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Anna Dorbec

Liquidity provision in  
transition economy:  
the lessons from Russia



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All opinions expressed are those of the authors and do not necessarily reflect the views of the Bank of Finland.

Anna Dorbec\*

## Liquidity provision in transition economy: the lessons from Russia

### Abstract

This paper provides micro and macroeconomic analysis of the economic role of banks in the Russian economy. Using a large panel containing Russian enterprises' balance sheet and income statement data, we evaluate the determinants of bank financing. Econometric model put out the existence of liquidity providing activity of Russian banks. Even though the overall liquidity provision system suffers from certain deficiencies, we demonstrate its importance in the macroeconomic context, using time series econometric analysis. Bank credit appears to be a significant factor in explaining the non-payment dynamics and use of informal financing. Finally, the uncertainty concept helps us to understand the reasons for a limitation of Russian banks in their liquidity providing role.

**Keywords:** liquidity, finance, transition, Russia, uncertainty, banks, inter-enterprise credit.

**JEL classification:** D80, G21

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Anna Dorbec

## Liquidity provision in transition economy: the lessons from Russia

### Tiivistelmä

Tässä tutkimuksessa analysoidaan Venäjän pankkien taloudellista merkitystä mikro- ja makrotasolla. Pankkirahoitusta määääviä tekijöitä tarkastellaan käyttämällä suurta paneeliaineistoa Venäjän pankkien tuloslaskelma- ja tasetiedoista. Ekonometrisen mallin avulla tutkitaan, kuinka venäläiset pankit tarjoavat luottoasiakkailleen likviditeettiä. Vaikka koko talouden likvidiydessä on puutteita, tutkimuksessa osoitetaan aikasarja-aineiston avulla, että likvidiydellä on kuitenkin makrotaloudellista merkitystä. Pankkiluottojen määrä osoittautuu merkittäväksi selittäjäksi yritysten maksamattomien velkojen ja epämuodollisen rahoituksen dynamiikassa. Epävarmuus on tärkeä seikka selitettäessä pankkien luotontarjonnan rajallista roolia Venäjällä.

**Asiasanat:** likvidiyys, rahoitus, siirtymätalous, Venäjä, epävarmuus, pankit, yritysten välinen rahoitus



# 1 Introduction

The Russian banking sector is often reproached for being counterproductive and for not assuming its economic role. It is a matter of fact; the credit/GDP ratio in Russian economy is relatively low: whereas in Germany and France it is more than 100% of GDP, in Russia it is actually only about 16%. The proportion of investment financed by bank credit is low (about 4.8% in 2003). Weak capitalization and opportunist behavior are the most often cited characteristics of Russian banks<sup>1</sup>. Certainly, the Russian banking system has experienced a number of financial crises (1994, 1995 and 1998) during the transition period. Financial crises were partly a consequence of banks financial speculations and their lack of interest to real sector financing. However, our findings show that the banks have played an important role in Russia: they provide liquidity to the productive sector. Even though we observe some deficiencies in the actual liquidity provision system, we demonstrate its great importance to the economy.

The paper is organized as follows: the first section gives a summary of the theoretical issues concerning banks' role in the economy. The second section contains an evaluation of the bank credit role for Russian enterprises, using a large panel of enterprise financial reports. The third section estimates the overall economic importance of Russian banks liquidity provision. The section 4 concludes by suggesting a theoretical framework to explain the limitation of Russian banks on liquidity provision.

## 2 Banks' economic role: theoretical approaches

According to the well known Gurley and Shaw [1960]<sup>2</sup> approach, financial intermediaries' role in the economy is to provide a mechanism for channeling funds from financial-surplus agents to those with financial deficits. More recent studies by Allen and Gale [1995]<sup>3</sup> and

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<sup>1</sup> See for example Pitiot H., Scialom L., [1993], "Système bancaire et dérapage monétaire", *Economie Internationale*, N°54, 2eme trimestre and more recently Matovnikov [2000] *Funktsionirovanie Bankovskoy sistemy v Rossii v usloviakh makroekonomicheskoy nestabilnosti*, Institute of Economy of Transition, Nauchnye Trudy, N°23P, Moscow.

<sup>2</sup> Gurley J., Shaw E., [1960], *Money in a Theory of Finance*, Brookings Institution.

<sup>3</sup> Allen F., Gale D., [1995], "A Welfare Comparison of Intermediaries and Financial Markets in Germany and the US", *European Economic Review*, N°2, March, 179-209.

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Allen and Santomero [1998]<sup>4</sup> point out the role of intermediaries in risk trading. This approach is not focused on banks specifically: however it appears that banks are better managers of intertemporal risk smoothing while financial markets are more efficient in cross-sectional risk sharing.

A vast theoretical literature on banks' role in the economy (for surveys see Bhattacharya and Thakor [1993]<sup>5</sup>, Chevalier-Farat [1992]<sup>6</sup>) points out two main characteristics of banks. The first is due to financial market imperfections in an asymmetric information environment. Informational imperfections generate a particular hierarchy of firm's financial sources (A). The second specific characteristic of banks points to their liquidity provision role (B).

## 2.1 Bank credit as a source of finance to enterprises

In an economy with perfect financial markets, any firm is able to finance any positive net present value project. If the cost of investment exceeds the firm's internal resources, or if the firm prefers to use its internal funds to pay dividends, it can raise the funds required for investment in the capital market or borrow from banks<sup>7</sup>. In such idealized markets, the source of capital used to finance investment is irrelevant and financial constraints do not restrain firms' growth.

In real financial markets there are various imperfections that may impose costs on firms that obtain investment funds externally. Many of these imperfections are rooted in conflicts of interest between investors and firms' insiders – the phenomenon largely known in the theory as agency problems. Jensen and Meckling [1976]<sup>8</sup> were the first to suggest a theoretical framework related to such problems. The firms' insiders have an incentive to exploit outside investors by investing in projects that benefit insiders and may lower the value of the outsiders' investment. In this situation, banks play a positive role by mobilizing

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<sup>4</sup> Allen F., Santomero A.M., [1998], "The Theory of Financial Intermediation", *Journal of Banking and Finance*, N°21, 1461-1485.

<sup>5</sup> Bhattacharya S., Thakor A., [1993], « Contemporary Banking Theory », *Journal of Financial Intermediation*, N° 3, pp. 2-50

<sup>6</sup> Chevalier-Farat T., [1992], « Pourquoi des banques », *Revue d'Economie Politique*, Septembre-Octobre, pp.633-685

<sup>7</sup> This is the idealized financial market studied by Modigliani and Miller (1958).

<sup>8</sup> Jensen M., Meckling W., [1976], "Theory of the firm: managerial behavior, agency costs and ownership structure", *Journal of Financial Economics*, N°3, 305-360

resources, identifying good projects, monitoring managers and managing risk (Levine [1997]<sup>9</sup>, Levine, Loayza, Beck [2000]<sup>10</sup>).

To protect their investment, outside investors and creditors have several options. They may require that mechanisms be put in place to monitor the actions of the firm. They may also attempt to constrain the firm contractually from engaging in opportunistic behavior. This monitoring and legal enforcement is costly. If these measures are not completely effective, then investors will take into account the cost of expected opportunistic behavior when transacting with the firm. As a result, the firm's cost of external capital will increase. Where the costs of enforcement are high and insiders' opportunities for diverting resources abundant, businesses may not be able to obtain investment capital at any price<sup>11</sup>.

