easiest way to test the hypothesis that shortage of crediting is the source of payment arrears is to find out if there is a relationship between the amounts of crediting and non-payments. However, this task may be complicated by a number of factors, the most important among them being the insufficient observation interval. Due to well known reasons it is impossible to compare the data on the amounts of crediting granted in the pre-reform period with the amounts of credits granted over the transition period. The major changes in the availability of financial resources for enterprises occurred at the start of the reforms. The effects of the shock experienced at the beginning of the transition period by the real sector persisted for a long time. Therefore, later changes in the crediting taking place in the new economic environment might prove to be incommensurably small as compared with the initial shock. It may result in statistically insignificant or no relationship between the dynamics of non-payments and the amounts of granted credits. However, it does not mean that this factor plays no role in the generation of payment arrears, since the available data array does not permit to detect its impact.

Yet another problem hindering to evaluate this relationship in statistical terms is the poor performance of banks related to the accumulation and redistribution of resources, and their "bad debts." The banking system in Russia alongside with other participants of the economic system experienced difficulties in adapting to the transition to the market. Banks also accumulated "bad debts" (non-payments), however, according to the statistics, at a level considerably below those registered at enterprises. A factor behind this development was that banks reregistered bad debts on credits as formally new credits in order to conceal their real financial standing. At the same time, liquidity indicators are more crucial for banks than for enterprises. A slightest sign of instability may scare their clients away and render the bank bankrupt over a very short time. Therefore, the registered indicators of amounts of credits granted to the real sector may turn out to be overstated. At the same time, the available CBR statistics include inter-bank loans, which have only indirect (if any) impact on enterprise payment arrears.

However, this relationship was tested in the framework of our earlier research[8]. As expected, the obtained results reveal a rather weak negative relationship between non-payments (increment) and the amounts of crediting.

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[8] See: Lugovoi, Semenov (2000)

Apparently, enterprises with longest production cycles experienced the most urgent need of credit resources. Therefore, the solvency of such enterprises was more dependent on the availability of credit resources. Accordingly, the presence of a relationship between non-payments and the duration of production cycles may indicate that there exists the problem related to the financing of current assets (Model 2, valid only for profitable enterprises).

As an alternative of the direct relationship between non-payments and granted credits, the hypothesis may be tested basing on indicators indirectly reflecting the amounts of crediting and / or availability of credits.

Indicators of Monetary Policy

Indicators of monetary policy (nominal and real interest rates, and money supply) may be used to characterize the availability of credits.

The interrelation of non-payments, interest rates, and money supply was studied in the framework of our earlier research (see: Entov et al., 1998). The three-month GKO (Government short term bonds) rate was used as the indicator of the market rate. Over the period under observation (1994 through 1997) the market of internal public debt dynamically developed and began to dominate the Russian financial market due to the active efforts on the part of the Finance Ministry and Central Bank. In this connection, although GKO interest rate was not identical to the interest rate on enterprise borrowings, it better reflects the level of liquidity[9] in the economy, and therefore indirectly indicates the availability of crediting.

In 1994 through 1998 the real rates on the market of government bonds were at a very high level, presumably over the average profitability in the real sector of the economy. In this situation, the crediting of the real sector entailing high risks of default was less acceptable than investment in the public debt market.

At the same time, enterprises might prefer to invest their internal or borrowed resources on the GKO-OFZ market seeking additional gains, what resulted in the outflow of money from the real sector and default on its payment obligations.

Thus, in the order of identification, there are two possible channels transmitting the impact of increasing interest rates on non-payments. The first channel is related to the limited availability of bank credits (Model 2) aggravated by difficulties encountered in transfers of payments (increase in interest rates also limited the availability of inter-bank loans thus negatively affecting the payment function of the banking sector). The second channel is related to incentives for premeditated default on obligations (Model 1). The increment of interest rates increased potential gains related to payment arrears. In the latter case both nominal and real interest rates are of importance.

The dynamics of nominal and real interest rates reflects changes in inflationary expectations. Entrepreneurs may delay the repayment of their obligations in order to repay them with depreciated money. At the same time, high interest rates, especially in the situation of institutionalized non-payments is a clear stimulus for defaulters to obtain certain gains. As it was noted above, the problem of deliberate default on obligations may acquire the global scope under weak market institutes.

Another indicator of monetary policy is the money supply in the economy. Therefore, the problems with liquidity and scarce bank credits are often related to the "tight money supply" and the "low GDP monetization." For a time, a number of

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[9] especially in case the dynamics of the risk component of these obligations (assumed to be at zero in developed economies) are disregarded.

authors adhered to this point of view (see, for instance, Lisitsian, (1997), Shmelev (1997), Gavrilenkov (1996), etc.). The supporters of this hypothesis assert that high inflation rates depreciating the money on enterprises' accounts, and a sharp contraction of crediting of the economy are the factors responsible for the shortage of current capital. Accordingly, enterprises experiencing so called scarcity of current capital could not settle with their creditors.

Indeed, the growth in money supply outpacing inflation rates may characterize the growth in liquidity in a short time perspective. However, it is apparent that in case the increase in money supply is not supported by growing demand for money these developments facilitate the future rise in prices. Accelerating growth in the nominal money supply most often intensifies inflation processes, facilitates increases in interest rates, and as a result decreases demand for real money balances.

Since the beginning of market reforms Russia has experienced considerable fluctuations of money supply and demand, as well as priorities of monetary and budgetary policies, while non-payments steadily grew until the crisis of 1998. It was observed that indebtedness increased at higher rates when the amount of real money in the economy was maximal (in 1997 through 1998); and decreased in the periods when the real money supply was at rather low levels (1999, see Annex 1, Fig. 7). Therefore, it may not be asserted that there exists a significant interrelation between non-payments and the money supply, at least without considering other factors of equal importance.

The issue of the impact of interest rates and money supply on non-payments was analyzed in Entov et al. (1998) by applying the econometric simultaneous equations model:

$$\begin{cases} \left(\dfrac{\Delta C}{P}\right)_t = \underset{(0.605)}{0.960} - \underset{(0.058)}{0.148} \cdot \left(\Delta\dfrac{Y}{P}\right)_{t-3} + \underset{(0.004)}{0.016} \cdot r^f_{t-1} - \underset{(0.038)}{0.181} \cdot \left(\dfrac{B_F - B_P}{P}\right)_{t-1} + \underset{(0.123)}{0.244} \cdot \left(\dfrac{\Delta D}{P}\right)_{t-1} + \underset{(0.596)}{1.742} \cdot \dot{R}^{3m}_t + \varepsilon_1 \\[2ex] \dot{R}^{3m}_t = -\underset{(0.703)}{1.186} - \underset{(0.058)}{0.302} \cdot r^f_{t-1} - \underset{(0.510)}{1.917} \cdot \dot{M}2_t + \underset{(0.755)}{1.819} \cdot \dot{M}2_{t-3..6} + \underset{(0.396)}{2.839} \cdot S_t + -\underset{(0.015)}{0.015} \cdot \left(\dfrac{\Delta C}{P}\right)_t + \varepsilon_2 \end{cases} \quad (1.1)$$

The model was evaluated using monthly time series, the interval from 2/1994 to 9/1997. According to the results of the evaluation (standard errors of coefficient evaluations are given in brackets) increments in overdue creditor indebtedness $\left(\dfrac{\Delta C}{P}\right)_t$ are influenced:

 – *negatively* – by previous recovery of business $\left(\Delta\dfrac{Y}{P}\right)_{t-3}$;

 – *positively* – by high real yields on government bonds registered over the preceding period r^f_{t-1} ;

 – *negatively* – by the excess of actual budgetary expenditures over the targets (i.e. expenditures below targets - negative difference – result in an increase in non-payments) $\left(\dfrac{B_F - B_P}{P}\right)_{t-1}$); the evaluation of this coefficient is given for the model with excluded variable of debtor indebtedness;

 – *positively* – by the increase in the debtor indebtedness over the preceding month (in real prices $\left(\dfrac{\Delta D}{P}\right)_{t-1}$); the evaluation of this coefficient is given for the model with excluded budgetary variable $\left(\dfrac{B_F - B_P}{P}\right)_{t-1}$;

– *positively* – by the increase in the nominal (three month) GKO interest rates $\dot{R}_t^{3m}$.

   The dynamics of nominal GKO rates are affected:
– *negatively* – by high real yields on bonds registered in the preceding period; what may also be interpreted as an inflation rate prediction error under adaptive expectations[10] r_{t-1}^f;
– *negatively* – by accelerating growth in the nominal money supply over the current period $\dot{M}2_t$;
– *positively* – by the preceding acceleration of growth in the nominal money supply due to the rise in prices $\dot{M}2_{t-3...6}$;
– *positively* – by unexpectedly high auction premium S_t on the GKO market interpreted as the intensity of the Finance Ministry demand for financial resources necessary to finance the budgetary deficit.

   Besides, logical variables were introduced to the model for the periods characterized as periods of increased instability (elections, crises). The model was designed as a simultaneous equations structure was aimed to separate the possible inter-influence of non-payments and interest rates, since it was not excluded that non-payments may influence interest rates. The nature of this relationship may be ambiguous. First, it is not excluded that enterprises experiencing liquidity problems may to withdraw funds from other assets, bonds including, thus facilitating an increase in interest rates. Second, the growth of non-payments in the real sector may also mean that budgetary tax revenues are decreasing, what would result in the increasing demand for borrowings on the part of the Finance Ministry with respective impact on interest rates. Third, the growth in non-payments may cause the contraction of bank crediting of the real sector, what, due to the related increase in demand of banks for alternative assets, would decrease interest rates.

   The results of the evaluation of the impact non-payments have on interest rates are ambiguous. Opposite trends were registered at different intervals, while no significant influence was detected over the whole evaluated interval. The length of the observation interval shall be taken into account (44 observations from 2/1994 to 9/1997). Taking into account the number of observations the twofold reduction of the sample substantially deteriorates confidence in the conclusions on the significance and trends of the relationship between non-payments and interest rates and requires a further research.

   In contradistinction to this relationship, the influence of interest rates on non-payments is statistically significant over the total observation interval and stable, what is supported (not rejected) by the results of the Chow breakpoint test and Chow forecast test. The high statistical significance (influence on non-payments) was detected both for the previous dynamics of real interest rates and the current growth rate in nominal interest rates. In other words, in this case the hypothesis about the significant impact of the liquidity levels in the economy on non-payments seems to be most relevant.

   However, the statistical significance of the impact of interest rates on non-payments alone does not suffice to conclude that constrained bank crediting generates non-payments. The impact of interest rates on non-payments may be caused by the functioning of different mechanisms. For instance, the following circumstances may

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[10] For deduction of the relationship between real interest rates and expected inflation see Lugovoi (1998).

be considered: in the situation where non-payments do not result in bankruptcy procedures the rising interest rates create additional incentives to default on current payments and invest liquid assets in the financial market. Moreover, in this situation even banks carrying out payment operations of their clients may, as experience show (see: Mikhailov, Sycheva, Timofeev, 1998) delay payments in order to utilize most liquid resources for investment to the market of the shortest-term loans.

As concerns the rate of growth in the money supply, its impact on non-payments was detected only via interest rates. The variable of the real money supply dynamics was introduced in the equation of non-payments and proved to be statistically insignificant. At the same time, the influence of changes in the money supply on interest rates is statistically significant and may be characterized by two periods. The current increase in the rates of growth in the money supply causes interest rates to decrease (the liquidity effect), what may facilitate a decrease in the growth of non-payments. The growth in the money supply facilitates increases in interest rates in the medium term (3 to 6 months), what creates incentives for the growth in non-payments. It shall be noted that according to the results of the model evaluation the effect of the medium-term impact of the money supply on interest rates proves to be more significant than the effect of the short term decrease. Apparently, the non-payment problem can not be settled by expanding money supply.

Indicators of Profitability

The identification of problems described by the third model may be affected by the results of comparison between indicators of profitability of firms and the accumulation of indebtedness.

In case non-payments are used as a means to finance losses, there may be detected a positive relationship between the indicators of the financial results of the economic activities and net non-payments (the difference between overdue payables and overdue receivables at the enterprise level). Losses are a part of the normal economic process, however, it losses are "transferred" to creditors they may be reviewed as the subsidizing of loss-making enterprises. In this situation the problem can not be settled by expansion of bank crediting. While crediting of loss-making enterprises may decrease inter-enterprise payment arrears, in fact they will be just reregistered as debts to banks. Moreover, in case non-payments are a form of concealed subsidizing of loss-making enterprises, even bank credits granted to profitable enterprises, whose partners include loss-making firms, will facilitate the subsidizing of the latter thus strengthening the system of non-payments at large.

A number of authors analyzed the relationship between the indicators of profitability and non-payments. A.Calvo and Fabrizio Coricelli (1994) conducted an econometric testing of the hypothesis basing on the data from balances of Romania's enterprises and arrived to the conclusion that non-payments may occur at rationally behaving firms, i.e. non-payments shall not be associated only with firms operating at a loss, what supports the hypothesis about temporary difficulties or "late payments." Alfandari and Schaffer (1996) arrived to similar conclusions basing on their analysis of Russian enterprises.

It shall be noted that the methodology applied by the authors of the second paper (and, accordingly the obtained results) are sensitive to the choice of the indicator of the non-profitability of enterprises. The authors used the financial results of enterprise operations. The analyzed period (1992 through 1995) was characterized by high inflation rates. As is well known, inflation is responsible for overstated financial results due to the production lag. The authors pointed out this circumstance,

however, they preferred this indicator asserting that in case a firm registers negative financial results under inflation, it experiences really serious problems. This suggestion may be accepted, however, in this case the sample is divided not in loss-making and profitable enterprises, but in the most non-profitable ones and the rest. The latter group will also include enterprises in fact operating at a loss (in real terms), but showing positive financial results due to inflation. This fact affects the authors' conclusion that only a small share of non-payments is generated by loss-making enterprises and that non-payments are by most part "late payments."

This hypothesis was tested basing on regional data in the course of our earlier research (see: Lugovoi, Semenov, 2000) and on time series (see: Entov et al., 1998). The aggregate amount of losses, profits, and the share of loss-making enterprises in the national economy were used as the indicator of profitability. Although official financial reporting was used without adjustment for inflationary distortion of financial results, the results of econometric tests provide an evidence that there exists a relationship between non-payments and profitability. A clear statistically significant relationship between non-payments and characteristics of production ineffectiveness was detected. For some periods losses explain up to 50 per cent of the dispersion of overdue indebtedness.

The obtained results disagree with the conclusions suggested by A.Calvo and Fabrizio Coricelli (1994), Alfandari and Schaffer (1996). The results may differ due to the fact that the former authors conducted the testing basing on the data on Romanian enterprises, while the latter authors based on the data collected in the early 1990s, and their conclusions agree with our results (for the period from 1993 to 1994), where we detected weak relationships seemingly caused by inflationary distortion of financial reporting.

It shall be emphasized that this model (Model 3) is focused on the behavior of loss-making enterprises. Behavior of profitable enterprises is outside the framework of this model and may be described by first two models. Besides, in case an enterprise is a net creditor, its behavior is outside the framework of these three microeconomic models, since such an enterprise does not generate payment arrears, but credits its counteragents.

It shall be noted that the available official statistics may be not sufficiently reliable due to some other factors. While the financial results registered by accounting are different from economic ones (as it was observed above, an especially wide gap between these indicators emerges in the periods characterized by high inflation rates due to the generation of inflationary profits), enterprises may conceal the true results of their operations by misrepresenting accounting data in order to diminish the tax base. Therefore, it is difficult to distinguish between profitable and loss-making enterprises basing only on official financial reporting.

The factors indirectly affecting their financial results and independent of (or less dependent on) financial reporting may be used in order to alternatively test the hypothesis that loss-making enterprises generate payment arrears (Model 3).

There may exist many factors affecting the effectiveness of economic operations of enterprises (and even whole sectors of the economy). First, there are changes in the price structure related to goods produced by enterprises and their suppliers. Second, due to the curtailment of production capital-intensive enterprises lost in gains derived from the returns to scale effect, what resulted in redundant employment. In case the factors affecting the financial results of enterprise operations also have an impact on non-payments, it may help to accept or discard the hypothesis

that financial standing of enterprises is significant for the generation of payment arrears.

Changes in Price Structure

The liberalization of prices and foreign trade sufficiently affected the price and demand structure of the Russian domestic market. Changes in the price structure affected profitability across many industries.

The approach to the problem of non-payments based on changes in the price structure resulting in non-profitability of a number of enterprises was employed by Volkonski and Kantorovich (1995). The authors attempted to detect a genuinely economic factor (in contradistinction to behavioral factors) behind the non-payment crisis. They defined this factor as the "non-market" structure of production.