This approach supports the pecking order theory developed by Myers and Majluf [1984]<sup>12</sup>. They argue that financial market imperfections make it costly for firms with inadequate cash flow to obtain external financing. The imperfections mean that when a firm seeks financing it does so according to a pecking order: own funds are preferred to external funds and debt is preferred to equity, as the market for loans is subject to less adverse selection than the market for equity.

In fact, Fazzari, Hubbard and Petersen [1988]<sup>13</sup> observed correlations between long-term investment and internal financing in a sample of financially constrained firms. This interpretation has been questioned by Kaplan and Zingales [1995]<sup>14</sup>, who defined the internal pecking order (not the external constraint) and found a particular role for cash flow, as a signal of investment opportunities.

These considerations of market failure suggest that there may be certain categories of investment expenditure that are easier to fund externally. In particular, liquid assets whose value is readily ascertainable and which can be readily repossessed may be easier to fund than specialized equipment. If loans can be secured by such assets separately, or if these assets can

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<sup>9</sup> Levine, R.[1997] "Financial Development and Economic Growth: Views and Agenda," *Journal of Economic Literature*, June

<sup>10</sup> Levine, R; Loayza, N. Beck, T.[2000] "Financial Intermediation and Growth: Causality and Causes," *Journal of Monetary Economics*.

<sup>11</sup> See the discussions of credit rationing by Stiglitz and Weiss [1981] and of adverse selection by Myers and Majluf [1984]

<sup>12</sup> Myers S.C., Majluf N.S.,[1984], "Corporate Financing and Investment Decisions when Firms Have Information that Investors Do not Have", *Journal of Financial Economics*, vol 13, June, 187-221

<sup>13</sup> Fazzari S., Hubbard R., Petersen B., 1988, "Financing Constraints and Corporate Investment", *Brookings Papers of Economic Activity*, vol.1

<sup>14</sup> Kaplan S., Zingales L. [1995] « Do Financing Constraints explain why investment is correlated with cash flow? » NBER Working paper 5267, September

be securitized, then investment in these categories of assets can be financed externally at relatively low cost<sup>15</sup>.

Demirgüç-Kunt and Maksimovic, [1996]<sup>16</sup> empirically estimate sources and uses of different types of financing. This estimation may be viewed as testing whether the Myers-Majluf pecking order is consistent with the data on the financing of two different categories of investment. The large cross country panel econometric study (the panel does not include Russia) suggests that external suppliers of capital have a comparative advantage in financing short-term assets, perhaps because of lower contracting and monitoring costs. Thus, a principal role of external finance for established firms may be in providing financing for their liquid assets, allowing them to redeploy internal funds to finance long-term investment.

The recent study of Fisman and Love [2003]<sup>17</sup> focused on a specific role for trade credit as a financial source for enterprises. Analyzing data from 37 sectors and 44 countries,<sup>18</sup> they demonstrate that firms in countries with less developed financial systems use implicit borrowing in the form of trade credit as an alternative source of funds. They suggest that in some cases (particularly with weaknesses in law enforcement mechanism and transparency) inter-enterprise credit could be less exposed to some types of informational asymmetry. Biais and Gollier [1997]<sup>19</sup> suggest that suppliers can give signals on specific firms which could induce banks to augment their credit offers to those firms. In such cases trade credit plays a signaling role for banks, and firms could even be subject to discrimination vis-à-vis the trade credit terms they get from suppliers. Petersen and Rajan [1998]<sup>20</sup> have shown that the trade credit can be used as a means of price discrimination. Better access to credit from financial institutions induces firms to offer more trade credit. This suggests that firms may intermediate between institutional creditors and other firms that have limited access to financial institutions.

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<sup>15</sup> Beck T., Demirgüç-Kunt A., Levine R. [2001], "Law, Politics, and Finance", World Bank Working Paper, February.

<sup>16</sup> Demirgüç-Kunt A., Maksimovic V., [1996], « Financial Constraints, Uses of Funds, and Firm Growth An International Comparison » The World Bank Working Paper, October.

<sup>17</sup> Fisman R., Love I., [2003], Trade Credit, Financial Intermediary Development and Industry Growth, Journal of Finance, Vol LVIII, N°1, Feb. See also Petersen M., Rajan R., [1997], "Trade Credit: Theories and Evidence", Review of Financial Studies, 10, pp.661-691.

<sup>18</sup> Issued from Compustat data for 1980-1989. The sample does not include Russia.

<sup>19</sup> Biais B., Gollier C., [1997], « Trade Credit and Credit Rationing », Review of Financial Studies, 10, 903-937.

<sup>20</sup> Petersen M., Rajan R., [1996] "Trade credit: Theories and Evidence" NBER Working Paper 5602, June.

However, in the Russian case, inter-enterprise financing has to be analyzed in a more global setting than simple trade credit relations. The analysis of Perrotti and Gelfer [1998]<sup>21</sup> focused on intraindustrial-financial group (or conglomerate) financing. They demonstrated the existence of intragroup financial transfers in the Russian economy. Enterprises which are members of official conglomerates appear to be less financially constrained than their 'independent' colleagues. This necessitates taking into account an alternative capital reallocation process for industrial and financial conglomerates in Russia.

More generally we can distinguish three financing regimes characterized by the degree of importance of external finance (Paranque [1999]<sup>22</sup>):

- Autonomy regime: the main finance pattern is based on profit accumulation which provides an important endowment of own funds and enables to limit their demand for external funds for financing fixed and circulating capital
- Debt regime: firms actively use external financing - and particularly bank financing - to finance their assets as a whole
- Overdraft regime (which differs from the other): enterprises finance their investment activities from their own funds, as under the first, but they use short term bank credit to cover their current finance (liquidity) needs.

La Porta and al [1998]<sup>23</sup> point out another important factor impacting finance behavior and more generally economic performance. They argue that the legal system is the primary determinant of the effectiveness of the financial system in facilitating innovation and growth.<sup>24</sup> Rajan and Zingales [1999]<sup>25</sup> however argued that even in countries with weak legal and accounting systems and frail institutions, powerful banks<sup>26</sup> can still force firms to reveal information and pay their debts, thereby facilitating industrial expansion.

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<sup>21</sup> Perrotti E., Gelfer S., [1998] "Investment financing in Russian Financial-Industrial Groups, Wiliam Davidson Institute working Papers Series 342

<sup>22</sup> Paranque B. [1999], « Flexibilité financière des PME », mimeo

<sup>23</sup> La Porta, R; Lopez-de-Silanes, F; Shleifer, A; and Vishny, R [1998]. "Law and Finance," *Journal of Political Economy*, , 106(6), pp. 1113-1155

<sup>24</sup> For a more extensive discussion of the role of commitments and the legal system in investment see Williamson (1994, 1988) and Shleifer (1994). For a cross-country empirical analysis of the effect of institutional differences on debt maturity see Demirguic-Kunt and Maksimovic (1996).

<sup>25</sup> Rajan, R., Zingales, L. "Financial Systems, Industrial Structure, and Growth", mimeo 1999.

<sup>26</sup> In fact, banks are institutions and their force could partly replace public institutions weakness

## 2.2 Liquidity provision

Liquidity provision can be summarized by offering a joint service of payment and finance (Diamond, Dybvig [1983]). In fact, on the asset side, banks make loans to difficult, illiquid borrowers, thus enhancing the flow of credit in the economy. On the liability side, they provide liquidity on demand to depositors.

This function is closely related to what Keynes [1937]<sup>27</sup> called ‘finance’. Keynes distinguished two main types of ‘finance’<sup>28</sup>: ‘finance’ of production and ‘finance’ of investment. An advance of liquidity is a necessary condition to start up a production or investment project: we can buy nothing with promises of receipts; the entrepreneur needs financial resources to spend. By granting long and medium term credit, banks finance investment, and via short term credits and overdraft facilities, they satisfy the demand for production finance. The demand for finance can generate credit money creation<sup>29</sup>.

The recent work of Kashyap, Rajan and Stein [2002]<sup>30</sup> focused on banks role as liquidity providers. The authors develop a partial equilibrium model which demonstrates positive synergy effects for banks, caused by coexistence within the same organization (bank) of credit (and particularly overdraft facilities) and deposit services.

In the Diamond and Dybvig, [1983] framework, banks can transform illiquid assets into more liquid demand deposits. In a risky environment, demand deposit contracts which provide liquidity are subject to multiple equilibria, one of which is a bank run. Bank runs can cause real economic damage. The analysis shows that there are circumstances in which government provision of deposit insurance can produce superior contracts.

The recent work of Diamond and Rajan [1999]<sup>31</sup> notes that both investors and borrowers are concerned about liquidity. Investors desire liquidity because they are unsure about when they will want to end their holding of a financial asset. Borrowers are concerned about liquidity because they are unsure about their ability to continue to attract or retain funding. Because borrowers typically cannot repay investors on demand, investors will

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<sup>27</sup> Keynes J.M., “Alternatives theories of the rate of interest”, *Economic Journal*, June, 1937, D.H. Robertson, “Mr Keynes and “Finance” and response of Keynes, *Economic Journal*, June 1938.

<sup>28</sup> Notice, however that in Keynesian perspective ‘finance’ can be offered by banks as well as by financial markets.

<sup>29</sup> Goux J-F., [1987], « La théorie monétaire de la « finance » chez Keynes : une réinterprétation », *Révue d’Economie Politique*, N5, pp.592-612.

<sup>30</sup> Kashyap A., Rajan R., Stein J. , [2002], « Banks as Liquidity Providers : An Explanation for the Coexistence of Lending and Deposit Taking », *Journal of Finance*, Vol LVII, N°1, Feb.

<sup>31</sup> Diamond D., Rajan R. [1999], « Liquidity Risk, Liquidity Creation and Financial Fragility : a Theory of Banking » NBER Working Paper 7430, December

require a premium or significant control rights when they lend directly, as compensation for their illiquidity. By developing an overlapping generations model in a risky environment the authors demonstrate that banks can resolve liquidity problems that arise in direct lending. Banks enable depositors to withdraw at low cost and buffer firms from the liquidity needs of their investors. In such a framework the bank will necessarily have a fragile capital structure, subject to bank runs, in order to perform these functions. Far from being an aberration to be regulated away, the funding of illiquid loans by a bank with volatile demand deposits is rationalized in the context of the functions it performs.

However, the analysis of banks liquidity providing role cannot be realized without taking into account its macroeconomic dimension (Chevalier-Farat [1992]). Generally speaking, the analysis in terms of liquidity is closely related to the monetary character of the economy and to the hypothesis about the overall informational environment. In a monetary economy, the banking system monetizes claims whose exact values are generally not known with certainty: transforms private claims in incontestable payment means<sup>32</sup> (the degree of incontestability is related to the notion of trust in the money and banking system (Aglietta, Orléan, [2002])<sup>33</sup>). Consequently, liquidity provision cannot be analyzed outside of the macro economic context, which includes three levels: liquidity provision from commercial banks to their customers, interbank liquidity provision and central bank liquidity provision to commercial banks (regular, through money market interventions, and exceptional, including that provided as lender of last resort).

## 3 What role for Russian banks?

### 3.1 Macroeconomic evidence

In the early stage of development of the Russian banking system, banks faced enormous payment system problems (Aglietta, Moutot, [1993]<sup>34</sup>). Relatively stable economic conditions and special efforts by the Russian central bank solved the payment system problem, but the overall liquidity failure and speculative opportunities prevented the real sector from having

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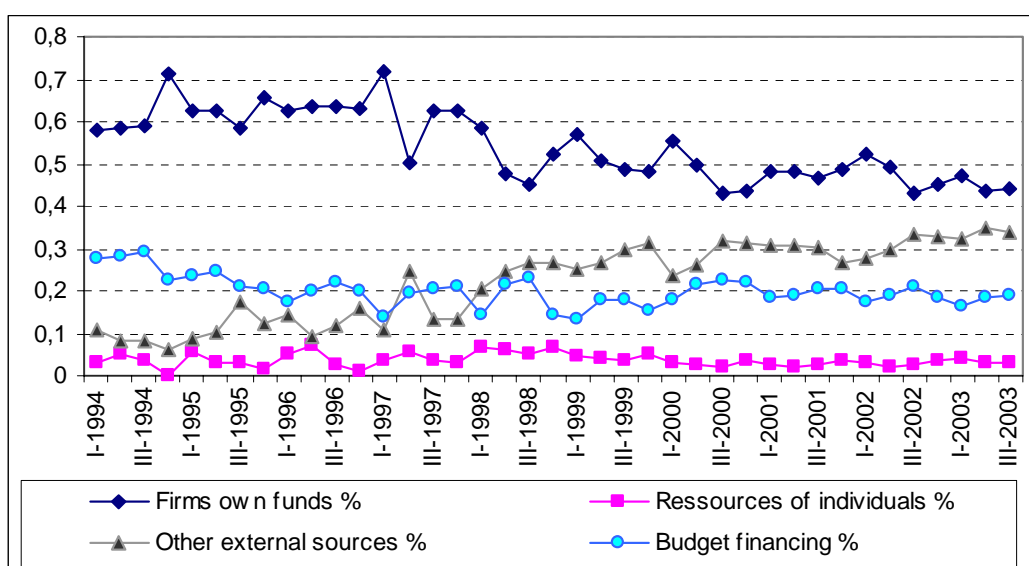
<sup>32</sup> Aglietta M., [1988] « L'ambivalence de l'argent », Revue Française d'Economie, été

<sup>33</sup> Aglietta M., Orléan A., [2002] "La monnaie: entre violence et confiance", Paris, Odile Jacob

<sup>34</sup> Aglietta M. Moutot P. [1993], "Redeployer des réformes", Economie Internationale, N°54, 2<sup>ème</sup> trimestre, pp. 67-104

access to liquidity<sup>35</sup>. Matovnikov [2000] points out the unsatisfactory role of banks in the highly bartered 1995-1998 economy. The remonetization of the economy, which followed the August 1998 crisis, was positive for banks' 'reorientation' from speculative operations to the real economy. According to the 'finance' approach, advances in liquidity can be used to support production or investment needs. To simplify, we can distinguish four principal sources of investment financing: own funds (profit and amortization fund), capital emissions, debt (bank, non bank and affiliated), and state funds (federal, local budget and extra-budgetary funds). In the Russian case firms' own funds (profit and amortization) are the primary source investment financing. However, from Rajan and Zingales [1998], we know that in economies where intermediated financing plays an important role, structural changes and economic growth can be facilitated by good access to debt and market financing.