The authors note that the "non-market" structure (characterized by disproportion, remoteness from the competitive equilibrium of existing (initial) distribution of resources) may be understood and defined differently, and concretized depending on the different sets of factors "external" to the economy, which determine the possible (desirable) export and import terms, admissible minimal wage levels, etc. In case these conditions are specified, the complete liberalization of prices and wages may result in the fact that they will be relatively fast set at levels rendering certain enterprises to operate at a loss or at a low profit and other to become highly profitable.

The authors develop a model of inter-industrial balance explaining the factors responsible for inflation and non-payments in the situation characterized by substantial price disproportion. The major factors generating the "anti-market" situation are monopolization and uneven initial (at the moment of price liberalization) distribution of resources across industries and individual enterprises.

The real exchange rate to a certain extent was the regulator of the price structure. Its impact on the competition between domestic and external producers was apparent. Since the beginning of 1992 Ruble has substantially appreciated (see Fig. 5, Annex 1). Apparently, it facilitated a substantial decrease in prices of imported goods competing with domestic products. The analysis of the relationship between non-payments and changes in the price structure (including the "Index of qualitative changes in producer prices,[11]" relative increase in prices of electric power demonstrating the outpacing rates of growth in prices of a major production factor for energy-intensive enterprises, and the real exchange rate. All three empirical tests based on time series favored this hypothesis (for details see: Lugovoi, Semenov, 2000).

Thus, the outpacing rates of growth in prices of energy resources and raw materials relatively to consumer goods prices (basing on the results of empirical tests) result in increasing non-payments. It appears that the deteriorating financial standing of enterprises producing consumer goods is responsible for this development. Therefore, the results of the tests favor the hypothesis that non-payments are generated in the consumer production sector, and not in the raw materials sector, while the accumulation of non-payments in the fuel and energy sector appears to be of the induced nature. The acceptance of this hypothesis is yet another evidence that not

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[11] For details see: Bessonov, 1998, 2000. The indices presented in the paper reflect the dynamics of changes in prices and output volumes of finished, end (processing-intensive) products relatively to raw materials. The "Index of qualitative changes in producer prices" reflects the relative changes in the price structure of the domestic market as concerns different commodity groups ("raw materials" and "finished (processing-intensive) products").

raw materials, fuel, and energy monopolies, but non-effective, loss-making enterprises are the source of non-payments.

The real Ruble exchange rate is an important factor in the process of growth in non-fulfilled obligations (basing on the results of empirical tests). The factor behind this development may be the increasing competitiveness of imports due to lowering prices of imported goods. It shall be emphasized that the enhancement of competition facilitates growth in the long run, since it creates incentives to increase the effectiveness of production. However, in the short term the competition pressure deteriorates financial standing of enterprises, what, according to the hypothesis, in the present situation generates non-payments. At the same time, increasing real Ruble exchange rates result in growth of relative costs borne by export-oriented (raw materials) enterprises. So, profitability and financial standing of enterprises deteriorates across practically all sectors. The mechanism of the facilitation of growth via the encouragement of competition implies that the effectiveness of enterprises shall be enhanced via additional investment. However, in the present situation existing in Russia, due to the lack of working markets of capital, investment may be generated only at the expense of internal funds of enterprises. In this situation it is impossible to stimulate growth via the enhancement of competition, since it eliminates the last source of investment – the economic profit.

The detection of relationships between indicators, which characterize the price structure and, respectively, reflect changes in the financial standing of enterprises may favor the third model, which assumes that loss-making is responsible for the generation of non-payments. At the same time, two other possible sources of payment arrears (lack of crediting and premeditated non-compliance with obligations) are not discarded (Models 2 and 1).

Budgetary Payment Arrears

Due to the transformational slump there was registered a decrease in budgetary expenditures resulting in declining demand on the part of the state (health care, education, housing and public utilities, law enforcement, culture, etc.) and contraction of state procurement (military and industrial complex). The situation was aggravated by the fact that actual state expenditures most often were below targets as is evidenced by the difference between the actual and planned administration of revenues and expenditures of the state budget (see Fig. 6, Annex 1). The planned expenditures (as non-paid state procurement) may become a source of non-payments. Due to insufficient financing the enterprises of the public sector could not settle with their creditors.

Therefore, the state may be included in the group of "non-scrupulous counteragents" defaulting on their obligations. Non-compliance with budgetary obligations with regard to earmarked expenditures deteriorates the effectiveness of enterprises and their partners and prevents them from settling with creditors, thus setting a vicious circle resulting in falling budgetary revenues. The non-compliance with target obligations may occur both at the level of federal and regional budgets.

The provision of the planned aid (federal transfers) is a very important factor for the economic activity of recipient regions. In case the federal center fails to fulfil its obligations with regard to transfers, regional authorities may encounter difficulties in financing public goods, what facilitates the emergence of chains of non-payments. At the same time, regions may also default on their obligations. The creditor indebtedness of regions is an evidence that there are outstanding budgetary obligations.

Our previous research presented an evidence that administration of budgets of all levels is significant for the generation of payment arrears (see: Entov et al., 1998, Lugovoi, Semenov, 2000). Higher levels of payment arrears were observed in regions registering large amounts of budgetary creditor indebtedness.

The results of the testing of this hypothesis shall be reviewed as an evidence favoring the assumption that loss-making is responsible for the generation of payment arrears (Model 3). Accumulation of unpaid finished products results from ineffective demand and the disparities in the structure of aggregate demand and supply. Insufficient financing may be reviewed as a reduction of prices of end products that being equivalent to loss-making. The problem of insufficient financing of state expenditures is outside the framework of short term cash gaps and can not be eliminated by applying methods creating incentives for bank crediting.

Ownership Structure

The effectiveness of enterprise operations may to some extent be determined by the form of ownership. It is well known that as a rule state-owned property is managed less effectively than private property. The principal – agent problem may to a certain extent account for this.

Therefore, the presence of a relationship between the ownership structure and effectiveness, the ownership structure and payment arrears may indicate the principal – agent problem.

It shall be noted that in case of Russia the effectiveness of enterprises may be related to privatization. On the one hand, privatization might primarily concern the most effective enterprises. On the other hand, it is well known that enterprises were often deliberately made bankrupt to facilitate their privatization.

State protectionism may account for the fact that state-owned enterprises show a greater propensity to generate payment arrears. Enterprises belonging to the military and industrial complex, social sphere and otherwise related to the production of public goods depend on the financing of state procurement and therefore may be more inclined to non-payments. This problem is closely related to the ineffectiveness arising due to lack of budgetary financing.

Our previous research provided evidence that there is a significant statistical relationship between shares of state-owned and loss-making enterprises. There was also obtained the statistical evidence that there exists a relationship between non-payments and the ownership structure. Regions with higher shares of public sector (share of enterprises, share of industrial output) accumulated more payment arrears. However, in spite of a clears statistical relationship the percentage of explained dispersion is relatively small. Proceeding from this fact it may be asserted that non-payments are characteristic not only of public sector enterprises. This conclusion agrees with the results obtained by Alfandari and Schaffer (1996), who found out no significant relationship between payment arrears and types of ownership at the micro-level.

Periods of Instability

The economic theory (Hicks, 1939, Keynes, 1936) describes the following effect. Economic agents seek to sharply increase their liquid assets in periods, where there are registered a steady process of economic operations and a sharp increase in uncertainty and risk factors. Apparently, this factor may play an important role in transition economies, where liberalization of prices, privatization, and other reforms sharply increase the uncertainty of further economic development, what may be

reflected, for instance, by accumulation of indebtedness. In the periods characterized by sharp economic and even political shifts (for instance, the Presidential elections in Russia held in 1996 might have had a considerable impact on the further economic development) entrepreneurs will apparently rush to accumulate liquid resources (in some cases transferring them to off-shore companies) and therefore generating their current non-payments.

Due to the above reasons, in the course of the empirical analysis of overdue indebtedness it makes sense to single out periods characterized by such an increase in uncertainty. By introducing dummies related to these periods in the dynamic model in the course of our preceding research we could support this hypothesis in econometric terms that being an evidence that uncertainty factors are significant in the process of payment arrears accumulation. It seems that these factors shall be attributed to the premeditated causes of non-payments (Model 1), since they are determined by the framework of rational strategies pursued by economic agents seeking to retain capitals under uncertainty. However, there is another possible mechanism transmitting the impact of these factors on payment arrears, for instance via a rise in interest rates and contraction of bank crediting in the periods of instability (Model 2).

Offset Transactions

The avalanche of mutual payment arrears, including indebtedness to the budget (budgetary payment arrears) resulted in the emergence of non-traditional tax collection methods, i.e. monetary and non-monetary budgetary offsets. These operations have a number of negative aspects, which include such major factors as creation of incentives to further accumulate indebtedness and insufficient transparency of these operations (for details on offset practices in the Russian Federation and their impact on economic effectiveness see Annex 4).

Therefore, the moral hazard problem most often refers to offsets. Firms may accumulate non-payments irrespectively of their financial standing in anticipation of offsets in order to derive additional gains (Model 1). The relationship between non-payments and offsets, tax amnesties was studied in Ivanova, Wyplosz (1999), and in the course of the comparison between dynamics of budgetary payment arrears and federal offsets there was found out a certain evidence that offset transactions have an impact on further growth in non-payments to the budget (offset transactions were followed by increases in budgetary payment arrears).

It shall be noted that the problem concerning the prime cause of the emergence of offsets (the government – enterprises conflict (Model 1), third factors (for instance, loss-making (Model 3), or payment arrears on the part of counteragents (macro-model)) remains unsolved. On the one hand, a cartel (collusion) of enterprises having a certain political power may force the government to yield and conduct an offset. On the other hand, offsets may emerge due to the absence of alternatives both for the government and firms. In the former case offsets (alongside with budgetary payment arrears) result from the moral hazard problem (Model 1), in the latter they represent the factors of non-voluntary nature responsible for insolvency of enterprises (Models 2, 3, macro-model).

SECTION 2. EMPIRICAL TESTING OF HYPOTHESES, CONSTRUCTION OF ECONOMETRIC MODELS[12]

This section focuses on a number of econometric tests of relationships between payment arrears and certain factors indicated in the theoretical section of this paper in order to find out the level of the non-payment problem in the Russian economy.

All empirical tests presented in this paper use regional data. In contradistinction to our previous tests, a number of which also making use of regional data, this presentation seeks to combine the data in the framework of a single dynamic model and to test new hypotheses. This approach will permit to substantially expand the sampling (up to 2 thousand observations), improve the quality of evaluation, and to ensure greater confidence in derived conclusions, as well as considerably expand the types of tests, since it combines both dynamic and panel data. The use of regional statistics allows to determine general regularities of development of the analyzed processes at the regional level (over time), to detect their differences and obtain additional information about the process.

The paper elaborates the methodology allowing to evaluate amounts of offset transactions at the regional level and studies this indicator.

The empirical testing is aimed to build regional dynamic econometric models of non-payments and offset transactions allowing to evaluate the aggregate impact of the analyzed factors.

Dynamic Regional Model of Non-Payments

In the theoretical section of this paper there were reviewed three models explaining the emergence of payment arrears at the micro-economic level, analyzed different factors affecting or related to non-payments, which could help to detect the origins of the indebtedness described by the models. These relationships are studied below.

The increment in the overdue creditor indebtedness relatively to the total volume of industrial output (over the respective period). This indicator characterizes the dynamics of aggregate payment arrears in the industrial sector[13] (excluding the arrears of payments due to banks). For details concerning the choice of this indicator see Lugovoi, Semenov (2000).

Indicators of Availability of Credits

The hypothesis that bank crediting is a significant factor for the non-payment problem shall be tested first. As it was mentioned above, the testing of this hypothesis presents certain difficulties due to the fact that banks credited the real sector at a rather low level over the period under observation. A certain increase in the variation of this indicator may be achieved in case we switch to the regional data.

Interest rates may present another factor reflecting the availability of credits. Interest rates on and amounts of bank loans to legal persons are the most important characteristics of the performance of the banking sector (with regard to the real

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[12] The authors are especially gratefult to V. P. Nosko for the consultations on the econometric analysis.

[13] The available Goskomstat statistics also permit to analyze non-payments outside this sector. In case industrial data were unavailable for certain periods, they were evaluated basing on the information about overdue indebtedness across a wider range of sectors on the assumption that the sectoral structure of non-payments was constant.

sector). It shall be noted that in contradistinction to the amount of crediting interest rates do not account for the rationing of credits.

To test this hypothesis the following model shall be evaluated:

$$\frac{\Delta C_{i,t}}{Q_{i,t}} = c_0 + c_1 \cdot I_t + c_2 \cdot r_t + c_3 \cdot \frac{K_{i,t}}{Q_{i,t}} + \varepsilon_{i,t}, \tag{2.1}$$

where

$\dfrac{\Delta C_{i,t}}{Q_{i,t}}$ is the increment in the overdue creditor indebtedness of industrial

enterprises in the i-th region over the period t ($\Delta C_{i,t}$) relatively to the average annual industrial output $Q_{i,t}$ (the share of non-payments accumulated by enterprises in this region in the output unit value, the regional variable, quarterly data);

I_t is the rate of increase in the nominal interest rate on granted credits (the macroeconomic variable);

r_t is the real interest rate on granted credits (the macroeconomic variable);

$\dfrac{K_{i,t}}{Q_{i,t}}$ is the amount of granted credits relatively to the volume of industrial

output (the regional variable, annual data);

$\varepsilon_{i,t}$, $\varepsilon'_{i,t}$, $\varepsilon''_{i,t}$ are the stochastic components;

c_j are coefficients, parameters of the regression equation.

The real interest rate in the model reflects the real value of credit resources. The higher is the real interest rate, the less possibilities enterprises have (and the less are inclined) to resort to bank credits and the higher is probability of payment arrears.

Sharp increases in the nominal interest rates reflect the contraction of liquidity, increasing uncertainty, inflationary expectations, what may, according to the hypothesis, facilitate growth in payment arrears.

In contradistinction to interest rates the amount of granted credits is a regional variable representing the activity of banks in regions. From the substantive point of view it is more appropriate to use the dynamics of this indicator (increments), which characterize changes in the level of banks' activity in the analyzed model, since the used explained variable is also expressed in increments. However, the available statistics do not allow to find out the difference, since the methodology of calculation was changed several times over the period of observation, what renders the data poorly comparable across time. Therefore, the model used actual amounts of granted credits, which nevertheless permit to conduct a cross-regional comparison with regard to the banking activity. According to the hypothesis, there is expected a negative coefficient, since increases in crediting weakens the demand for trade credits, decreases payment arrears.

For the results of the evaluation of coefficients of model (2.1) see Table 2.

Table 2. Results of the evaluation of model (2.1), OLS, I/1995-IV/2000.

	Coefficient	Std. Error	t-Statistic	Prob.
c_0	-0.092	0.026	-3.506	0.001
c_1	0.152	0.026	5.824	0.000
c_2	0.169	0.017	9.875	0.000
c_3	-0.018	0.007	-2.734	0.006

R-squared	0.061	Mean dependent var	0.112
Adjusted R-squared	0.060	S.D. dependent var	0.167
Observations	1824	S.E. of regression	0.162
F-statistic	39.596	Prob(F-statistic)	0.000

The variables in the model have high statistical significance, however the assumption about the normalcy of the model residuals. According to the results of the Jarque-Bera test, the hypothesis about the normality of the residuals is discarded (see Fig. 8, Annex 2). The removal of outliers does not considerably change the situation (see Fig. 9, Annex 2). Although evaluations remain unbiased, the distribution of evaluations does not correspond to the normal, what prevents conclusions about their statistical significance basing on *t*-statistics.

The non-normality of residuals may result from the specifics of the pooled regressions, i.e. the probable heteroskedasticity of the analyzed value (both over time and across regions). Even in case the assumption about the normality of residuals proves to be true for each period of time (quarter) and each region, the mix of samples with different variances will result in a non-normal distribution (with kurtosis and "heavy tails").

Proceeding from the plot of model residuals (Fig. 10, Annex 2) it may be suggested that there exists heteroskedasticity. This fact is also supported by the results of the White's Heteroskedasticity Test according to which the hypothesis about the absence of heteroskedasticity is rejected (see Table 18, Annex 2).

The quarter-based evaluation of standard deviations of the modeled value ($\dfrac{\Delta C_{i,t}}{Q_{i,t}}$) supports the hypothesis about the heteroskedasticity of non-payments across time periods. The variance of increments in non-payments across regions varied from period to period. Since this form of heteroskedasticity may be considered as known (it may be evaluated), we evaluate model (2.1) applying the weighted least square method (WLS) using the inverse value of evaluated quarterly standard errors (Table 19, Annex 2). For the results of the model WLS evaluation see Table 3.

Table 3. Results of the evaluation of model (2.1), WLS, I/1995-IV/2000.