Figure 1. Sources of investment financing of Russian enterprises I/1994-III/2003



Source : Goskomstat<sup>36</sup>, large and medium-size enterprises

Goskomstat (GKS) data show that during the transition period investment has been financed mainly by firm's own funds. We observe nevertheless a recent increase of external private sources of financing. These include: bank credit, inter-enterprise (often intra-conglomerate) credit, extra-budgetary public financing and stock and bond issuance. Basing on more detailed

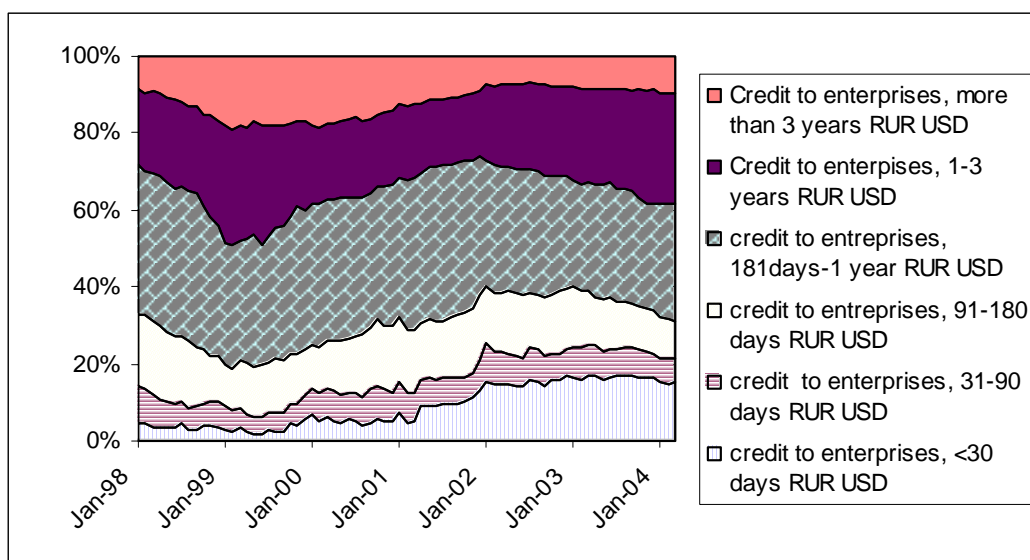
<sup>35</sup> Dorbec A., Renversez F.[2004], "Mechanisms of Russian economy financing during the transition", Studies on Russian Economic Development, forthcoming

<sup>36</sup> Russian State Statistics Committee. New name – Federal Public Statistical Service



GKS data we see a notable increase in intra-group inter-enterprise financing (from 8.5% in 2002 the home office share increased to 13.6% in 2003 while other inter-enterprise debt went from 5.7% to 7.9%). Some of this financing is hidden under ‘others-2’ (16.7% in 2002 to 21.5% in 2003). Nevertheless, we observe that the bank financing share was almost unchanged at 5% of total investment financing during the last four years. Capital markets’ share is insignificant (0.2% of investment for stocks and 0.2% for bonds in 2003)! Thus, we conclude that the recent growth of external financing is principally due to inter-enterprise (intra-conglomerate) profit transfers and not to increases in banks’ participation in the investment process.

Figure 2. Term structure of bank credit to enterprises in Russia (stocks)



Source: Bank of Russia

Figure 2 clearly shows a weakness of long and medium term credit and a dominance of short term financing in banks credit activity: 70% of bank credit is extended for less than 1 year. Note that the ‘under 30 days’ credit is the segment of the credit portfolio that increased the most during 2001-2003, so that, basing on macroeconomic data, we would argue for the liquidity-providing role of banks in the Russian economy.

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## 3.2 Microeconomic evidence

However, the macroeconomic evidence alone seems insufficient to establish the liquidity-providing role of banks. Investment financing may be concentrated on certain sectors. On the other hand, bank credit could be a part of speculative financial schemes and not at all supportive real activity. Consequently, we refer to disaggregated accounting data to obtain more evidence on the role of bank credit role in enterprise financing.

### 3.2.1 Data source

We make econometric estimations based on annual balance sheet and income statement data (forms 1 and 2 of the official Russian accounting report) published by the Federal Commission on Securities Markets under the information disclosure program. We use rolled panel data covering the five year period 1996-2000 and including 487 big and medium size enterprises<sup>37</sup>. Annex 1 contains detailed information on the representativeness of our panel sample.

In order to correct for size and period bias and to identify branch features we made estimations for size, sub-period and branch sub-samples. Size sub-samples were constructed using data on the number of employees.<sup>38</sup> We created two sub-samples, one for small and medium size enterprises (less than 200 employees) and the other for the biggest enterprises (>1000 employees). Sub-period sub-samples were constructed by splitting our sample into two 2-year samples and excluding the crisis year 1998 in order to correct for possible crisis chock. The first sub-sample contains data for 1996 and 1997 and the second for 1999 and 2000.

Our panel includes enterprises of different economic and industrial branches: light industry, food, metallurgy, machine building, extraction, energy, chemicals/petrochemicals (incl. pharmaceuticals), wood & paper, trade, transport, telecommunications, construction, nonbank financial intermediation, research & development. Branch sub-sample estimations were made only using sufficiently large representative industries (7 sub-samples, including

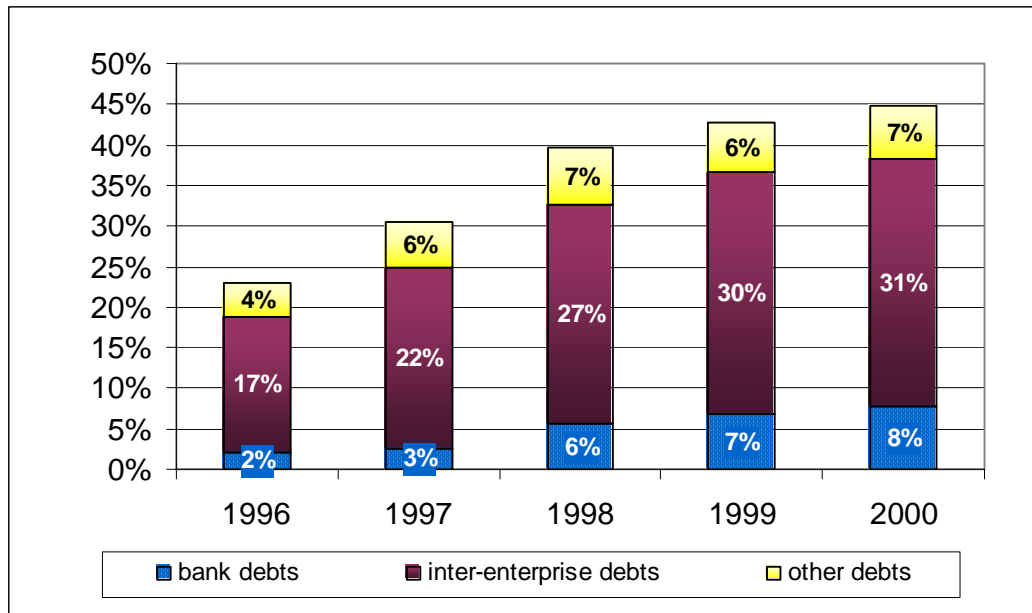
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<sup>37</sup> We excluded “giant” size enterprises like Gazprom and RAO EES, Lukoil, TNK because their financing patterns are particular and not typical for all Russian enterprises. Because of their size, the presence of such enterprises in our sample could considerably bias the estimations. The outliers’ identification method used is Tukey Box Plot, (Kremp [1990]).