	Coefficient	Std. Error	t-Statistic	Prob.
c_0	0.035	0.027	1.314	0.189
c_1	-0.039	0.030	-1.297	0.195
c_2	0.221	0.012	18.551	0.000
c_3	-0.013	0.004	-3.070	0.002
R-squared	0.087	Mean dependent var		0.097
Adjusted R-squared	0.085	S.D. dependent var		0.129
Observations	1824	S.E. of regression		0.123
F-statistic	116.095	Prob(F-statistic)		0.000

As the table reveals, the coefficient of the rate of growth in the nominal interest rates reversed its sign and lost its statistical significance in contradistinction to the real interest rates, which considerably gathered in significance. However, the hypothesis about the normality of residuals is rejected (both using the total sampling, and with excluded outliers, see Figs. 11 and 12, Annex 2). However, it shall be mentioned that the distribution of weighted residuals is closer to normal than in case of the non-weighted ones, as is evidenced by smaller values of the Jarque-Bera statistics (compare Figs. 8 and 9 to. Figs. 11 and 12 respectively, Annex 2).

In the similar way the correction was carried out under the assumption that the variance of the explained variable (remaining after the correction for conditional heteroskedasticity) is different across regions. For the results of the model evaluation involving extended correction and exclusion of outliers see Annex 2, Table 20. The variance of the model residuals (Fig. 13, Annex 2) was even closer to the normal and this hypothesis is not rejected at the 99 per cent significance level. Therefore, the use of the WLS method allows to get more precise notion about the significance of evaluations.

According to evaluation results, the rate of growth in the nominal interest became statistically significant with negative sign, what is inconsistent with the hypothesis. A more profound analysis of this relationship reveals that the sign reversal was caused by the interdependence between nominal and real interest, what originated multi-collinearity problems. In case the real interest is shifted one lag back (or excluded from the model), it restores the sign of the coefficient of the nominal interest (see Table 21, Annex 2). Therefore, it would be better not to use these indicators with the same lag.

The evaluation results favor the hypothesis about the importance of bank crediting for the generation of payment arrears, described in the framework of Model 2. The significance of the interest may support both Model 2 and Model 1. As it was asserted above, growth in interest may facilitate the spreading of premeditated non-payments due to the attractiveness of alternative investments and increasing uncertainty.

As it was noted in the theoretical section of this paper, enterprises with longest production cycles experience the most urgent need of credit resources. Therefore, the solvency of such enterprises is more dependent on the availability of credit resources. Accordingly, the presence of a relationship between non-payments and the duration of production cycles may indicate that there exist problems related to the financing of current assets (Model 2, "late payments").

The duration of production cycle is a micro-economic indicator and is not available from Goskomstat as regional averages. The duration of production cycle may be indirectly characterized by such indicators as capital productivity and capital intensity. Apparently, they are not net characteristics of this indicator. However, it may be suggested that the more rapid is the capital turnover in an industry (region), the less capital intensive is the production and the more rapidly investments are recouped, and, probably, the shorter is the production cycle.

For the testing of this hypothesis see Annex 3. According to the evaluation results the hypothesis is not rejected as the regions with more capital intensive production demonstrate higher propensity to generate payment arrears.

Indicators of Profitability

According to the classification presented above, in case non-payments may be a means to finance losses (Model 3) it may be indicated by the existence of a relationship between indicators of profitability and payment arrears.

It shall be noted that the relationship between (debtor and creditor) indebtedness and profits (losses) may be of a more complex nature. A write-off of overdue debtor indebtedness (on a certain expiration date) may mean a respective increase in a firm's losses, while write-offs of creditor indebtedness result in a respective increment in its profits. In this case profits and losses become endogenous variables and outstanding liabilities are an exogenous variable. However, the data indicate that this effect probably had no serious impact on the analyzed process (see Table 1).

The relationship between non-payments and losses, profits, the share of loss-making enterprises as based on regional data was demonstrated in the course of our previous research (see: Lugovoi, Semenov, 2000). Therefore, these data are not presented separately, but included into the generalized model alongside with other factors (real exchange rate, price structure). The impact of this indicator (similarly to real exchange rate) on profitability may not be directly reflected by accounting indicators of profitability (loss-making), due to the disagreement between economic and accounting results of economic operations, concealment of true data about the financial standing of enterprises, changes in output volumes. Therefore, these indicators may be used simultaneously (indicators are not collinear).

The price structure was characterized by the "Index of qualitative changes in producer prices" elaborated and computed by Bessonov (2000). The index describes the national (macro-economic) dynamics, reflecting the fact that the rate of growth in prices of end (processing-intensive) products outpaces the rise in prices of raw materials. There may be suggested a similar indicator characterizing the price structure at the regional level, which shall be computed as a ratio between the accumulated price indices of regional producers and the accumulated regional consumer price indices.

In case the prices of goods produced by regional enterprises outpace inflation (as regards consumer goods) it may be either an evidence that these goods are in good demand, what facilitates the rise in price, or that there is no external competitive pressure.

It is apparent that in case an enterprise sells its products at a higher price (than other producers of similar merchandize), it positively affects its financial standing. Hence a relationship with payment arrears. In case successful enterprises generate less non-payments, an increase in this indicator may reflect their decrease.

Evidently, the enterprises and regions whose products are not included in the consumer basket or have no substitutes are not marketable. It is clear that prices of the raw materials sector are less correlated with consumer prices (at least in the current period), while prices of the sector of end products somewhat affect inflation.

This relationship may also be reviewed via costs. Lagging growth in consumer prices indicates lower production (labor) costs. Low inflation rates account for the abating urgency to adjust wages, therefore relative labor costs decline.

The following model is evaluated:

$$\frac{\Delta C_{i,t}}{Q_{i,t}} = c_0 + c_1 \cdot e_t + c_2 \cdot e_{t-1} + c_3 \cdot \frac{q_{i,t}}{p_{i,t}} + c_4 \cdot l_{i,t} + \varepsilon_{i,t} \,, \tag{3.1}$$

where

e_t is the rate of increase in the real Ruble exchange rate;

$\dfrac{q_{i,t}}{p_{i,t}}$ is the outpacing rate of growth in prices of consumer goods produced by

enterprises of the i-th region over the period t, accumulated since the price liberalization (January of 1992);

$l_{i,t}$ is the share of loss-making enterprises in the i-th region over the period t.

For the results of model evaluation see Table 4. Similarly to the previous case the WLS method and normalizing weights were applied to evaluate the model.

Table 4. Results of the evaluation of model (3.1), WLS, III/1995-IV/2000.

	Coefficient	Std. Error	t-Statistic	Prob.
C_0	0.211	0.040	5.330	0.000
C_1	-0.001	0.031	-0.038	0.970
C_2	-0.171	0.022	-7.739	0.000
C_3	-0.084	0.016	-5.378	0.000
C_4	0.232	0.019	12.072	0.000

R-squared	0.131	Mean dependent var	0.109
Adjusted R-squared	0.129	S.D. dependent var	0.132
Observations	1616	S.E. of regression	0.123
F-statistic	60.649	Prob(F-statistic)	0.000

The model's coefficients are statistically significant and are of the expected signs. The variable representing the share of loss-making enterprises was most statistically significant and positively signed. In other words, the regions with higher shares of loss-making enterprises account for larger non-payments, therefore the growth of this indicator may reflect the increment in payment arrears.

The increase in the real Ruble exchange rate (a decrease in the value of the indicator in Rub./$ terms) registered over the preceding period (quarter) entails an increment in payment arrears. The real exchange rate is statistically insignificant in the current period (without lag).

Changes in the regional price structure (between goods produced and consumed (by households) in the region) also affect payment arrears. According to the hypothesis, the rise in producer prices outpacing the growth in consumer prices

may reflect some improvement of financial standing of enterprises and in case there exists a "profitability – payment arrears" relationship result in declining indebtedness.

Therefore, the obtained results confirm the presence of loss-making component in the generation of payment arrears (Model 3). Both the increase in the share of loss-making firms and the dynamics of macro-economic indicators affect non-payments providing the evidence that there exists a channel allowing to finance losses at the expense of payment arrears.

Administration of the State Budget

As it was noted above, budgetary failures may present a source of indebtedness accumulation. Many enterprises engaged in the state procurement operate in such a way that they have to produce first and be paid later. At the same time, their suppliers credit them with energy and raw materials. In this situation delays of budgetary payments result in the fact that budget recipients can not settle with their creditors and thus facilitate the further spreading of payment arrears.

This hypothesis has already been tested basing on aggregate time series in the course of our previous research. This paper tests the hypothesis basing on regional data. The following model is evaluated:

$$\frac{\Delta C_{i,t}}{Q_{i,t}} = c_1 \cdot B_t^{F-P} + c_0 + \varepsilon_{i,t} \tag{4.1}$$

where

B_t^{F-P} is the annualized excess of actual federal budgetary expenditures over targets in per cent of targets (see Fig. 6, Annex 1);

For the results of the evaluation of model coefficients see Table 5. Notwithstanding the correction of quarterly and regional variances and the exclusion of outliers the hypothesis about the absence of heteroskedasticity is rejected (White Heteroskedasticity Test, Annex 2, Table 22. In order to take into account the heteroskedasticity of unknown form there were applied the weights mentioned above (taking into account the quarterly and regional heteroskedasticity) and the White Heteroskedasticity-Consistent Standard Errors & Covariance method.

Table 5. Results of the evaluation of model (4.1),WLS, White, IV/1994-IV/2000.

	Coefficient	Std. Error	t-Statistic	Prob.
c_1	-0.318	0.016	-19.756	0.000
c_0	0.065	0.002	31.599	0.000

R-squared	0.106	Mean dependent var	0.082
Adjusted R-squared	0.106	S.D. dependent var	0.087
Observations	1838	F-statistic	463.097

According to the evaluation results the budgetary variable is of high statistical significance and is of the expected sign. Therefore, the excess of actual budget indicators over targets was negatively correlated with the growth in non-payments.

The annualized budgetary indicators are stipulated by the law on budget. The targets were broken down by quarters only in 1995. Therefore the budgetary variable used in the model was computed basing on annualized dynamics, its value is identical

across all quarters of the same year. The monthly data on budget administration are available, and on the assumption that expenditures are linearly planned[14], the utilization of expenditure targets may be calculated for each quarter. It allows the model to take into account dummies for different years (otherwise they will be linearly dependent on the budgetary variable).

Equation (4.1) is evaluated by substituting the budgetary variable B_t^{F-P} with the quarter variable b_t^{f-p} and introducing quarterly dummies (d^j). These variables are intended to take into account the seasonal factor, which may emerge both in the course of the break down of the budgetary variable by quarters, and due to a possible seasonal character of the dependent variable itself. No seasonal differences are applied due to the fact that not all analyzed factors may be submitted to this procedure. Besides, the seasonal differences model reduces the sample and requires special evaluation techniques. The following model is evaluated:

$$\frac{\Delta C_{i,t}}{Q_{i,t}} = c_1 \cdot b_t^{f-p} + \sum_j c_2^j \cdot d^j + \varepsilon_{i,t}, \qquad (4.2)$$

The results of the model evaluation are presented in Table 6.

Table 6. Results of the evaluation of model (4.2),WLS, White, IV/1994-IV/2000.

	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*
c_1	-0.330	0.016	-20.834	0.000
c_2^I	-0.013	0.005	-2.368	0.018
c_2^{II}	0.018	0.004	4.487	0.000
c_2^{III}	0.028	0.004	7.721	0.000
c_2^{IV}	0.065	0.004	15.301	0.000

R-squared	0.101	*Mean dependent var*	0.108
Adjusted R-squared	0.099	*S.D. dependent var*	0.126
Observations	1838	*S.E. of regression*	0.120

According to the evaluation results (see Tables 5 and 6), expenditures at 1 per cent below target result in the growth in payment arrears by about 0.33 per cent on the average (coefficient c_1 in models 4.1 and 4.2 may be reviewed as elasticity, since both the independent and explained variables are fractional).

The test does not provide evidence about the trend of the detected relationship. It is possible that that the relationship between non-payments and the execution of budgetary expenditures may also be bilateral[15]. While budgetary expenditure failures may result in the accumulation of payment arrears, the increment in non-payments entail, among other things, that budgetary payment arrears increase (budgetary and extra-budgetary payment arrears are a part of the creditor indebtedness), what results in falling budgetary revenues and therefore failures to meet budgetary expenditures targets. Taking into account this fact, we previously used for modeling the a single lag budgetary variable, thus eliminating the possible feedback. It was not crucial for

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[14] In 1995 this distribution of quarterly targets was approximately linear.
[15] The situation where actual budgetary expenditures are below targets may be defined as a sequester of budgetary expenditures even if it was not announced officially.

monthly time series and the significance of the budgetary variable persisted. The following model is evaluated with the lagged variable:

$$\frac{\Delta C_{i,t}}{Q_{i,t}} = c_1 \cdot b_{t-1}^{f-p} + \sum_j c_2^j \cdot d^j + \varepsilon_{i,t} \qquad (4.3)$$

Table 7. Results of the evaluation of model (4.3),WLS, White, IV/1994-IV/2000.

	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*
c_1	-0.094	0.011	-8.252	0.000
c_2^I	0.057	0.005	11.191	0.000
c_2^{II}	0.050	0.005	10.578	0.000
c_2^{III}	0.040	0.005	8.684	0.000
c_2^{IV}	0.050	0.005	10.439	0.000
R-squared	0.019	*Mean dependent var*		0.108
Adjusted R-squared	0.017	*S.D. dependent var*		0.126
Observations	1838	*S.E. of regression*		0.125

According to the evaluation results the budgetary variable is statistically significant in both models, although at a lower level. At the same time, the absolute value of the coefficient decreases. The significance of the budgetary variable means that the processes of accumulation of overdue indebtedness in the real sector demonstrates the same trend as budgetary failures (and vice versa). Therefore, the budgetary variable without lag will be further used on the assumption that it is exogenous to payment arrears taking into account the fact that this relationship may be of the bilateral nature and requires a further study.

The detected relationship favors the third model, i.e. that loss-making enterprises generate payment arrears. Budgetary failures result in the contraction of state procurement, what affects the effectiveness of enterprises belonging to the public sector and those involved in state procurement.

Generalized Regional Model

The obtained results are combined in the framework of a generalized model. In order to test the stability of coefficients the explanatory regional variables are broken down by years:

$$\frac{\Delta C_{i,t}}{Q_{i,t}} = c_1 \cdot r_t + c_2 \cdot I_t + c_3 \cdot e_t + c_3^{(t-1)} \cdot e_{t-1} + c_4 \cdot b_t^{f-p} + c_4^{(t-1)} \cdot b_{t-1}^{f-p} +$$

$$+ c_5 \cdot \frac{q_{i,t}}{p_{i,t}} + c_6 \cdot \frac{\Delta D_{i,t-1}}{Q_{i,t-1}} + \sum_j \left[c_7^j \cdot \frac{L_{i,t}}{Q_{i,t}} + c_8^j \cdot \frac{R_{i,t}}{Q_{i,t}} + c_9^j \cdot \frac{K_{i,t}}{Q_{i,t}} \right] \cdot d_t^j + \sum_j c_{10}^j \cdot d_t^j + \varepsilon_{i,t} \qquad (5.1)$$

where

$\dfrac{\Delta C_{i,t}}{Q_{i,t}}$ is the increase in the outstanding creditor indebtedness of industrial

enterprises over the period t relatively to the volume of output;

I_t is the rate of increase in the nominal interest rate on granted credits;

r_t is the real interest rate on granted credits;

b_t^{f-p} B_t^{F-P} is the annualized excess of actual federal budgetary expenditures over targets in per cent of targets;

$\dfrac{\Delta D_{i,t-1}}{Q_{i,t-1}}$ is the increment in the overdue debtor indebtedness of industrial enterprises in the i-th region over the period t relatively to the volume of output;

$\dfrac{q_{i,t}}{p_{i,t}}$ is the outpacing rate of growth in prices of consumer goods produced by enterprises of the i-th region over the period t, accumulated since the price liberalization (January of 1992);

$\dfrac{L_{i,t}}{Q_{i,t}}$ is the aggregate financial result of enterprises operating at a loss in the i-th region relatively to the volume of output;

$\dfrac{R_{i,t}}{Q_{i,t}}$ is the aggregate financial result of enterprises operating at a profit in the i-th region relatively to the volume of output;

$\dfrac{K_{i,t}}{Q_{i,t}}$ the amount of credits in the economy granted by banks of the i-th region over the period t;

d_t^j are dummies for the period j, $d_t^j = \begin{cases} 1, t = j \\ 0, t \neq j \end{cases}$.

Different specifications of this model with and without dummies, as well as with and without lagged variables are presented in Annex 2 (Tables 23 – 24 and 25 – 26 respectively). Besides, dummies for the crisis 1998 year (third quarter) and the periods of election campaigns (4th quarters of 1995 and 1999, 2nd quarter of 1996 and 1st quarter of 2000) were introduced to the model.

According to the evaluation results, the model explains about 20 per cent of variance for the total sample and over 30 per cent with excluded outliers. Values and statistical significance of coefficients do not critically change with the introduction of logical variables.