<sup>38</sup> These data are available only for 335 of 487 enterprises

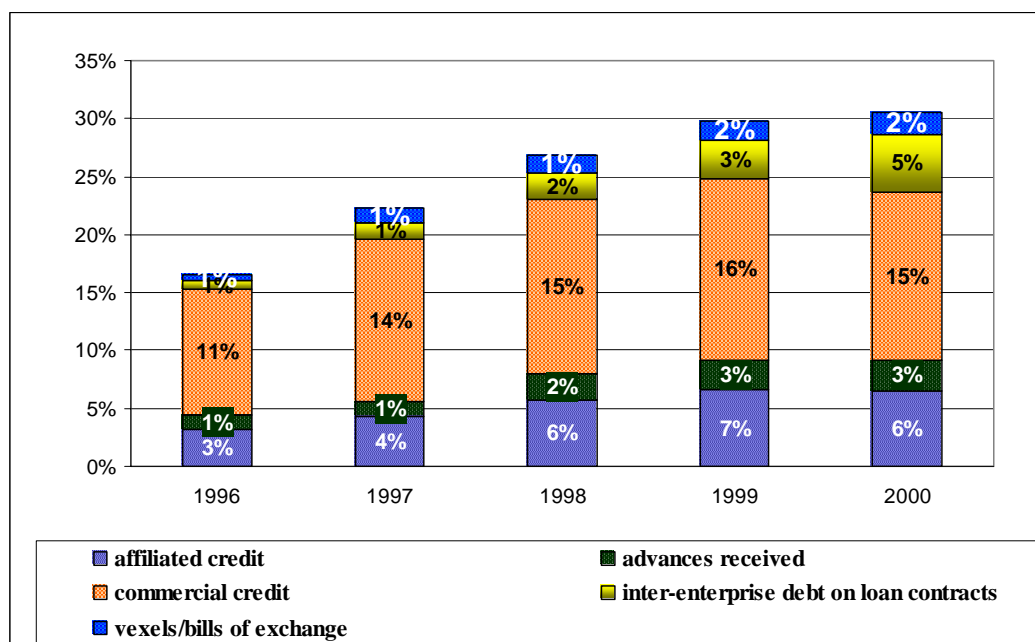
telecommunications, energy, metallurgy, chemicals petrochemicals and pharmaceuticals, machine building, food and beverages, trade and supplying).

Figure 3. Debt structure by source ( % of total liabilities)



Descriptive analysis of our panel data clearly shows that the importance of external sources of financing increases over the period. We can see from Figure 3 the importance of inter-enterprise financing and the gradual increase in the importance of bank finance: banks financed only 2 % of enterprise assets in 1996 and 8% in 2000. These dynamics reveal the emergence of a financial transfer mechanism which is not based exclusively on bank financing. Inter-enterprise credit plays an important role in this financial mechanism (Figure 4).

Figure 4. Inter-enterprise credit structure ( % of total liabilities)



### 3.2.2 Variables and initial hypothesis

The main purpose of our study is to evaluate the role of bank credit for Russian enterprises. We also examine other sources of financing and compare them with bank credit in order to evaluate parameters which influence the availability of bank credit (demand and supply).

As the endogenous variable (DETTE\_BQ) we retained a bank credit. So, it represents a sum of lines 511 and 611 of form 1 of the enterprise accounting report.

### 3.2.3 Exogenous variables

Looking at existing studies on the role of bank credit as a finance source for enterprises financial source (for a survey see Sheuer and Sauv e, [1999]) we see that the variables used in specifications are relatively heterogeneous. However, indicators of size and profit are used in the majority of them. Proxies for the cost of debt, as well as firms' guaranties are used by Kremp, St oss and Gerdesmeier [1999]<sup>39</sup>. The question of cost of debt logically of course matters in financial decisions even though informational imperfections, as in Stiglitz and Weiss [1981] can lead to rationing, under which the interest rate loses its status as the main

<sup>39</sup> Kremp E., St oss E. and Gerdesmeier D. [1999] "Estimation d'une fonction d'endettement" in Sauv e and Sheuer, op.cit.

variable equilibrating supply and demand for credit. However, in our sample internal interest rate calculations (interest payments/bank debt) appear not to reflect real interest payments of firms (Kharchenko-Dorbec [2002]). Firstly, we made comparisons between calculated internal interest rates and official market credit interest rates (Central Bank of Russia data) and it appears that the internal rates are actually lower<sup>40</sup>. We may thus suppose the existence of ‘non-market’ relations between enterprises and their banks. Secondly, the peculiarities of Russian accounting law enable enterprises to include interest rate payments in ‘general costs’, and in this case these will not appear separately in income statement data, which then biases the internal interest rate calculation. Finally, we preferred to exclude such a biased internal interest rate indicator from our estimations.

For our analyses we retained the following variables:

**Turnover** (L10): (line 10 of enterprise’s income statement). This parameter could give a positive signal to the banks as to the current activity of the enterprise and may have a positive influence on the supply of bank credit. Different specifications of turnover were used in Rajan and Zingales [1995], and Biais Hillion and Malecot [1995] as proxies for size. The expected effect is again positive.

**Profit** – (L2140) line 140 of income statement. It seems obvious that high profits are a positive signal for banks (and other external finance suppliers) as to an enterprise’s financial performance. However, the pecking order approach (Myers, [1984]) suggests a negative relation between profit and the demand for bank credit: own sources are preferred by enterprises over external debt. In the existing empirical studies on different countries (such studies for Russian enterprises are not available), profit variables usually have a negative impact on bank indebtedness (see e.g. Demirgüç-Kunt and Maximovic [1996]).

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<sup>40</sup> We have to mention, however, that during the period of liquidity shortage and GKO speculation in 1996-1998 interest rates in real terms attained extremely high levels, especially compared with enterprises profitability, so some differences in banks interest rates can exist especially for banks which were not involved in GKO speculation (Kharchenko-Dorbec, Renversez, [2004]).

### 3.2.4 Inter-enterprise debt

In order to obtain a more precise picture concerning the inter-enterprise source of financing, we decomposed inter-enterprise credit into contractual loans, affiliated loans, trade credit and advances received: it appears that these types of debt play a different role in the financing of Russian enterprises. However, the expected impact of some variables is still ambiguous, since we cannot obtain more detailed data on financial suppliers and the existence of informal affiliation links.

**Inter-enterprise contractual loans** (CREDITIEC) – lines 512 and 612 of balance sheet. This variable represents loans received through loan contracts from nonbank firms (including nonbank financial intermediaries). Theoretical assumptions about such sources of financing are ambiguous. There may be sources alternative to bank credit when the banking system is weak and inefficient because other firms may be better able to offer financing due to their superior better knowledge of an enterprise's particular situation or of the situation regarding the industry (Schwartz, [1974]). Thus, in the case of the existence of important contractual (institutionalized) financial mechanisms as alternative to bank credit, we should expect a negative relation. On the other hand, the importance of external nonbank financing may be a positive signal for banks as to the enterprise's financial situation. This fact will cause a positive relation in the case where the banks are, a priori interested in enterprise financing but suffer from important informational asymmetry problems (Biais and Gollier [1997]). However, in the Russian case we must take into account the evidence that this type of financing could be part of a relatively opaque intra-group nonmarket financial scheme and thus not at all affect a bank credit as a signal.