The majority of coefficients are statistically significant. The statistically insignificant coefficients include the nominal interest rate on the granted credits (it shall be noted that the rate of growth in the nominal interest remains insignificant if there are introduced lags and / or the real interest is excluded) and profits, amount of crediting, losses (for some periods), see Tables 23 through 26, Annex 2. The real interest and the budgetary variable remain statistically significant with and without lag and have expected signs of coefficients. The index of regional price structure demonstrates the expected negative coefficient, although at a low level of statistical significance.

The detection of a positive relationship between payment arrears and losses at a high level of statistical significance may provide an evidence that there exists the problem of "transfer" of losses in non-payments to creditors (suppliers, the state, employees), what agrees with the assumptions for a theoretical model of the third type. On the contrary, positive financial results of economic operations (profit) do not

demonstrate coefficients of stable positive sign, what is not in variance with this hypothesis. In most cases the profit is statistically insignificant in the model. For years 1995 and 1999 the coefficient of this indicator is negatively signed, what may be explained by the inverse logic of the third theoretical model, i.e. the repayment of previously accumulated indebtedness at the expense of profits. However, profitable enterprises may show more propensity to grant commercial credits, what also may result in a negative relationship between these indicators.

A positive coefficient of the profit was registered for year 1998, what can not be explained by the previous logic and indicates that in 1998 even profitable enterprises might present a source of payment arrears. It shall be noted that 1998 is the crisis year (forex crisis and default on internal public debt). The premeditated causes of non-payments may become especially widespread in the crisis period, characterized by higher uncertainty (theoretical model 1), while a surge in inflation rates registered in this period might significantly affect the accounting results of economic operations (inflationary profits).

It shall be noted that bank crediting had a significant impact on the generation of payment arrears (excluding 1999), what indicates the presence of problems described by the second theoretical model.

Logical variables are statistically significant in the periods of the State Duma election campaigns (IV-1995 and IV-1999) and are positively signed. In fact, it means that overdue indebtedness grew at faster rates over these periods. The factor behind these developments might be the high uncertainty observed in these periods, which facilitated the spreading of premeditated causes of non-payments (Model 1). It shall be emphasized that at the end of each year there are usually registered certain decreases in overdue indebtedness (see Fig. 2.4, Annex 1). A factor behind this phenomenon is that at these periods the authorities more actively carry out offsets in order to improve tax collection and bridge budgetary gaps. However, even taking into account this and other factors of the model, the growth in payment arrears in these periods was significantly above the mean value.

However, no significant increases in the growth of indebtedness relatively to the mean path (predicted by other factors of the model) were registered in the periods of Presidential election campaigns (II-1996 and I-2000). To the contrary, the beginning of year 2000 was characterized by relatively lower increments in overdue indebtedness. This might be attributed to inverse expectations emerging in this period in anticipation of the state to resort to tougher measures concerning payment arrears.

Stability of Coefficients

The following is the testing of the possibility to combine annualized variables. The hypothesis about the equilibrium of coefficients of model (5.1) was tested:

$$c_7^{1994} = c_7^{1995} = c_7^{1996} = c_7^{1997} = c_7^{1998} = c_7^{1999} = c_7^{2000} \qquad (6.1)$$

Table 8. Results of the Wald Test for coefficient restrictions, model (5.1).

F-statistic	15.183	Probability	0.000
Chi-square	91.097	Probability	0.000

According to the test results (Table 8) this hypothesis is rejected. Indeed, the coefficient values significantly vary across years. A unique "turning point" was registered in 1998. While in preceding periods coefficients were in the neighborhood

of one, after 1998 their values decreased (see Tables 23 though 26, Annex 2). Another set of problems related to the poor comparability of the data on financial results in 1999 and 2000 caused by the aggregation embracing different groups of sectors (Goskomstat has started to provide data across all sectors only since 1999, previously only industrial data were available) shall also be mentioned.

The hypothesis was reformulated taking into account a possible change in coefficients after 1998:

$$c_7^{1994} = c_7^{1995} = c_7^{1996} = c_7^{1997}, \ c_7^{1998} = c_7^{1999} = c_7^{2000} \tag{6.2}$$

Table 9. Results of the Wald Test for coefficient restrictions, model (5.1).

F-statistic	1.676	Probability	0.137
Chi-square	8.380	Probability	0.137

According to the test results, the hypothesis is not rejected. Similar testing of other coefficients demonstrated instability of coefficients of profits, insignificant change in coefficients of granted credits (in spite of the poor comparability of the data from different years), and statistical equilibrium of quarterly dummies (insignificance of the seasonal factor).

For evaluations of the model with excluded insignificant variables see Table 9.

Table 10. Results of the evaluation of model (5.1),WLS, White, IV/1994-IV/2000.

	Coefficient	Std. Error	t-Statistic	Prob.
c_1	0.043	0.012	3.626	0.000
c_3	-0.065	0.034	-1.930	0.054
c_4	-0.145	0.019	-7.621	0.000
c_6	-0.005	0.002	-2.129	0.033
$c_7^{1994-1997}$	1.314	0.113	11.616	0.000
$c_7^{1998-2000}$	0.188	0.071	2.651	0.008
c_8	-0.016	0.019	-0.871	0.384
c_9	-0.013	0.003	-4.424	0.000
c_0	0.086	0.033	2.612	0.009
c_{10}^{IV-95}	0.070	0.010	7.282	0.000
c_{10}^{II-96}	0.015	0.013	1.189	0.235
c_{10}^{III-98}	0.095	0.028	3.410	0.001
c_{10}^{IV-99}	0.014	0.011	1.256	0.209
c_{10}^{II-00}	-0.041	0.006	-6.397	0.000

R-squared	0.277	Mean dependent var	0.082
Adjusted R-squared	0.272	S.D. dependent var	0.087
Observations	1838	S.E. of regression	0.074
F-statistic	104.753	Prob(F-statistic)	0.000

In spite of a certain decrease in the coefficient of the multiple regression (0.31 as compared to 0.2); the loss of the explanatory power seems to be caused by combination of profit values from different years (the hypothesis about stability is

rejected[16]), as well as by the aggregation of credits into a single variable and the exclusion of lagged variables). However, this did not affected the key inferences from the model:

- losses are a significant factor behind the growth in payment arrears thus indicating that they may be financed at the expense of non-payments (theoretical model 3);
- increase in bank crediting of the economy facilitate decrease in non-payments (theoretical model 2);
- failures to meet state targets may result in the generation of payment arrears in the real sector (theoretical model 3);
- high interest rates on credits facilitate growth in non-payments via higher price of credit resources, decrease in liquidity (theoretical model 2) and / or creating incentives for premeditated non-payments (theoretical model 1);
- growth in the real Ruble exchange rate and changes in the price structure (slower rate of the rise in producer prices in comparison to consumer goods) facilitate increase in non-payments (deteriorating effectiveness, therefore theoretical model 3);
- indebtedness may grow most intensively in the periods of uncertainty (Model 1).

Evaluation and Analysis of Offset transactions

The intensifying growth in outstanding payments has brought about a number of negative consequences. One of these consequences is the non-monetary administration of budgetary revenues and expenditures. It would suffice to mention that such administration predetermines the structure of budgetary expenditures thus deteriorating their effectiveness to mark this phenomenon as negative. Another negative aspect is that these operations set the precedent for further accumulation of budgetary indebtedness on the part of economic agents in anticipation of offsets. In other words, there arises the moral hazard problem (profitable enterprises delay payments due to the budget). As it was mentioned above, the behavioral aspect of the generation of payment arrears by enterprises anticipating offsets was studied in Perotti (1998), Nikitin (2000).

Offsets took place both at the federal and regional levels (for details on the development of offset transactions in the Russian Federation see Annex 4) and apparently had a certain impact of regional indicators, including payment arrears.

The obtaining of reliable empirical evidence about the impact of offsets on the behavior of economic agents presents certain difficulties due to the fact that, first, behavioral parameters are non-observable, and, second, there is no sufficient statistical data on offset operation (especially at the regional level).

Evaluation of the Share of Offset Transactions

No centralized statistics on regional offset transactions is available, what renders the offset-related testing of the hypotheses more difficult. Taking into account this fact, this paper elaborated a method to compute an indicator indirectly

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[16] In spite of the rejection of the hypothesis about the stability of coefficients it was attempted to combine the data from different periods to test the statistical significance and the trend of the relationship for the whole period under observation.

characterizing shares of offset transactions in regions. To be more precise, this indicator characterizes the (weighted) difference between federally conducted and local offsets. The methodology is based on the specifics of tax collection.

The tax legislation of the Russian Federation stipulates the collection of federal, regional, and local taxes. Alongside with the federal agencies, RF subjects are also vested with certain rights concerning the collection of federal taxes. The tax jurisdictions of RF subjects are limited to their respective shares in tax revenues, where they are free to introduce additional privileges and set taxation regimes. The budgetary regulations are stipulated by tax laws, special legislation, and the annually approved federal budget.

Profits of legal persons are taxable at 30 per cent (35 per cent prior to 1999), and the profit tax revenues are shared between the federal and regional as follows: 11 per cent to the federal budget and up to 19 per cent to regional budgets (13 and 22 per cent respectively prior to 1999). The federal budget receives 85 per cent of VAT revenues, regional budgets receive 15 per cent (75 and 25 per cent respectively before 1.4.1999). The authors limited their research to these two taxes, however, the budgets also share excises on certain goods and raw materials, personal income tax, payments for the use of natural resources, the road fund tax.

These arrangements result in the fact that there simultaneously arise tax obligations to both budgetary tiers. These obligations shall be settled basing on the aforementioned proportions, even in case the taxpayer does not meet these obligations in full. Therefore, the budgetary payment arrears are accumulated in accordance with these arrangements.

Of course, in practice these proportions are not strictly observed due to several factors, the first of them being offsets. There is a variety of monetary and barter offsets, both at the regional and federal levels (for details see Annex 4). Offsets are necessarily conducted with participation of either the federal, or a regional budget, who seek to repay the respective indebtedness and administer expenditures and revenues. Therefore the tax collection improves only with regard to the participating budget.

Thus, unilateral participation of budgets in the offsets results in the fact that the ratio between the budgets in terms of the amounts of collected taxes and accumulated budgetary payment arrears is at variance with the arrangements stipulated by law. Similarly, if budgets at both levels participate in an offset, the proportion may vary in case their shares do not correspond to the tax arrangements.

There are also other factors at work, which account for imbalances of actually collected taxes and accumulated budgetary payment arrears among the budgets. The imbalances are tax-specific. For instance, exporters are reimbursed VAT from the federal share of this tax. Tax rates vary across regions, systems of privileges are in place for different goods, etc.

Nevertheless, these factors are less significant than offsets. The difference between amounts of offsets conducted by the federal and regional budgets may be evaluated without taking into account these factors.

Budgetary payment arrears (no offsets, all other things being equal) shall be distributed *pro rata* to taxes:

$$\frac{N_F}{N_R} = \frac{T_F}{T_R} = k, \quad Z_F = Z_R = 0 \tag{7.1}$$

where

T_F, T_R are the respective actual amounts of the federal and territorial tax budgetary revenues;

N_F, N_R are the respective actual amounts of the federal and territorial budgetary payment arrears;

k is the ratio between the (effective) federal and regional tax rates;

Z_F, Z_R are the respective amounts of offsets of the federal and territorial budgets.

In case offsets are entered into the equality (7.1) it, as a general rule, is disturbed. Summarizing the aforementioned facts it shall be repeated that offsets may be conducted at the federal and territorial budgetary levels; offsets improve tax collection increasing actual tax revenues, and reduce budgetary payment arrears. Other things being equal:

$$T_F = T_F^{'} + Z_F$$
$$N_F = N_F^{'} - Z_F$$

(7.2)

Similarly at the regional level:

$$T_R = T_R^{'} + Z_R$$
$$N_R = N_R^{'} - Z_R$$

(7.3)

where

$T_F^{'}$, $T_R^{'}$ are the respective actual amounts of the federal and territorial tax budgetary revenues in the monetary form (or those assumed to be collected without offsets, other things being equal);

$N_F^{'}$, $N_R^{'}$ are the respective actual amounts of the federal and territorial budgetary payment arrears (increment over a period), which are assumed to be accumulated without offsets (other things being equal).

In general, the equality (7.1) holds true only for the part of tax transactions (those in the monetary form):

$$\frac{N_F^{'}}{N_R^{'}} = \frac{T_F^{'}}{T_R^{'}} = k$$

(7.3')

or, taking into account (2) and (3):

$$\frac{N_F + Z_F}{N_R + Z_R} = \frac{T_F - Z_F}{T_R - Z_R} = k$$

(7.4)

therefore:

$$\boxed{Z_R - k^{-1} \cdot Z_F = k^{-1} \cdot N_F - N_R}$$

(7.5)

and

$$\boxed{Z_R - k^{-1} \cdot Z_F = -k^{-1} \cdot T_F + T_R}$$

(7.6)

The left side of equalities (7.5) and (7.6) presents the weighted difference between amounts of territorial and federal offsets. Unfortunately, due to the fact that there are two equalities in two unknowns (offsets) it is impossible to determine the variables unambiguously, since the equations are linearly dependent. It is only possible to determine the algebraic difference of offsets (the left side of equalities), since the actual amounts of budgetary payment arrears and taxes collected at different budgetary levels. It shall be noted that value $Z_R - k^{-1} \cdot Z_F$ derived from equations (7.5) and (7.6) will tally only in case, where

$$k^{-1} \cdot N_F - N_R = -k^{-1} \cdot T_F + T_R$$

or

$$\boxed{k = \frac{T_F + N_F}{T_R + N_R}}, \qquad (7.7)$$

what represents the ratio between taxes charged by the federal and territorial budgets.

Generally speaking, coefficient k may be set normatively, since regional tax rates are known. However, the present system of privileges at different budgetary levels and differential tax rates for different product groups result in the fact that in practice the arranged ratio between tax rates of the federal (τ_F) and regional (τ_R) budgets is not maintained ($k \neq \frac{\tau_F}{\tau_R}$). Therefore, k may be considered to be a ratio between the effective tax rates:

$$k = \frac{\tau_F^e}{\tau_R^e}, \qquad (7.8)$$

where

τ_F^e, τ_R^e are respective effective territorial and regional tax rates.

Let us designate

$$\Delta Z = Z_R - k^{-1} \cdot Z_F \qquad (7.9)$$

Then, substituting (7.7) in (7.5) and (7.6), it will be obtained that:

$$\boxed{\Delta Z = \frac{T_R + N_R}{T_F + N_F} \cdot N_F - N_R} \qquad (7.10)$$

$$\boxed{\Delta Z = -\frac{T_R + N_R}{T_F + N_F} \cdot T_F + T_R} \qquad (7.11)$$

It is clear that ΔZ shall not be regarded as the amount of offsets conducted at one budgetary level. In spite of the fact that it is technically more difficult to conduct offsets at the federal level, such offsets nevertheless were conducted and involved large enterprises. Therefore, their share is significant. Besides, it shall be kept in mind that third factors are at work, which affect the ratio between tax revenues of the federal and regional budgets. Besides, it may be conjectured that in case an offset is conducted simultaneously with monetary tax payments the assumption that the ratio of monetary transactions (7.3') may not hold. For instance, the federal taxpayer may settle with the federal budget in "cash," while the regional taxpayer may resort to an offset. In accordance with (7.10) and (7.11)

$$\Delta Z \leq Z_R, \qquad (7.12)$$

since $Z_F \geq 0$, $Z_R \geq 0$.

As an example why this variable shall not be regarded as offsets of territorial budgets (discard offsets of the federal budget) the following data may be presented. According to V. M. Zubov[17], ex-Governor of the Krasnoyarsk Region, the share of VAT and profit tax offsets in the Krasnoyarsk Region was at 84 per cent and 81 per cent respectively in 1997. According to (7.10) or (7.11) (these values are equal), the

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[17] V. M. Zubov "Ot neplatezhei k razvitiyu." 1999.

share of ΔZ in actual regional revenue component makes 31 per cent and 17 per cent respectively for VAT and profit tax, what agrees with (7.12).

In fact, any budgetary tax may be offset, since eligibility of taxes is determined by regional administrations[18]. The ratio between ΔZ and the amount of collected tax (taxes):

$$\Delta Z_i^* = \frac{\Delta Z_i}{T_F^i + T_R^i} \qquad (7.13)$$

may be only reviewed as a proxy characterizing the excess of the share of non-monetary transactions in regional budgetary tax revenues over the share of offsets in federal budgetary tax revenues collected in this region. At the same time, this indicator may be interpreted differently. The excessive share of federal budgetary payment arrears may be viewed as an evidence of regional protectionism.