**Trade credit** - (L621) – 621 line of balance sheet. A large literature on trade credit importance reveals several motives for firms to use trade credit as a finance source (some where mentioned in section 1A). In fact, in the asymmetric information environment with weak financial markets, trade credit can be used as an alternative finance source to bank credit. In a situation of rationing of bank credit, trade credit becomes more easily available to firms, compared to banks' financing (Smith, [1987], Schwartz [1974], Wilner [2000], Jain [2001]), especially for firms with negotiating strength (due to monopoly or specific goods market). So we can presume the existence of a 'trade credit' liquidity providing mechanism

which is not based on contractual relations but on the supplier-customer chain. In this case we should expect a negative relation whose importance should increase with increasing liquidity constraint (small firms). The evidence on weakness of payment discipline inside the corporate sector (which differs by industry) can however be an additional factor contributing to the negative relation between bank and trade credit from the bank side.

On the other hand, an important commercial credit can signal a strong (monopoly) market position for the firm to its suppliers, and in this case banks are induced to offer more credit to such firms. In this case we should observe a positive relation (Biais and Gollier [1997]).

**Affiliated loans** (AFFILIES) – sum of lines 623 and 628 of balance sheet. This variable includes short term inter-enterprise loans (without specific loan contract) from firms having official affiliation links with the enterprise in question, but also ‘other debts’. These ‘other debts’ include loans from headquarters but also other debts which we suppose to be informally affiliated<sup>41</sup>. As demonstrated in Perrotti and Gelfer [1998], such affiliated financing plays a resource reallocation role and softens enterprise’s liquidity constraint. In this case (as trade credit and contractual loans) affiliated loans can be used as an alternative to the bank credit source of finance, especially in the case of severe bank rationing. Moreover, the role of affiliated debt is peculiar: if we consider as the ‘firm’ not as the accounting entity but as the entire conglomerate, affiliated debt can be assimilated to own funds finance. In this case, following a pecking order approach, we should also suppose it to be negatively related to bank credit.

On the other hand, we cannot a priori reject an eventually positive affiliated debt - signaling role for banks. A closely linked affiliated company could offer liquidity in case of temporary liquidity difficulties (Ziane [2004]<sup>42</sup>).

**Advances** – (L627) line 627 of balance sheet. From the enterprise’s perspective, an advance is a provision of liquidity by a customer for future delivery. The existence of hard liquidity

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<sup>41</sup> In fact, property rights practices are somewhat opaque in 1996-2000 Russia, and we know of many examples of the existence of ‘not registered’ proximity relations, such as tolling or compensation schemes, which apparently include not affiliated firms having in reality very close links. Generally speaking, given the relative importance of this item, we can suppose that firms that provide such financing cannot be complete outsiders.

<sup>42</sup> Ziane Y., [2004], “Crédit interentreprises et asymmetries d’information: le cas des petites entreprises”, MODEM Working Paper, University of Paris X-Nanterre

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constraints for the firm implies a negative relation with bank credit: in this case, advances are an alternative second best source of financing.

On the other hand the importance to the enterprise of payments in advance could be considered a positive signal as to the demand for its output or its negotiation strength in obtaining “cash in advance”. This demand is measured in money (and not in barter or monetary substitutes) and could provide an estimate of future enterprise liquidity. In this case the relation could be positive. We should remember that monetary payments are not automatic in the Russian economy due to its high degree of barterization, especially in 1996-1998 period (Brana, Maurel [1999]<sup>43</sup>).

**Capital (Social capital)** – line 410 of liabilities side of the balance sheet. Highly capitalized firms are better placed in some types of principal-agent problems than undercapitalized ones (Ross [1977]<sup>44</sup>): owners are induced to better control managers. So, abundant capital can represent an additional guarantee source, which incites banks to lend and could be a good signal for debt suppliers (in this case the expected coefficient sign is positive).

In the case of strict bank credit rationing (extremely high informational opacity), capital issuance (in the Russian case we mean that capital is augmented by issuing nontradable shares<sup>45</sup>), may be an alternative way of financing activities through the conglomerate channel. Moreover, in the case where official shareholders rights are not sufficiently protected (which is a realistic hypothesis for the Russian environment; see Linz [2002]<sup>46</sup>), nontradable share issues become a part of insiders' financial cost optimization schemes and are closer to affiliated financing than to external financing. In this case we can a priori expect a negative relation.

Theoretically banks can finance two types of assets of nonfinancial firms: fixed and circulating capital. In our study we use proxies for both variables and try to find out which type of assets is financed by bank credit. In the case of nonsignificance of both variables, we should conclude that bank credit flows are completely outside of real sector financing and

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<sup>43</sup> Brana S. Maurel M. [1999] “Barter in Russia: Liquidity Shortage versus Lack of Restructuring” Working Paper, Paris

<sup>44</sup> Ross S. [1977], “The determination of financial structure: the incentive signaling approach” *Bell Journal of Economics*, N°8

<sup>45</sup> Due to extremely narrow financial markets in Russia, issues of tradable shares as a finance source concern only about 10 Russian enterprises whose share market can be considered as liquid. Such giant enterprises (Gazprom, Lukoil, RAO EES etc) were excluded from our sample as outliers.

<sup>46</sup> Linz S. [2002], “Barriers to Investment by Russian Firms: Property Protection or Credit Constraints?” William Davidson working paper N°469.



credit is mostly used for financing financial assets, and so is part of financial optimization, opaque privatization and tax avoidance. In this case we should conclude that real sector financing is ensured only by self financing and intra-conglomerate transfers.

**Machinery and equipment** (L120) - line 120 of balance sheet. In the case of the existence of banks' investment financing, we should expect a positive sign in the relation. However, macro economic data presented before suggest some skepticism about this hypothesis maybe warranted. Industrial branch sub-sample evaluation is necessary in order to determine the branches which attract bank investment financing. On the other hand, a large group of econometric studies consider the value of machinery and equipment as similar to a guarantee, which also suggests a positive relation<sup>47</sup>. However, for Russian case we have to take into account the low liquidity of such equipment (due to its use and narrow secondary markets) and difficult procedures for recovery in the case of bankruptcy. So the guarantee role of machinery and equipment would probably not exist in the Russian case. Moreover, firms with much machinery and equipment can be considered inflexible. If this equipment covers the social sphere (houses, kindergartens, sports equipment, etc.) it represents additional charges to such enterprises, so that banks could be even less favorable to lend.

**Inventories** (L210) - line 210 of balance sheet. The amount of inventories (stocks of inputs but also of final production) can approximate the enterprise's need for circulating capital. A positive relation between inventories and bank debt would confirm our hypothesis about the liquidity providing role of bank credit. Some econometric studies consider stocks as guarantees. However, even if stocks are more liquid than equipment, insufficiently effective legal procedures in Russia may complicate the realization of collateral.

A negative relation would appear if the important inventories are perceived as a signal of weak performance by the enterprise in selling its products; this fact would discourage banks from offering finance<sup>48</sup>.

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<sup>47</sup>For a survey, see e.g. « Modes de financement des entreprises allemandes et françaises », projet de recherche commun de la Deutsche Bundesbank et de la Banque de France, 1999, A. Sauvé et M. Scheuer (dir).

<sup>48</sup>As we observe in Brana S., Maurel M., Sgard J. [1999], « Enterprise Adjustment and the Role of Bank Credit in Russia: Evidence from a 420 Firm's Qualitative Survey », *CEPII, Working Paper n° 99-06*.

### 3.2.5 Method

We made our estimation using two econometric approaches: static and dynamic. By static, we mean Within/Between and Feasible Generalized Least Squares estimations. Static estimation is based on variables in levels<sup>49</sup>. In our case the need for dynamic specification by instrumental variables is twofold: it enables us to estimate coefficients in net flows (for balance sheet variables) and in surplus (for income statement variables) but also to solve a typical data problem due to the endogenous character of balance-sheet variables and simultaneity bias.<sup>50</sup> Dynamic estimation is done using Generalized Method of Moments. The combination of both methods increases the robustness of our results.

### 3.2.6 Results

Significant coefficients are presented in bold. Standard errors are heteroscedasticity consistent.

The static model is estimated by FGLS and Within methods with random effects. Detailed results are presented in Annex II-a. Annex II-b contains sub-period estimations results. The estimated static model is:

$$\text{dette\_bq} = \alpha_1 L10 + \alpha_2 L240 + \alpha_3 \text{creditiec} + \alpha_4 \text{affilies} + \alpha_5 * l627 + \alpha_6 * l210 + \alpha_7 l120 + \alpha_8 l410 + u_i + \varepsilon_{it}$$

The dynamic specification uses the GMM instrumental variables method. The estimation is based on first differences of variables and includes a lagged endogenous variable and period dummies. Variables are instrumented by their past level data lagged by 2 periods and other balance sheet variables.

The estimated model is:

$$\Delta \text{dette\_bq} = \text{lag} \Delta \text{dette\_bq} + \alpha_{1\Delta} L10 + \alpha_{2\Delta} L240 + \alpha_{3\Delta} \text{creditiec} + \alpha_{4\Delta} \text{affilies} + \alpha_5 \Delta l627 + \alpha_6 \Delta l210 + \alpha_7 \Delta l120 + \alpha_8 \Delta l410 + \alpha_9 T_1 + \alpha_{10} T_2 + \alpha_{11} T_3 + u_{it}$$

<sup>49</sup> In order to correct for possible size bias we also did estimations using size sub-samples. Estimation results are presented in annex II-c. It appears that even if there are some differences between small and big enterprises' financing, our main results still matter for both subsamples.

<sup>50</sup> For more detailed explanation of econometric methods see Sevestre P. [2002], « Econométrie des données de panel », Dunod, Chap. 4 -6.

Table 1. Results from static and dynamic estimations.

| Variable                           |              | GMM       | QGLS     | Within   |
|------------------------------------|--------------|-----------|----------|----------|
| Y-1                                | Lag dette_bq | 0.4137784 |          |          |
|                                    | t Value      | 12.78     |          |          |
|                                    | (Pr>/t)      | 0         |          |          |
| Turnover                           | L10          | 0.0128852 | 0.0711   | 0.04707  |
|                                    | t Value      | 1.3790849 | 8.32     | 5.56     |
|                                    | (Pr>/t)      | 0.168     | <0.0001  | <0.0001  |
| Profit                             | L2140        | -0.243371 | -0.17556 | -0.09666 |
|                                    | t Value      | 8.4823103 | -7.21    | -4.10    |
|                                    | (Pr>/t)      | 0         | <0.0001  | <0.0001  |
| Inter-enterprise contractual loans | CREDITIEC    | 0.0784733 | 0.04459  | 0.05089  |
|                                    | t Value      | 4.1659792 | 1.59     | 1.89     |
|                                    | (Pr>/t)      | 0.000031  | 0.1123   | 0.0589   |
| Commercial credit                  | L621         | -0.031128 | -0.04547 | -0.01128 |
|                                    | t Value      | 1.4222395 | -2.42    | -0.56    |
|                                    | (Pr>/t)      | 0.1549    | 0.0154   | 0.5756   |
| Affiliated loans                   | AFFILIES     | -0.136321 | -0.06946 | -0.06871 |
|                                    | t Value      | 6.252639  | -1.96    | -2.06    |
|                                    | (Pr>/t)      | <0.0001   | 0.0506   | 0.0398   |
| Advances received                  | L627         | 0.554879  | 0.11532  | 0.14168  |
|                                    | t Value      | 10.339082 | 2.63     | 3.20     |
|                                    | (Pr>/t)      | 0         | 0.0085   | 0.0014   |
| Social capital                     | L410         | -0.019275 | 0.04466  | 0.06312  |
|                                    | t Value      | 0.8287048 | 2.81     | 3.81     |
|                                    | (Pr>/t)      | 0.4072715 | 0.0051   | <0.0001  |
| Machinery and equipment            | L120         | -0.050901 | -0.04291 | -0.04944 |
|                                    | t Value      | 3.4072733 | -5.55    | -5.01    |
|                                    | (Pr>/t)      | 0.0006562 | <0.0001  | <0.0001  |
| Stocks                             | L210         | 0.8849016 | 0.64465  | 0.71399  |
|                                    | t Value      | 10.459112 | 12.36    | 12.47    |
|                                    | (Pr>/t)      | 0         | <0.0001  | <0.0001  |

### 3.2.7 Interpretation of results

Lagged endogenous variable's influence appears to be significantly positive: if the enterprise had access to bank credit before, it would have a better chance of obtaining credit later. This result is in line with practices of renewal of credit or credit line as a main procedure. Such a mechanism is representative of an adaptive attitude (which is necessary in the situation of unpredictable shocks) which enables the enterprise and its bank to adjust financing conditions to a changing external environment. This situation can however indicate the presence of an entry cost for the enterprise to obtain bank credit.

**Turnover.** The relation is unstable: positive in the static versus not significant in the dynamics for the whole sample. The signaling influence of current sales appears to be weekly positive and not decisive. We obtain a counterintuitive significantly negative relation for the SME sub-sample. We can interpret it by the change in pecking order: enterprises which have substantial current sales are liquidity sufficient and do not ask for bank credit in the situation of entry barriers and credit rationing<sup>51</sup>.

**Profit** – all three methods converge by revealing a significantly negative relation (in flows but also in net surplus) between profit and bank credit. This result is robust to all sub-sample specifications, so the pecking order hypothesis is confirmed: Russian enterprises prefer using their own funds before asking for bank financing.

### Inter-enterprise credit

**Inter-enterprise contractual loans (IECL)** – we observe a relatively instable relation: while the overall sample evaluation produced a positive impact (less significant for QGLS estimation), the sub-samples results differ. The impact of the signaling role of IECL appears to be more important in the case of SME but also for three of the industries most concerned with arrears problems: energy, metallurgy and machine building. In the situation of relatively weak transparency of firms, other enterprise financing is perceived by banks as a signal, as well as the existence of opportunities to provide an additional financing source in case of temporary illiquidity. Negative signs for the estimated coefficients for trade and food industries suggest the existence of some institutionalized extra-bank financial transfers to

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<sup>51</sup> However, to confirm this hypothesis we should do our estimations with larger SME samples.

industries offering rapid return of investment. However, not all branches are concerned with such mechanisms.