Payment Arrears and Offsets

Before proceeding to test these hypotheses, the properties of the indicator shall be analyzed. As it was mentioned above, large budgetary payment arrears originate offsets. Therefore, offsets shall be primarily observed in the regions with higher shares of budgetary payment arrears. This hypothesis may be tested by evaluating the following model:

$$\Delta Z_i^* = c_0 + c_1 \cdot \frac{\Delta C_i}{Q_i} \qquad (8.1)$$

where

ΔZ_i^* is the evaluated indicator of the share of offsets in tax revenues (determined above);

$\dfrac{\Delta C_i}{Q_i}$ is the increment in overdue creditor indebtedness (of industrial

enterprises) in the region relatively to the volume of industrial output.

Table 11. Results of the evaluation of coefficients of model (8.1) for 1995-1999.

	1995	1996	1997	1998	1999
Obs.	70	78	78	77	71
R-squared	0.116	0.142	0.118	0.094	0.013
Const	0.348	0.678	0.500	0.996	0.400
Std.Error	0.026	0.045	0.052	0.106	0.093
t-Statistic	13.288	15.212	9.682	9.380	4.310
Prob.	0.000	0.000	0.000	0.000	0.000
C	2.814	4.475	3.748	5.035	1.042
Std.Error	0.942	1.261	1.172	1.803	1.059
t-Statistic	2.988	3.548	3.199	2.793	0.984
Prob.	0.003	0.000	0.001	0.005	0.326
Residuals Normality Test					
Jarque-Bera	1.720	1.620	4.890	4.390	3.090
Prob.	0.420	0.420	0.080	0.110	0.210
Excluded obs.	72, 65, 46, 29, 76, 47, 61, 64				30, 93, 7, 76, 64, 29

Note: for the numbers of regions excluded from the sample see Annex 4.

According to the results of the evaluation of model (8.1) (Table 11), coefficients of the explanatory variable are significant over all periods, excluding

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[18] Ibid., p. 135. См.там же, с. 135.

1999. Therefore, this hypothesis is not rejected. The regions with larger amounts of outstanding indebtedness demonstrated greater arrears imbalances between the federal and territorial budgets, what may be caused by the higher share of offset transactions at the regional level.

Market Concentration Level

In spite of the authorities' efforts to simplify offset procedures, only large taxpayers have been involved in offsets. There are several factors behind this phenomenon: first, the complexity of such transactions and, second, certain political power of large taxpayers.

Large enterprises may also more easily put pressure on the fiscal authorities, since large taxpayers may more seriously affect the administration of the budget forcing the authorities to resort to offsets.

Therefore, greater market power may be responsible for more frequent use of offsets.

Goskomstat calculates the share of enterprises dominating respective regional markets (having more than the 35 per cent share on the market of a certain product and operating within the geographical borders of the Russian Federation), and the share of their output in the total industrial regional output. Taking into account the fact that this indicator was not available for all periods under observation (only for 1997 and 1998), there shall be constructed alternative indicators indirectly characterizing the market concentration level. The number of enterprises in a region and the ratio between the charged taxes or GRP and the number of registered enterprises.

To test this hypothesis the following models shall be evaluated:

$$\Delta Z_i = c_0 + c_1 \cdot q_i^m + \varepsilon_i \tag{9.1}$$

$$\Delta Z_i = c_0 + c_1 \cdot \frac{TN_i^m}{n_i} + \varepsilon_i \tag{9.2}$$

$$\Delta Z_i = c_0 + c_1 \cdot \frac{Y_i^m}{n_i} + \varepsilon_i \tag{9.3}$$

q_i^m is the (percentage) share of enterprises having more than the 35 per cent share on the market of a certain product and operating within the geographical borders of the Russian Federation as calculated by Goskomstat;

$\frac{TN_i^m}{n_i}$ is the average amount of charged taxes per enterprise (the ratio between the taxes charged in the region and the total number of enterprises registered in this region);

$\frac{Y_i^m}{n_i}$ is the average product (GRP) per enterprise (the ratio between GRP and the total number of enterprises registered in this region).

For the results of the model evaluation see Tables 12 through 14.

Table 12. Results of the evaluation of coefficients of model (9.1)

	1997	1998
Obs.	61	56
R-squared	0.061	0.008
C_0	0.069	0.077
Std.Error	0.007	0.011
t-Statistic	9.965	7.284
Prob.	0.000	0.000
C_1	-0.065	0.038
Std.Error	0.034	0.057
t-Statistic	-1.890	0.675
Prob.	0.061	0.501

The coefficient is statistically significant at the 90 per cent level only for 1997 and is signed as expected. Therefore, there is a slight evidence that the hypothesis that offsets are more frequent in regions with higher degree of monopolization holds true.

Table 13. Results of evaluation of coefficients of model (9.2)

	1995	1996	1997	1998	1999
Obs.	70	75	77	76	74
R-squared	0.150	0.066	0.017	0.148	0.010
C_0	0.047	0.007	0.042	0.029	0.056
Std.Error	0.007	0.010	0.012	0.016	0.015
t-Statistic	7.047	0.654	3.488	1.810	3.695
Prob.	0.000	0.514	0.001	0.071	0.000
C_1	-0.033	0.027	0.014	0.062	0.009
Std.Error	0.009	0.012	0.012	0.017	0.010
t-Statistic	-3.466	2.269	1.144	3.586	0.874
Prob.	0.001	0.024	0.253	0.000	0.383

Table 14. Results of the evaluation of coefficients of model (9.3)

	1995	1996	1997	1998	1999
Obs.	70	75	75	76	70
R-squared	0.229	0.043	0.003	0.174	0.030
C_0	0.054	0.018	0.066	0.053	0.063
Std.Error	0.010	0.012	0.009	0.014	0.010
t-Statistic	5.228	1.586	7.272	3.925	5.970
Prob.	0.000	0.114	0.000	0.000	0.000
C_1	-0.089	0.163	0.012	0.243	0.420
Std.Error	0.066	0.056	0.036	0.062	0.241
t-Statistic	-1.359	2.921	0.329	3.924	1.745
Prob.	0.175	0.004	0.743	0.000	0.082

Coefficients of models (9.2) and (9.3) are significant for years 1996, 1998, and 1999 (9.2), what favors this hypothesis. The coefficient of the explanatory variable for 1995 is statistically significant in model (9.2) is of the sign opposite to the expected. This may be explained via the indicator of offsets itself, which characterizes the weighted difference between regional and federal offsets. The negative value of the explained variable (according to the assumptions) means that federal offsets prevailed in the regions with higher degree of monopolization. It shall be noted that federal offsets have intensified since 1995 (see Annex 4) and were followed by regional offsets.

Loss-Making and Bank Crediting

According to a hypothesis reviewed above, the share of offset transactions is higher in the regions generating more payment arrears. However, as was indicated above (see models of non-payments), non-payments significantly correlated with financial results. Therefore, in case non-payments result from loss-making, while non-payments entail offsets there may be observed correlation between offsets and indicators of financial operations.

A similar logic may be applied for other factors affecting non-payments. For instance, the growth in crediting in a region may facilitate decrease in amounts of non-monetary transactions, including offsets.

Growth of federal budgetary payment arrears may create incentives for the spreading of offset transactions both at the federal and regional levels, what renders difficult to predict its impact on indicator ΔZ_i.

These hypotheses is tested basing on panel regressions.

Dynamic Regional Model of Offset Transactions

Similarly to the model of non-payments, an aggregate dynamic regional model of offset transactions is built:

$$\Delta Z_{i,t}^* = c_0 + c_1 \cdot B_{t-1}^{F-P} + \sum_j \left[c_2^j \cdot l_{i,t} + c_3^j \cdot \frac{K_{i,t}}{Q_{i,t}} \right] \cdot d_t^j + \varepsilon_{i,t}, \qquad (10.1)$$

where

$l_{i,t}$ is the share of loss-making enterprises in the i-th region over the period t;

B_t^{F-P} is the annualized excess of actual federal budgetary expenditures over targets in per cent of targets;

$\dfrac{K_{i,t}}{Q_{i,t}}$ is the amount of granted credits relatively to the volume of regional industrial output;

d_t^j are dummies for the period j, $d_t^j = \begin{cases} 1, t = j \\ 0, t \neq j \end{cases}$.

For the results of evaluation of model (10.1) see Table 15.

Table 15. Results of the evaluation of model (10.1), OLS, White, 1995-1999.

	Coefficient	Std. Error	t-Statistic	Prob.
C_0	-0.002	0.011	-0.178	0.859
C_1	-0.089	0.079	-1.126	0.261
C_2^{1995}	0.105	0.038	2.752	0.006
C_2^{1996}	0.026	0.026	1.004	0.316
C_2^{1997}	0.077	0.033	2.303	0.022
C_2^{1998}	0.112	0.030	3.741	0.000
C_2^{1999}	0.142	0.036	3.932	0.000
C_3^{1995}	-0.001	0.002	-0.234	0.815
C_3^{1996}	-0.016	0.006	-2.662	0.008
C_3^{1997}	-0.045	0.014	-3.213	0.001
C_3^{1998}	-0.012	0.003	-4.633	0.000
C_3^{1999}	-0.005	0.004	-1.282	0.201

R-squared	0.227	Mean dependent var		0.049
Adjusted R-squared	0.202	S.D. dependent var		0.048
Observations	362	S.E. of regression		0.043
F-statistic	9.321	Prob(F-statistic)		0.000

According to the obtained results, the budgetary variable in the model is insignificant. However, coefficients (with some exceptions) of the share of loss-making enterprises in the region and the amount of crediting are of high statistical significance. Coefficients are singed in agreement with the hypotheses. For instance, the share of offset transactions is positively related to the share of loss-making enterprises. Therefore, it may be inferred that offset transactions are of non-voluntary nature (assuming profitability indicators are exogenous).

$$\Delta Z_{i,t}^* = c_0 + c_1 \cdot B_{t-1}^{F-P} + \sum_t \left[c_2^t \cdot l_{i,t} + c_3^t \cdot \frac{K_{i,t}}{Q_{i,t}} \right] + c_4 \cdot \Delta Z_{i,t-1}^* + \varepsilon_{i,t}, \qquad (10.2)$$

Table 16. Results of the evaluation of model (10.2), OLS, White, 1996-1999.

	Coefficient	Std. Error	t-Statistic	Prob.
C_0	0.021	0.019	1.101	0.272
C_1	0.014	0.108	0.129	0.897
C_2^{1996}	0.006	0.027	0.228	0.820
C_2^{1997}	0.072	0.034	2.128	0.034
C_2^{1998}	0.096	0.031	3.111	0.002
C_2^{1999}	0.057	0.059	0.973	0.331
C_3^{1996}	-0.017	0.006	-2.801	0.005
C_3^{1997}	-0.042	0.013	-3.145	0.002
C_3^{1998}	-0.011	0.002	-4.657	0.000
C_3^{1999}	-0.011	0.006	-1.881	0.061
C_4	0.111	0.058	1.922	0.056

R-squared	0.227	Mean dependent var		0.049
Adjusted R-squared	0.202	S.D. dependent var		0.048
Observations	289	S.E. of regression		0.043
F-statistic	9.321	Prob(F-statistic)		0.000

According to the results of the evaluation the lagged variable of offset transactions is statistically significant at the 90 per cent level, what may indicate some persistent inclination (propensity) of regions to offset transactions in different periods. In other words, it may be inferred that regions more or less consistently maintain a certain attitude to such operations (another possible explanation is protectionism). Nevertheless, the share of offset transactions varies across time, what is reflected via a low statistical significance of this relationship.

Tentative Conclusions

A system of theoretical models was elaborated in the framework of our research concerning the problem of payment arrears. Each of the three micro-economic models characterizes a certain factor (a group of factors) behind the initial emergence of net indebtedness (the difference between obligations and claims).

The first model considers the factors behind the premeditated increase in outstanding obligations. Such opportunistic behavior may become most widely spread under ineffective market institutions and inadequate system of enforcement of contractual obligations. Therefore, the prevalence of these strategies may be crucial for the economy at large.

A situation where firms to some extent are forced to accumulate outstanding obligations (firms could cope with the problem at the expense of a short-term loan, bank credit, short term securities). However, due to underdeveloped financial markets and high credit risks resulting in the accumulation of outstanding obligations, a key assumption of the second model is that these firms do not encounter the systemic loss. In a more precise formulation, the authors assume that no "linkage" between current obligations and cash inflows expected to take place in the last period is possible (possible external credit financing of ineffective enterprises is outside the framework of these models).

The deepest roots of non-payments are reviewed in the framework of the third model, which is based on the assumption that payment arrears result from ineffectiveness of production and other factors generating ever increasing losses of enterprises. The role played by these factors shall be especially important in transition economies, where old industries and sectors are "dying out," since they proved to be noncompetitive in the new situation.

Therefore, the growth in non-payments may become a certain "shock absorber" checking the downfall in production and sustaining employment in the "dying out" sectors. However, it may brake the restructuring of production in other sectors of the economy.

The processes describing each model are closely related to each other. For instance, it is apparent that ineffectiveness of production described in the framework of the third model seriously deteriorates payment terms and selection problems reviewed in the second model. Non-payments originated by short term cash gaps appear to legalize and "sustain" non-payments thus facilitating the growth of payment arrears reviewed in the framework of the first model.

In the course of our analysis of the problem we arrived at the analysis of a more general macroeconomic model of interaction – the general equilibrium model, which may become the subject of the further study of non-payments. In the framework of such a model there shall be reviewed the "transfer" of payment arrears from one sector to another. The cumulative development of such processes is most perceptible in periods of payment and credit crises and forces even most effective firms, who under normal circumstances do not need crediting to maintain current liquidity, to generate payment arrears. This cumulative growth in non-payments most clearly reveals the "fragility" of financial systems in transition economies.

Our analysis differentiates possible ways and means to restrain non-payments in a transition economy. The effect of the factors described in the framework of the first model may be moderated by the development of the enforcement mechanisms for contractual obligations and introduction of effective bankruptcy procedures. These economic policies shall be based on the governmental program of judiciary reform and be its substantial component.

The second model associates payment arrears with certain "technical" troubles and does not review them as a systemic problem Therefore, these problems will play less important role as financial markets will develop, enterprises get restructured and the financial system improved.

Seemingly, under the market economy there always exists a number of ineffective enterprises, therefore the problem of eliminating mass payment arrears may not be tied to the complete extinction of loss-making enterprises. However, the state may limit the adverse impact of non-payments generated by ineffective sectors on the economy at large by implementing structural economic policies.

The "fragility" of modern financial systems, which may be reflected via a spontaneous cumulative growth in non-payments presents the most serious problem.

The complex and multisided nature of this problem requires a further research, however the facts stated above suffice to conclude that it can not be settled without the improvement of market institutes, rehabilitation of state finances, and without putting in place an enforcement system and bankruptcy procedures.

An empirical study presented in this paper is based on the above theoretical analysis. Methods of multiple regression are applied to test some hypotheses described in the theoretical models.

Our calculations revealed that:

1. Increments in non-payments are really inversely related to the amounts of granted credits. As concerns interest rates, according to our calculations the growth in non-payments is affected by the dynamics of the nominal interest rates (the relationship was detected in bivariate regressions). It was observed that they are positively correlated. However, the impact of the real interest rates was most profound (the higher the real interest is, the faster the amount of non-payments grows). The detected relationships, however, explain only a part of the variance of increments in payment arrears. At the same time, the available data do not allow to more precisely define the mechanism of the influence and to find out to what extent increments in interest rates indicate credit difficulties (Model 2), or are an incentive for premeditated withdrawal of funds from the sphere of payment arrears (Model 1).

2. The empirical evidence favored the hypothesis about the presence of a relationship between non-payments and indicators of ineffectiveness. Growth in losses results in payment arrears, while amounts of profit have no clear relationship with indebtedness. The following shall be emphasized: in the course of the separate calculation of regression relationships between a) non-payments and profits; b) non-payments and losses it was detected that the dependencies were of substantially different nature. For instance, relationships between payment arrears and losses are characterized by higher statistical significance and higher (in absolute values) coefficients (more intensive relationship), stability of signs of coefficients. Profits are statistically significant in some periods, however its influence is not stable and is characterized by changes in the signs of coefficients. Among other factors, which could account for these differences, specifics of methods applied to aggregate evaluations, *et cetera* there shall be also mentioned a possible implicit relationship between payment arrears and ineffectiveness of financing of certain firms and sectors of the economy. In these cases non-payments represent a type of financial support of relatively ineffective enterprises.

3. Alongside with the aforementioned factors growth in payment arrears may be facilitated by a sharp contraction of demand for production of domestic firms. The terms of competition between domestic products and imports significantly depend on the real Ruble exchange rate. Calculations reveal that accelerated depreciation of the Ruble result in falling rates of growth in non-payments, what may be explained by expanding demand for domestic products and intensification of current money flows into the turnover of payments among domestic firms.

4. The ratios between trends demonstrated by retail and producer prices frequently changed over short periods. The calculations reveal that changes in these ratios significantly affected payment arrears. Outpacing growth in producer prices might also represent both primary accumulation of funds in channels of inter-enterprise payments, and higher profitability of production. The impact of this indicator (as well as the real Ruble exchange rate) on profitability was not necessarily directly reflected by accounting indicators of profitability (loss-making) due to the fact that the financial results registered by accounting are different from economic ones, concealment of true financial standing, changes in volumes of output. Therefore, the use of these indicators alongside the accounting results of economic operations does not present contradiction (indicators are not collinear).

5. There is no doubt that payment arrears on the part of the state (although not always in the form of outstanding obligations) were a major factor behind the generation of non-payments. Indeed, the calculations provide evidence that administration of state expenditures at targeted levels and non-payments are positively correlated.

At the same time, these factors seem to explain only a part of the accumulation of payment arrears (coefficient of determination in Tables 3 through 6 varies from 8 to 13 per cent). The aggregation of factors under analysis (see, for instance, Table 24, Annex 3) allows to increase the explained variance up to 30 per cent and higher. The obtained results agree with our previous research (see: Entov et al., 1998, Lugovoi, Semenov, 2000). Notwithstanding all differences in model specifications and evaluated periods the same factors are statistically significant.

The analysis of offset transactions at the regional level (under certain assumptions the evaluation obtained in this paper may be considered to be a value characterizing the share of offset transactions at the regional level) revealed that offsets are conducted in regions with high overall levels of payment arrears and depend on the performance of the banking sector and effectiveness of regional enterprises. The growth in bank crediting in regions is inversely related to the share of offset transactions. To the contrary, the regions with higher share of loss-making enterprises show more propensity to offsets. The obtained results are more in favor of the non-voluntary nature of offsets. However, there were also detected relationships between offsets and regional market concentration levels, what favors the behavioral (premeditated) nature of offset transactions. In other words, the regions with high levels of industrial concentration show more propensity to offsets at the regional level.

Intensification of offsets at the regional level may be also interpreted as increasing regional protectionism. Regional authorities seek to decrease tax payments of enterprises at the expense of federal taxes due to the federal budget. However, it is

also possible that offsets are conducted due to the impossibility to collect taxes in "cash." However, the data available for this presentation do not allow to investigate this problem in detail.

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Annex 1. Dynamics of Overdue Indebtedness
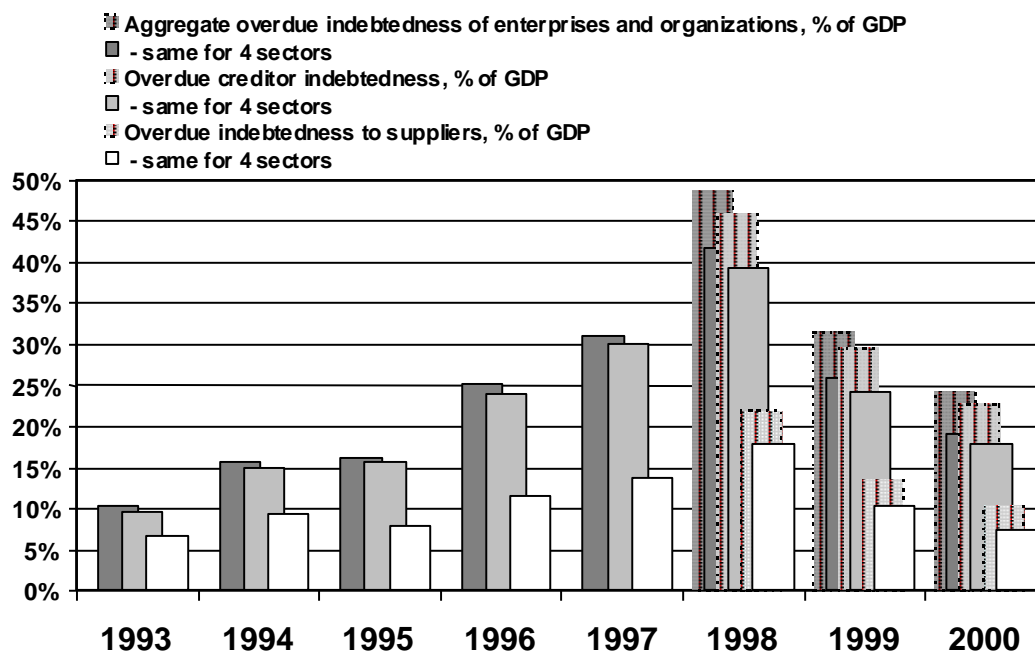
Figure 1. Dynamics of overdue indebtedness (share in GDP, end-period).
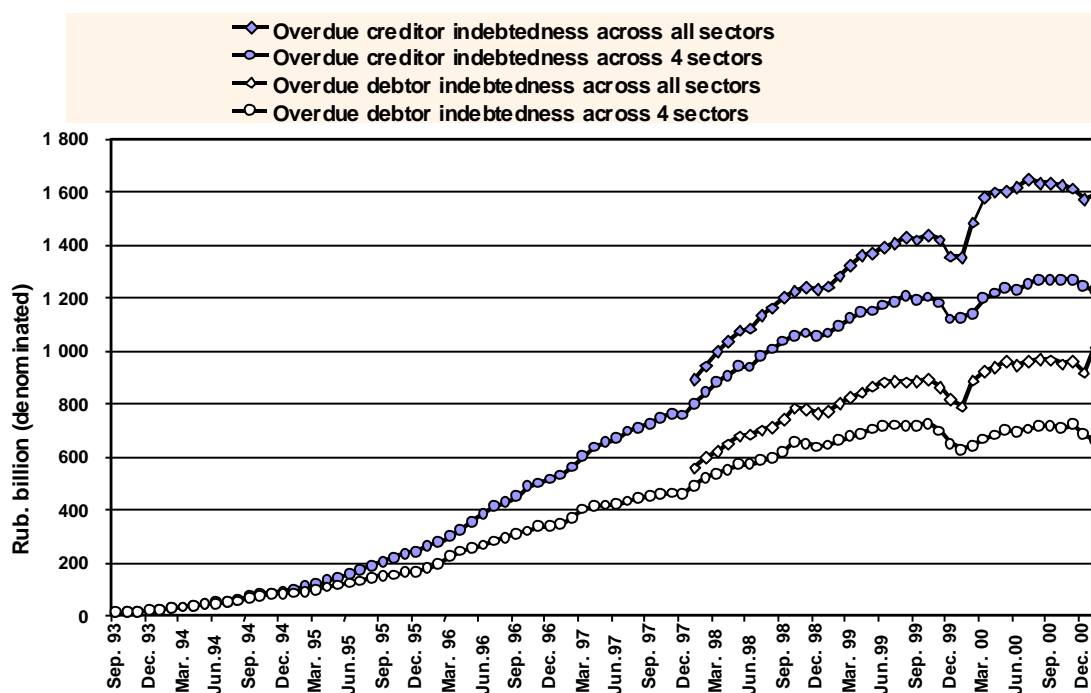
Figure 2. Dynamics of nominal accumulated overdue credit indebtedness and debtor indebtedness (Rub. billion.)
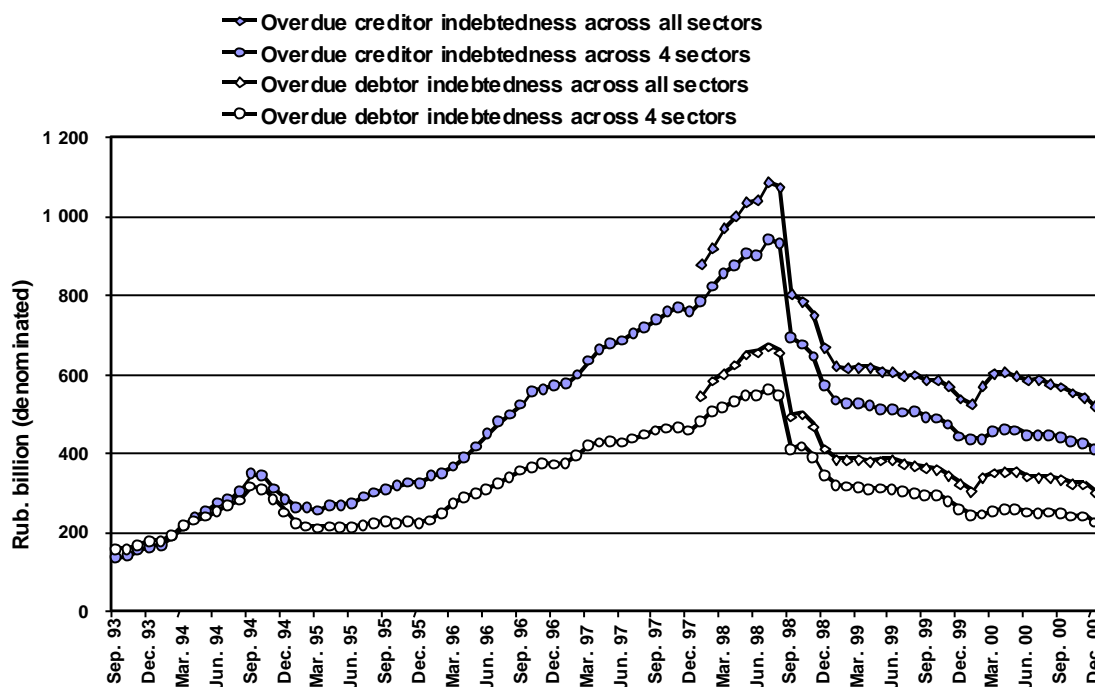
Figure 1. Dynamics of CPI deflated accumulated overdue creditor indebtedness and overdue debtor indebtedness (base period 1.1.1997, Rub. billion).

Figure 2. Dynamics of CPI deflated increments in overdue creditor indebtedness (base period 1.1.1997, Rub. billion).

Figure 3. Real Ruble exchange rate dynamics (in terms Rub./$, 100=1.1.1995, source: authors' calculations, Goskomstat, IFS)

Figure 4. Difference between actual and target indicators of the federal budget.
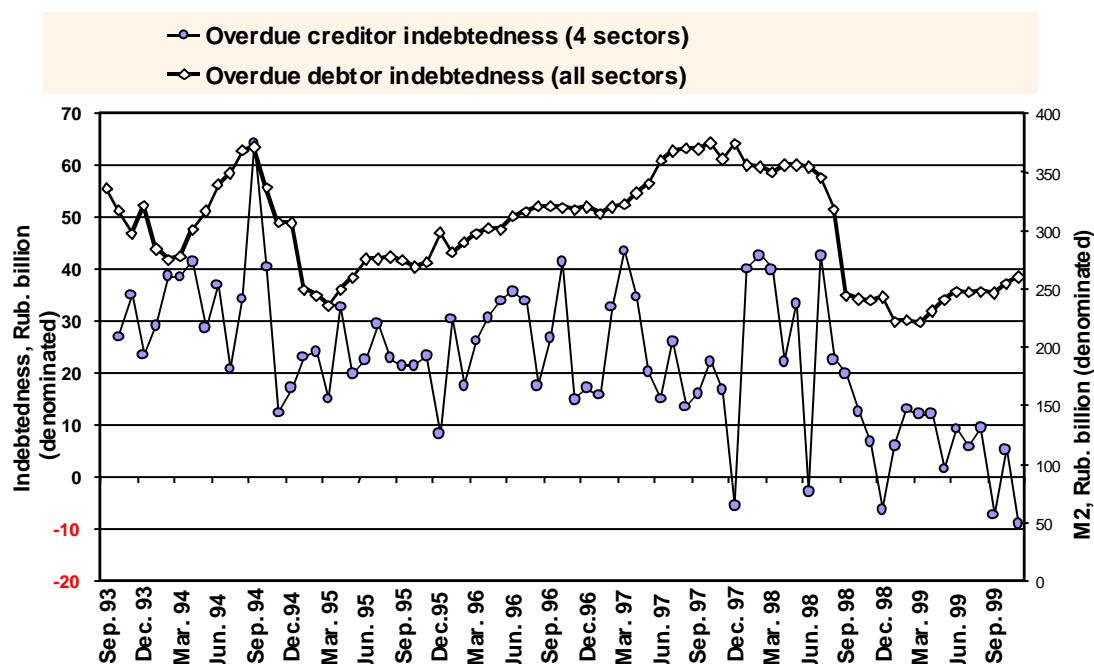
Figure 5. Dynamics of real money supply and CPI deflated increments in indebtedness (base period 1.1.1997, Rub. billion).

Amounts of written off overdue indebtedness

Table 17. Indebtedness written off to financial results.

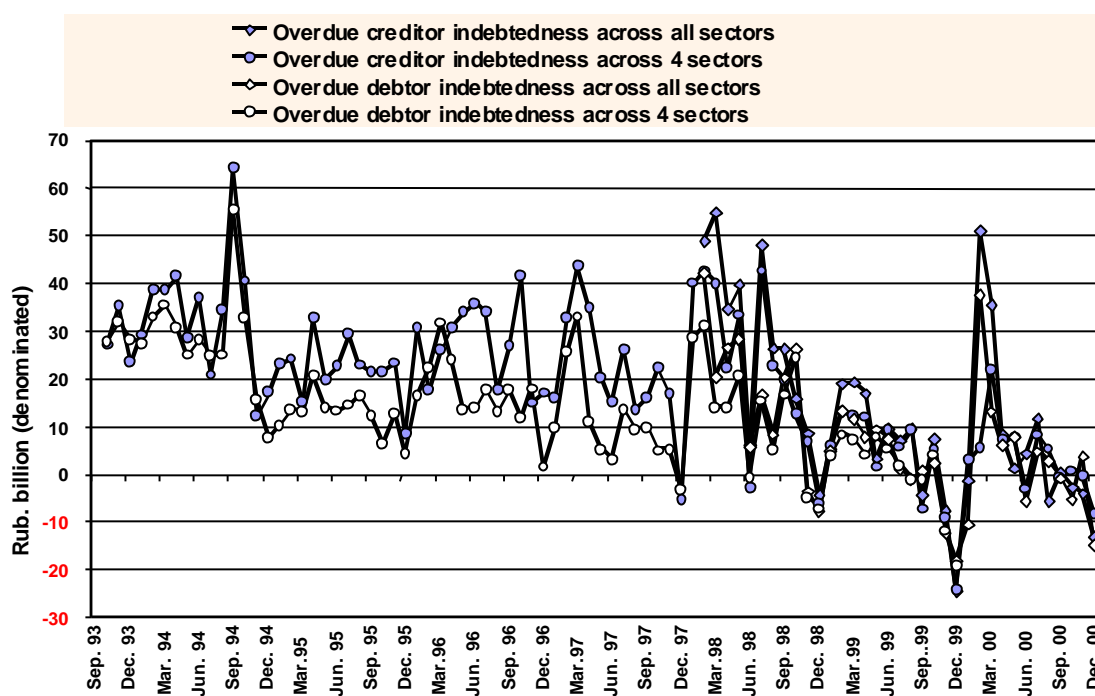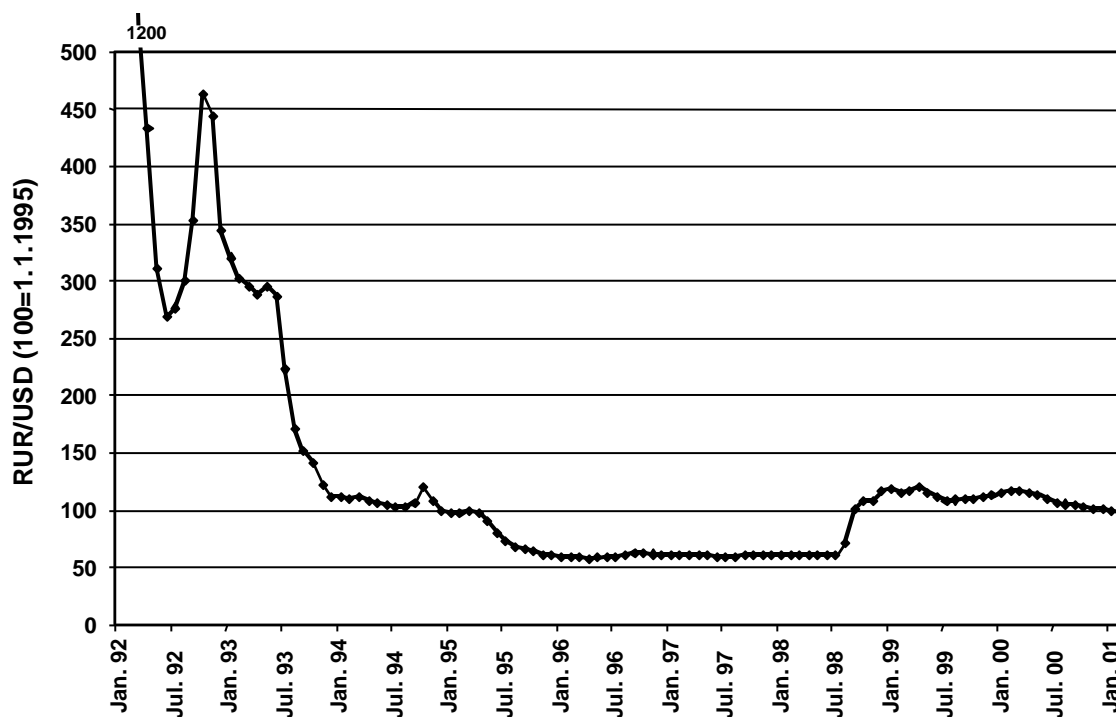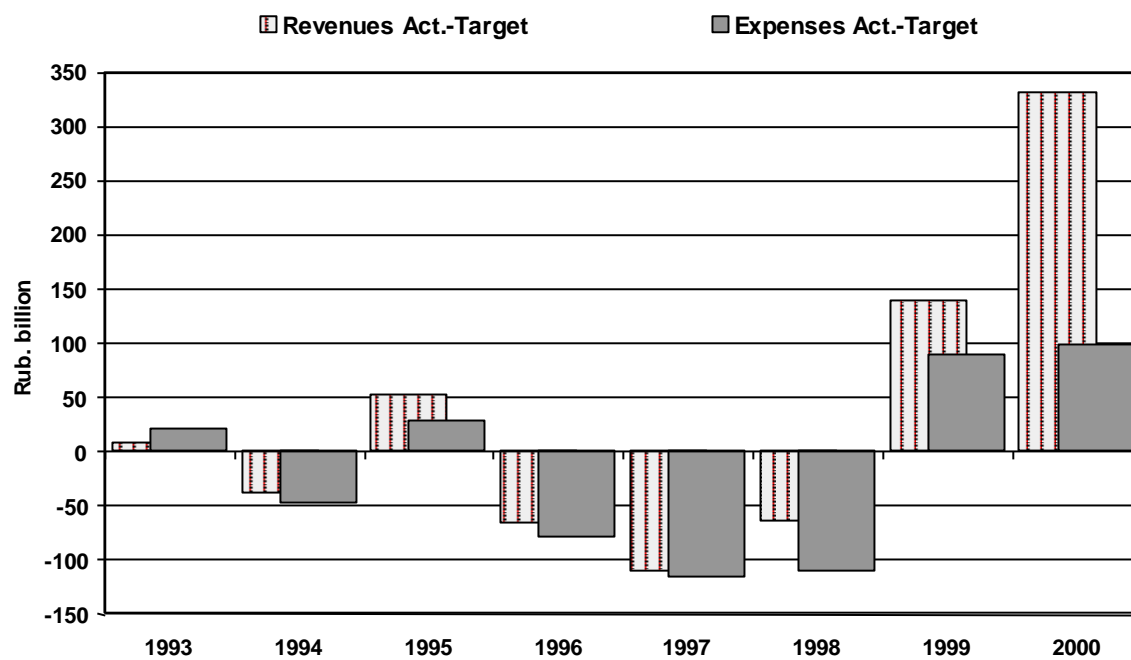| Period	Creditor indebtedness written off to profit			Debtor indebtedness written off to losses		
	Total, Rub mil	in % to overdue creditor indebtedness	in % of annual Increment in overdue creditor indebtedness (adjusted for write-offs)	Total, Rub. mil.	in % of overdue debtor indebtedness	in % of annual increment in overdue debtor indebtedness (adjusted for write-offs)
1997	874	0.1%	0.4%	1 921	0.4%	1.5%
1998	2 777	0.3%	1.3%	7 990	1.0%	3.2%
1999	5 597	0.5%	8.1%	12 420	1.5%	19.1%
2000	6 598	0.5%	5.0%	21 955	2.4%	17.8%

Note: the figures for 1997 are based on the data from four key sectors of the economy (industry, agriculture, transport, construction). The figures for 1998 through 2000 are based on the data from all sectors of the economy. Source: RF Goskomstat.

As the table reveals, the amounts of overdue indebtedness written off to financial results are relatively small in comparison to its overall amount, however, they demonstrate a certain propensity to grow. At the same time, the amount of written off indebtedness is rather considerable relatively to the increments. It is especially true for the debtor indebtedness. Its value was over 17 per cent of the increments in the overdue indebtedness (write-offs included) in 1999 through 2000. In other words, the increments registered over these periods would have been by 20 per cent higher without write-offs.

Annex 2. Results of Evaluation of Models
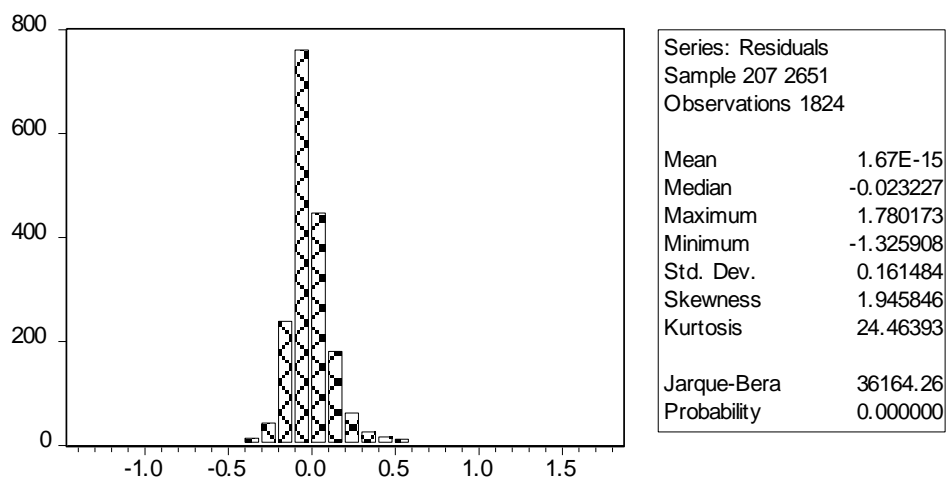
Figure 6. Results of the Jarque-Bera test for normality of residuals, model (2.1), OLS.
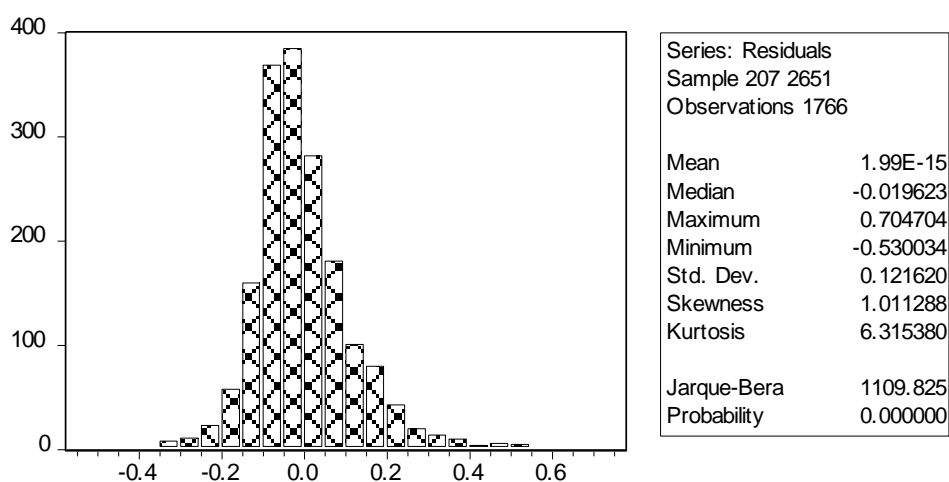
Figure 7. Results of the Jarque-Bera test for normality of residuals, model (2.1), OLS with excluded outliers.
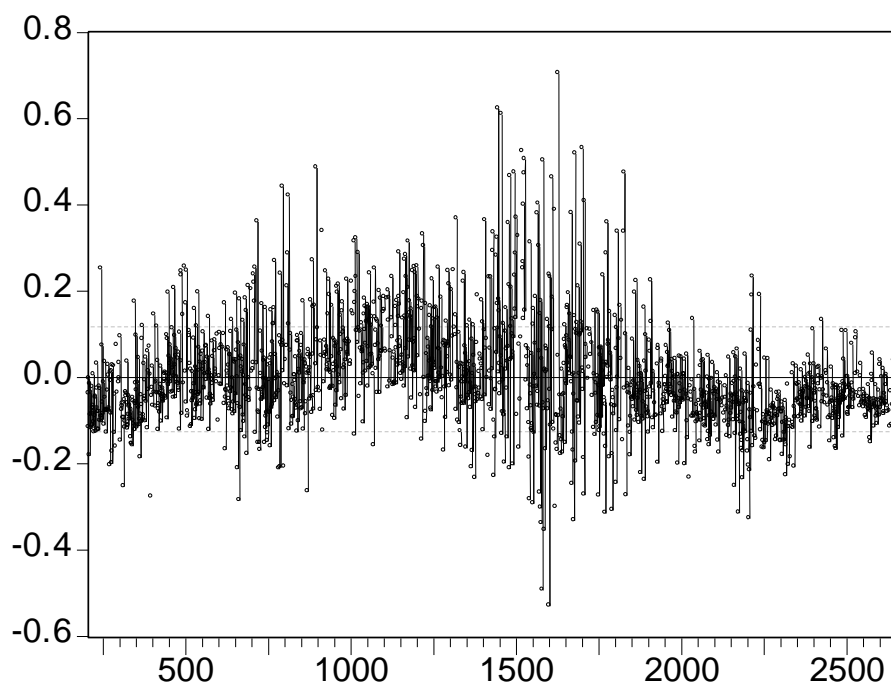
Figure 8. Regression residuals of model (2.1) with excluded outliers.

Table 18. White Heteroskedasticity Test, model (2.1).

F-statistic	23.285	Probability	0.000
Obs*R-squared	188.287	Probability	0.000

Table 19. Quarter-based evaluation of standard errors in the explained variable (increment in non-payments $\dfrac{\Delta C_{i,t}}{Q_{i,t}}$).

| Period	Std. Error	Period	Std. Error
94/IV	0.316	98/I	0.459
95/I	0.102	98/II	0.258
95/II	0.134	98/III	0.301
95/III	0.108	98/IV	0.198
95/IV	0.088	99/I	0.129
96/I	0.125	99/II	0.119
96/II	0.134	99/III	0.070
96/III	0.138	99/IV	0.147
96/IV	0.156	2000/I	0.248
97/I	0.168	2000/II	0.082
97/II	0.124	2000/III	0.093
97/III	0.132	2000/IV	0.066
97/IV	0.119		
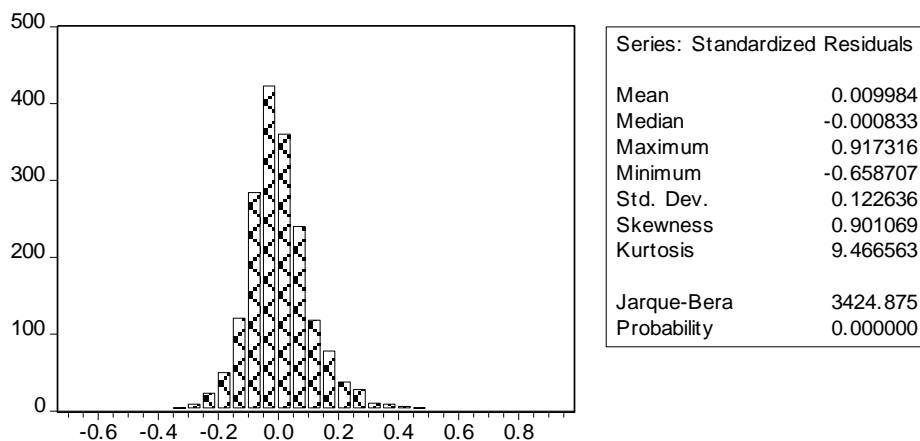
Figure 9. Results of the Jarque-Bera test for normality of residuals, model (2.1), WLS.
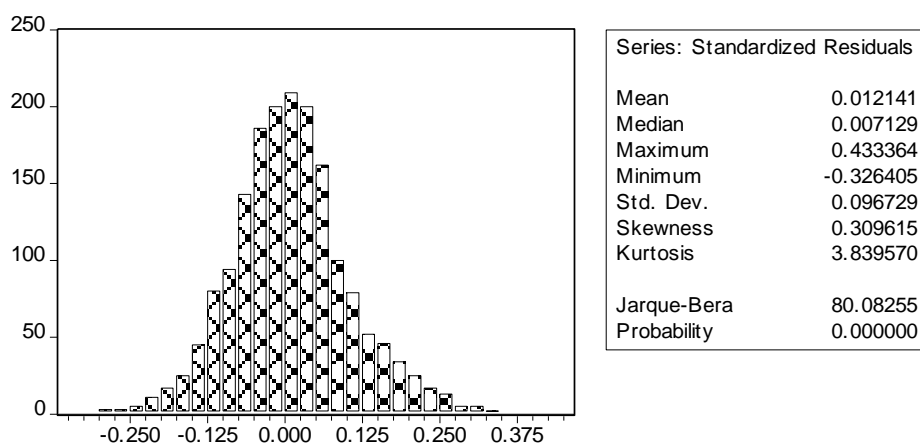
Figure 10. Results of the Jarque-Bera test for normality of residuals, model (2.1), WLS with excluded outliers.

Table 20. Results of the evaluation of model (2.1) with excluded outliers, WLS with "exponential" weights, I/1995-IV/2000.

	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*
c_0	0.038	0.019	1.974	0.049
c_1	-0.051	0.022	-2.354	0.019
c_2	0.182	0.009	20.017	0.000
c_3	-0.011	0.003	-3.799	0.000
R-squared	0.006	*Mean dependent var*		0.081
Adjusted R-squared	0.004	*S.D. dependent var*		0.086
Observations	1766	*S.E. of regression*		0.086
F-statistic	160.364	*Prob(F-statistic)*		0.000

Series: Standardized Residuals	
Mean	0.017912
Median	0.018087
Maximum	0.326602
Minimum	-0.275789
Std. Dev.	0.084342
Skewness	-0.068623
Kurtosis	3.251096
Jarque-Bera	6.025421
Probability	0.049158
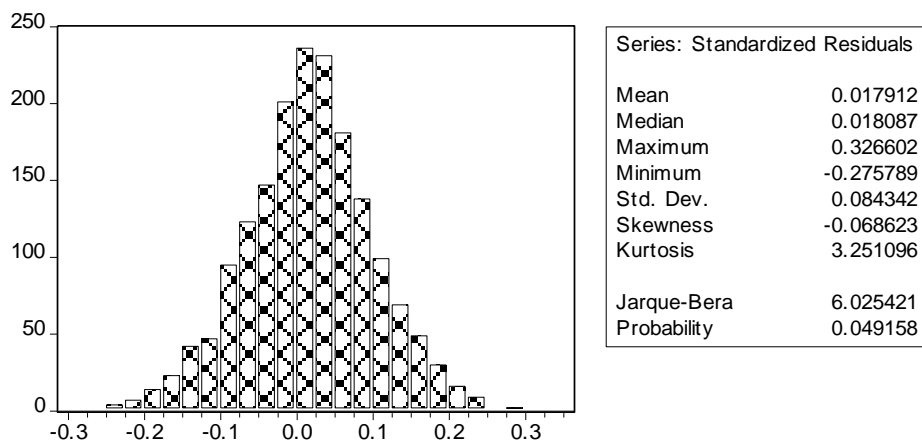
Figure 11. Results of the Jarque-Bera test for normality of residuals, model (2.1) with excluded outliers, WLS with "exponential weights."

Table 21. Results of the evaluation of model (2.1) with lagged real interest rates and excluded outliers, WLS with "exponential" weights, I/1995-IV/2000.

	Coefficient	Std. Error	t-Statistic	Prob.
c_0	-0.053	0.021	-2.486	0.013
c_1	0.045	0.023	1.984	0.047
$c_{2\,(t-1)}$	0.191	0.010	19.146	0.000
c_3	-0.011	0.003	-3.939	0.000

R-squared	0.004	Mean dependent var	0.081
Adjusted R-squared	0.003	S.D. dependent var	0.086
Observations	1766	S.E. of regression	0.086
F-statistic	159.242	Prob(F-statistic)	0.000

Table 22. White Heteroskedasticity Test, equation (4.1).

F-statistic	14.492	Probability	0.000
Obs*R-squared	28.581	Probability	0.000

Table 23. Results of the evaluation of model (5.1) with lagged variables, WLS, White, I/1995-IV/2000.

	Coefficient	Std. Error	t-Statistic	Prob.
c_1	0.063	0.026	2.465	0.014
c_2	0.025	0.027	0.906	0.365
c_3	-0.029	0.028	-1.057	0.291
$c_3^{(t-1)}$	-0.075	0.023	-3.205	0.001
c_4	-0.078	0.024	-3.236	0.001
$c_4^{(t-1)}$	0.028	0.022	1.255	0.210
c_5	-0.005	0.004	-1.441	0.150
c_6	0.027	0.034	0.778	0.437
c_7^{1995}	1.576	0.304	5.176	0.000
c_7^{1996}	1.542	0.253	6.097	0.000
c_7^{1997}	1.254	0.229	5.468	0.000
c_7^{1998}	0.190	0.083	2.293	0.022
c_7^{1999}	0.210	0.108	1.932	0.054
c_7^{2000}	0.073	0.131	0.558	0.577
c_8^{1995}	0.024	0.063	0.380	0.704
c_8^{1996}	0.103	0.114	0.901	0.368
c_8^{1997}	0.222	0.095	2.327	0.020
c_8^{1998}	0.676	0.187	3.613	0.000
c_8^{1999}	-0.073	0.032	-2.304	0.021
c_8^{2000}	-0.061	0.018	-3.304	0.001
c_9^{1995}	-0.016	0.004	-4.305	0.000
c_9^{1996}	-0.026	0.016	-1.569	0.117
c_9^{1997}	-0.048	0.011	-4.269	0.000
c_9^{1998}	-0.025	0.011	-2.355	0.019
c_9^{1999}	0.006	0.007	0.822	0.412
c_9^{2000}	-0.005	0.004	-1.409	0.159
c_0	0.103	0.046	2.267	0.024

R-squared		0.206	Mean dependent var	0.088
Adjusted R-squared		0.195	S.D. dependent var	0.102
Observations		1824	S.E. of regression	0.092
F-statistic		34.288	Prob(F-statistic)	0.000

Table 24. Results of the evaluation of model (5.1) with lagged variables and dummies, WLS, White, I/1995-IV/2000.

	Coefficient	Std. Error	t-Statistic	Prob.
c_1	0.058	0.026	2.220	0.027
c_2	-0.015	0.028	-0.535	0.593
c_3	-0.329	0.060	-5.524	0.000
$c_3^{(t-1)}$	-0.067	0.027	-2.489	0.013
c_4	-0.080	0.046	-1.737	0.083
$c_4^{(t-1)}$	-0.110	0.039	-2.793	0.005
c_5	-0.004	0.003	-1.542	0.123
c_6	0.037	0.022	1.674	0.094
c_7^{1995}	0.979	0.240	4.077	0.000
c_7^{1996}	1.404	0.216	6.491	0.000
c_7^{1997}	1.188	0.219	5.431	0.000
c_7^{1998}	0.181	0.074	2.449	0.014
c_7^{1999}	0.161	0.089	1.810	0.071
c_7^{2000}	0.254	0.118	2.155	0.031
c_8^{1995}	-0.265	0.076	-3.501	0.001
c_8^{1996}	0.159	0.117	1.357	0.175
c_8^{1997}	0.096	0.098	0.979	0.328
c_8^{1998}	0.813	0.184	4.420	0.000
c_8^{1999}	-0.069	0.029	-2.394	0.017
c_8^{2000}	-0.018	0.023	-0.791	0.429
c_9^{1995}	-0.016	0.003	-5.495	0.000
c_9^{1996}	-0.028	0.014	-2.011	0.044
c_9^{1997}	-0.050	0.010	-4.880	0.000
c_9^{1998}	-0.026	0.009	-3.020	0.003
c_9^{1999}	0.008	0.008	0.991	0.322
c_9^{2000}	-0.016	0.006	-2.815	0.005
c_{10}^{I}	0.430	0.070	6.142	0.000
c_{10}^{II}	0.386	0.063	6.088	0.000
c_{10}^{III}	0.395	0.066	6.001	0.000
c_{10}^{IV}	0.395	0.067	5.858	0.000
c_{10}^{IV-95}	0.093	0.012	7.752	0.000
c_{10}^{II-96}	-0.006	0.016	-0.385	0.700
c_{10}^{III-98}	0.219	0.042	5.258	0.000
c_{10}^{IV-99}	0.039	0.015	2.667	0.008
c_{10}^{II-00}	-0.022	0.012	-1.872	0.061

R-squared	0.310	Mean dependent var	0.081
Adjusted R-squared	0.297	S.D. dependent var	0.086
Observations	1766	S.E. of regression	0.073
F-statistic	42.526	Prob(F-statistic)	0.000

Table 25. Results of the evaluation of model (5.1) with dummies, WLS, White, IV/1994-IV/2000.

	Coefficient	Std. Error	t-Statistic	Prob.
c_1	0.086	0.035	2.486	0.013
c_2	-0.023	0.030	-0.764	0.445
c_3	-0.245	0.059	-4.158	0.000
c_4	-0.129	0.044	-2.919	0.004
c_6	-0.006	0.003	-1.582	0.114
c_7^{1994}	0.648	0.392	1.654	0.098
c_7^{1995}	1.317	0.271	4.866	0.000
c_7^{1996}	1.733	0.278	6.225	0.000
c_7^{1997}	1.169	0.241	4.856	0.000
c_7^{1998}	0.169	0.082	2.064	0.039
c_7^{1999}	0.219	0.106	2.071	0.039
c_7^{2000}	0.153	0.130	1.177	0.239
c_8^{1994}	0.073	0.123	0.593	0.553
c_8^{1995}	-0.211	0.075	-2.820	0.005
c_8^{1996}	0.260	0.150	1.736	0.083
c_8^{1997}	0.125	0.102	1.229	0.219
c_8^{1998}	0.590	0.180	3.277	0.001
c_8^{1999}	-0.074	0.031	-2.408	0.016
c_8^{2000}	-0.049	0.019	-2.556	0.011
c_9^{1994}	-0.024	0.009	-2.636	0.009
c_9^{1995}	-0.018	0.003	-5.703	0.000
c_9^{1996}	-0.030	0.016	-1.846	0.065
c_9^{1997}	-0.053	0.011	-4.845	0.000
c_9^{1998}	-0.025	0.012	-2.155	0.031
c_9^{1999}	0.005	0.009	0.594	0.553
c_9^{2000}	-0.007	0.004	-1.957	0.051
c_{10}^{I}	0.283	0.053	5.298	0.000
c_{10}^{II}	0.264	0.049	5.354	0.000
c_{10}^{III}	0.270	0.052	5.224	0.000
c_{10}^{IV}	0.268	0.053	5.063	0.000
c_{10}^{IV-95}	0.088	0.012	7.336	0.000
c_{10}^{II-96}	0.008	0.015	0.536	0.592
c_{10}^{III-98}	0.185	0.040	4.607	0.000
c_{10}^{IV-99}	0.023	0.015	1.584	0.113
c_{10}^{II-00}	-0.004	0.025	-0.156	0.876

R-squared	0.241	Mean dependent var	0.088
Adjusted R-squared	0.227	S.D. dependent var	0.103
Observations	1900	S.E. of regression	0.090
F-statistic	29.651	Prob(F-statistic)	0.000

Table 26. Results of the evaluation of model (5.1) with dummies and excluded outliers, WLS, White, IV/1994-IV/2000.

	Coefficient	*Std. Error*	*t-Statistic*	*Prob.*
c_1	0.071	0.032	2.250	0.025
c_2	-0.019	0.028	-0.675	0.500
c_3	-0.247	0.055	-4.482	0.000
c_4	-0.146	0.043	-3.437	0.001
c_6	-0.004	0.003	-1.433	0.152
c_7^{1994}	0.465	0.307	1.515	0.130
c_7^{1995}	1.128	0.239	4.728	0.000
c_7^{1996}	1.546	0.245	6.319	0.000
c_7^{1997}	1.244	0.220	5.662	0.000
c_7^{1998}	0.133	0.075	1.764	0.078
c_7^{1999}	0.198	0.091	2.173	0.030
c_7^{2000}	0.211	0.111	1.910	0.056
c_8^{1994}	0.046	0.113	0.406	0.685
c_8^{1995}	-0.172	0.069	-2.492	0.013
c_8^{1996}	0.250	0.154	1.620	0.105
c_8^{1997}	0.110	0.098	1.115	0.265
c_8^{1998}	0.611	0.176	3.472	0.001
c_8^{1999}	-0.057	0.029	-1.969	0.049
c_8^{2000}	-0.027	0.023	-1.146	0.252
c_9^{1994}	-0.022	0.007	-3.162	0.002
c_9^{1995}	-0.016	0.003	-5.377	0.000
c_9^{1996}	-0.031	0.014	-2.268	0.023
c_9^{1997}	-0.051	0.011	-4.819	0.000
c_9^{1998}	-0.025	0.011	-2.290	0.022
c_9^{1999}	0.005	0.009	0.622	0.534
c_9^{2000}	-0.015	0.006	-2.738	0.006
c_{10}^{I}	0.277	0.050	5.488	0.000
c_{10}^{II}	-0.022	0.008	-2.828	0.005
c_{10}^{III}	-0.009	0.010	-0.986	0.324
c_{10}^{IV}	-0.010	0.013	-0.828	0.408
c_{10}^{IV-95}	0.090	0.011	8.022	0.000
c_{10}^{II-96}	0.017	0.015	1.192	0.233
c_{10}^{III-98}	0.182	0.038	4.853	0.000
c_{10}^{IV-99}	0.024	0.014	1.722	0.085
c_{10}^{II-00}	-0.043	0.009	-4.623	0.000

R-squared	0.305	*Mean dependent var*	0.082
Adjusted R-squared	0.291	*S.D. dependent var*	0.087
Observations	1838	*S.E. of regression*	0.073
F-statistic	41.996	*Prob(F-statistic)*	0.000

Annex 3. Length of Production Cycle, Capital Productivity and Per Capita Product

The hypothesis about the significance of the length of the production cycle as a factor behind the generation of payment arrears is tested below. The following model is evaluated:

$$\frac{\Delta C_{i,t}}{Q_{i,t}} = c_0^t + c_1^t \cdot \frac{Y_{i,t}}{F_{i,t}} + c_2^t \cdot \frac{Y_{i,t}}{N_{i,t}} + \varepsilon_{i,t}, \tag{11.1}$$

$F_{i,t}$ is the fixed assets of enterprises and organizations in the i-th region in the period t;

$\dfrac{Y_{i,t}}{N_{i,t}}$ is the per capita product in the i-th region (characterizes the mean product of labor).

In the accordance with used indicators the hypothesis under testing may be also formulated via capital productivity. The higher is the product of capital, the higher is the profitability of production, and the less is the probability of payment arrears (Model 3). The similar reasoning may apply to the product of labor.

For the results of the model evaluation see Table 30.

Table 27. The results of the evaluation of model (11.1), OLS.

	1994	1995	1996	1997	1998	1999
Obs.	74	75	74	75	73	73
R-squared	0.481	0.198	0.103	0.115	0.064	0.119
c_0	0.127	0.143	0.213	0.090	0.238	0.094
Std.Error	0.023	0.021	0.026	0.017	0.060	0.017
t-Statistic	5.633	6.664	8.321	5.180	3.939	5.507
Prob.	0.000	0.000	0.000	0.000	0.000	0.000
c_1	-0.255	-0.312	-0.650	0.054	-0.961	-0.152
Std.Error	0.059	0.096	0.241	0.033	0.478	0.080
t-Statistic	-4.301	-3.240	-2.699	1.627	-2.011	-1.912
Prob.	0.000	0.001	0.007	0.105	0.045	0.057
c_2	0.030	0.013	0.013	0.011	0.019	-0.004
Std.Error	0.004	0.003	0.006	0.005	0.011	0.004
t-Statistic	8.064	3.836	2.314	2.278	1.760	-0.971
Prob.	0.000	0.000	0.021	0.023	0.079	0.332
Residuals Normality Test						
Jarque-Bera	4.719	3.248	0.274	0.927	2.048	20.097
Prob.	0.094	0.197	0.872	0.629	0.359	0.000

According to the obtained results the majority of coefficients are statistically significant. Therefore, the higher product of capital is registered in the region, the less payment arrears the region generates, and the higher is the value of the per capita product in the region, the higher is the increment in non-payments. The positively signed per capita product may be best explained by the fact that this indicator characterizes the sectoral structures of regions. Accordingly, regions with higher levels of economic activity generate more payment arrears.

Annex 4. Offset Practices in the Russian Federation

The problem of financing budgetary expenditures in the situation characterized by growing amounts of tax revenue arrears resulted in the emergence of monetary and non-monetary offsets in the process of budget administration. The arrears of budgetary obligations related to state procurement, social expenditures deprive budget recipients of the possibility to settle with their creditors and suppliers, therefore the latter experience difficulties in the course of their operations and can not settle with the budget. Enterprises refrain from paying taxes, since the budget and budget recipients did not settle with them. Budgetary revenues decline, therefore the budget can not repay its obligations. The vicious circle is complete. In this situation it is impossible to find out who was the initial defaulter.

Special instruments were designed to carry out offsets at the federal level. By end-1994 there were issued treasury bills (*Russ. abbr.* KOs, a type of government securities with interest rates below the market levels, which were endorsed by a certain minimal number of private enterprises). KOs were primarily aimed to restructure budgetary debts to recipients. KOs could be either repaid in cash or exchanged for the treasury tax exemption certificates (*Russ. abbr.* KNOs), which entitled KNOs owners to offset their tax liabilities at par value. In 1996 the Finance Ministry started to issue KNOs to directly finance certain federal expenditures.

Generally speaking, the use of KNOs had a mixed impact on the budget. First, issuing KNOs at below-the-market interest the state in fact transferred the burden to service a part of the public debt to the budget recipients, who receiving from the government KNOs in stead of cash payments could sell them immediately only at a price considerably below the placement price. The second, and perhaps the most serious problem encountered by the government in relation to KNOs and KOs was that enterprises used them to repay the arrears they deliberately accumulated in order to settle them later with these securities. In this relation the most illustrative example is the seasonal financing of the agriculture in 1995 through 1996. The government used KNOs to secure the commodity credit (fuels and lubricants), which oil companies granted to agricultural enterprises. Taking into account the fact that KNOs were used without relevant checking of tax arrears amounts, it created direct incentives for oil companies to accumulate their budgetary payment arrears.

A new generation of offsets emerged in end-1996, which had some advantages in contradistinction to the previous instruments: first, these offsets were carried out in monetary form and, second, the chain of offsets was determined in advance. In brief outline the offset procedure looked as follows: the taxpayer in tax arrears settled them with the state at the expense of a bank loan, in its turn the state settled its obligations to budget recipients. Moving along the payment chain these funds ultimately reached the taxpayer, who could then repaid the bank loan.

In the fourth quarter of 1997 the government approved the procedure of "inverse monetary offset": at the first state the Finance Ministry settled with budget recipients, who could then repay their debts to the creditors. In their turn the creditors settled with the budget.

It shall be noted that a large number of violations and imperfect procedures governing monetary offsets (especially in case budget recipients transferred their obligations) accounted for a rather low effectiveness of these offsets. Besides, similarly to KNOs offsets created the incentives to accumulate budgetary payment arrears in order to settle them later in the course of an offset.

Since 1999 offsets has been suspended at the federal level. Certainly, the favorable economic situation and high budgetary revenues contributed to this

development. For the first time since 1995 actual budgetary expenditures have exceeded targets. Therefore, offsets became unnecessary.

At the same time regions and municipalities have actively used various types of offsets and money surrogates to cover budgetary deficits and payment arrears. The most wide-spread form of tax payment for a long time was bills issued by large companies (mainly regional subsidiaries of natural monopolies rendering public utility services to organizations financed from the budget), as well as bills issued by regional administrations. The bills circulated between regional and municipal enterprises and local budgets, who therefore received a part of tax payments and could finance their expenditures. A wide-spread practice was to denominate bills not in money, but in commodity pieces, what naturally resulted (similarly to barter relations) in de facto discounting of tax obligations occurring at the background of high inflation rates.

The second wave of bills issued by banks and often guaranteed by the Finance Ministry, as well as local and regional administration gave rise to more complex offset chains, which included federal ministries responsible for government procurement (for instance, the Defense Ministry). Over a certain period, these bills were also used for tax payments and expenditures of municipal and regional budgets.

A similarly widespread practice is to settle with arrears related to tax payments due to local budgets with goods and services. There is a large number of examples of such practices across Russia's regions. However, they entail a number of negative consequences. First, these operations are insufficiently transparent.

Second, the discounting of tax obligations in the process of the circulation of money surrogates (bills issued by enterprises, banks, regional and town administrations) apparently results in budgetary losses. The real values of transfers made in the form of money surrogates or in kind to budget recipients is always below their nominal values. The same may be applied to the budget administration.

Third, the resort to offsets carried out along a predetermined chain deteriorates the structure of budgetary expenditures, since governmental agencies are in fact made to finance exactly those budget items, whose recipients participate in the chain of offsets.

Fourth, offsets create incentives to accumulate arrears in order to repay them later via instruments allowing to discount tax obligations.

Fifth, offsets render the mechanism of financing of budgetary expenditures less transparent, thus facilitating corruption.