**Commercial credit** – the relation is negative, but its significance is not robust to the method used for the whole sample. However, sub-sample estimations reveal more clearly an alternative role for this type of financing. The impact is significantly negative for both sub-periods. The importance of trade credit as an alternative source of financing is higher for SME (which is in line with the financial constraint hypothesis) but also significant for big enterprises. The instability of the whole-sample negative relation is surely due to important inter-sectoral differences in financing. We can easily see that the impact of trade credit to bank credit is positively related to differences in sectoral non-payment ratios. While for energy, the industry most affected by the non-payment problem during the period studied, the commercial credit coefficient is important and significantly negative, for communication (the lowest non-payment level in the economy) the relation is significantly positive, so that trade credit plays a positive signaling role. In this case, disaggregated data on the level of non-paid on time commercial credits by each enterprise, should clarify our results. Unfortunately, balance sheet data does not contain such information.

**Affiliated loans** – the relation is significantly negative, so that this type of financing appears to be an alternative to bank credit. This result appears to be in line with existing studies on the importance of intra-conglomerate financial transfers<sup>52</sup>. Affiliated financing can be considered as own funds of an industrial conglomerate, so that, according to the pecking order approach, it is closer to own funds financing than to external funds (even though in accounting such financing is displayed as external). However, we observe some interesting dynamics: the importance of affiliated loans as an alternative finance source is greater during the first sub-period (characterized by an exceptionally severe liquidity shortage). Affiliated debt appears to be used more by SMEs as a finance source (due to their more important liquidity constraint) and is not a significant financial source for big enterprises (such enterprises can be considered as a conglomerate centers that are more often lenders than borrowers). Branch sub-sample

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<sup>52</sup> See e.g. Mesnard M. [1999] Emergence des groupes et Corporate Governance en Russie, *Economie Internationale* N°77, 1<sup>er</sup> trimestre.

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analysis gives a relatively homogenous picture: except for trade and metallurgy (metallurgic enterprises' size is relatively big) all relations are negative.

**Advances** – The relation is significantly positive for the whole sample; this confirms our hypothesis about an important role for this indicator as a signal of demand for output measured in money. The importance of a signal given by advances is relatively stable across periods. Size sub-samples however indicate that the signaling role of advances is greater for SMEs which is in line with information asymmetry approach. We observe that some branches of industry (energy, metallurgy and machine building) use advances as a finance source<sup>53</sup>. This result can be interpreted by referring to both inter-enterprise arrears and the industry concentration situation. We know that the Russian energy market is not very competitive; energy enterprises are monopolist on the regional level. The metallurgy branch is oligopolistic: entry barriers exist due to the particular technology and increasing returns production function. The machine building branch statistically seems quite competitive. However, we must take into account that firms produce extremely specific goods whose (national) markets are narrow, so that machine building enterprises can also use negotiation strength vis-à-vis customers to obtain 'cash in advance', which strength they do not have vis-à-vis their banks.

**Social capital** – we cannot establish clear relation between bank credit and enterprise's capital. The whole sample analysis put out a weekly positive static relation (the coefficient is not significant in dynamics). Relation is clearly positive only for food and trade enterprises where highly capitalized firms give a positive signal to their banks. Our results provide indirect indication about a weakness of financial markets: the capital reflected on enterprise's account is not really a variable to guarantee liquidity or solvability of enterprise.

**Machinery and equipment** – the relation is significantly negative for the whole sample, so that we reject the hypotheses about both the investment financing role of banks and the guarantees role of equipment in the Russian environment. We did not find any particular

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<sup>53</sup> We observe some similarities in these three industries' financial patterns which suggest conventional financing practices: having an important part of 'oldly created' enterprises, those industries are relatively monopolistic. All these industries are deeply involved in arrears problems (1<sup>st</sup> place for energy, 3<sup>rd</sup> place for machine building and 4<sup>th</sup> place for metallurgy). All of them are constrained to use advances as a liquidity source and we observe that IECL plays a positive signaling role for their bank indebtedness.

industries with a clearly positive relation. This result confirms the GKS macroeconomic data presented below; banks do not significantly finance investment projects (Figure 1).

**Stocks** - the relation is significantly positive for the whole sample based on the three estimations. This result appears to be extremely robust to all sub-sample specifications. So we can confirm our hypothesis about a liquidity providing role of bank credit. Banks offer to enterprises a ‘finance of production’ by financing their liquid assets. Sub-period estimations reveal that the coefficients are more important for the second sub-period, so that we conclude that banks are actually developing their liquidity providing activities. This liquidity provision is an important element of ‘overdraft financing’.

To summarize, our econometric estimation leads to the following results:

- a positive relation of bank credit and inventories and the importance of the signalling role of advances. This clearly supports the hypothesis on the liquidity providing role of Russian banks.
- a negative relation with investment and a weak social capital role confirm that banks do not provide ‘investment finance’, which is provided by enterprises themselves or their conglomerates.
- banks appear to be in third position in the pecking order, after self financing and intra-group financing. This reveals a weakness in the corporate control mechanism and more generally of institutional enforcement.

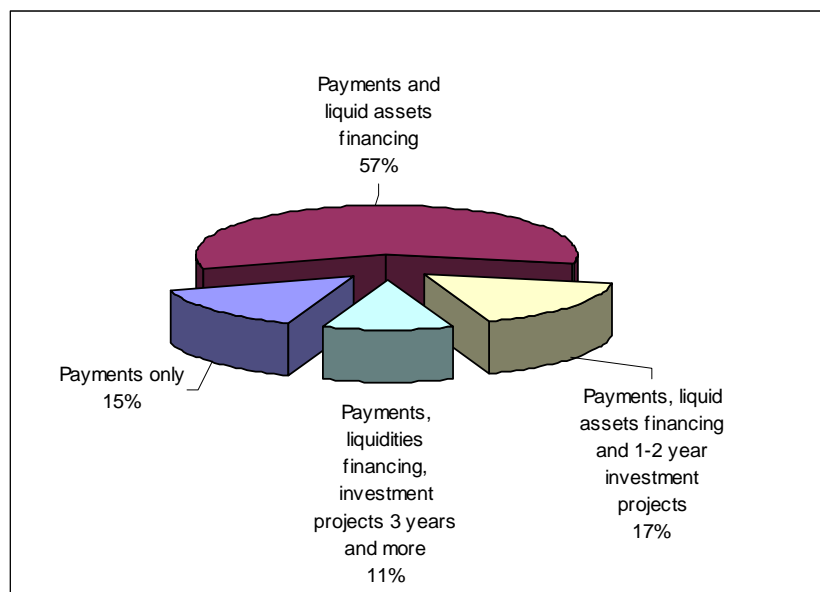
### **Has this situation changed?**

The query recently completed by the Institute of Economic Forecasting (Kovalin and Moïseev [2004]<sup>54</sup>) supports our econometric results: actually banks continue to be mostly liquidity providers for business.

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<sup>54</sup> Kovalin D. Moïseev A., [2004] forthcoming in Studies on Russian Economic Development.

Figure 5. Bank-enterprise relation, 2003



Source: Query, 180 enterprises, mid-2003

We clearly see from the chart the predominance of payment services and circulating capital financing. The role of bank credit as a source of medium term investment financing is limited to 11% of the sample enterprises (2% one year earlier). Of the enterprises, 17% are supported in their short term investment projects (versus 11% for 2002). We see a very good trend, but absolute data still suggest that bank intermediation does not play a decisive role as a source of investment financing but confirm the importance of banks role in liquidity provision.

However, as noted in section 1, the liquidity providing role has a macroeconomic dimension closely related to the payment system. Theoretically speaking, this role has to be realized jointly on three levels: bank-client, bank-bank and commercial bank-central bank

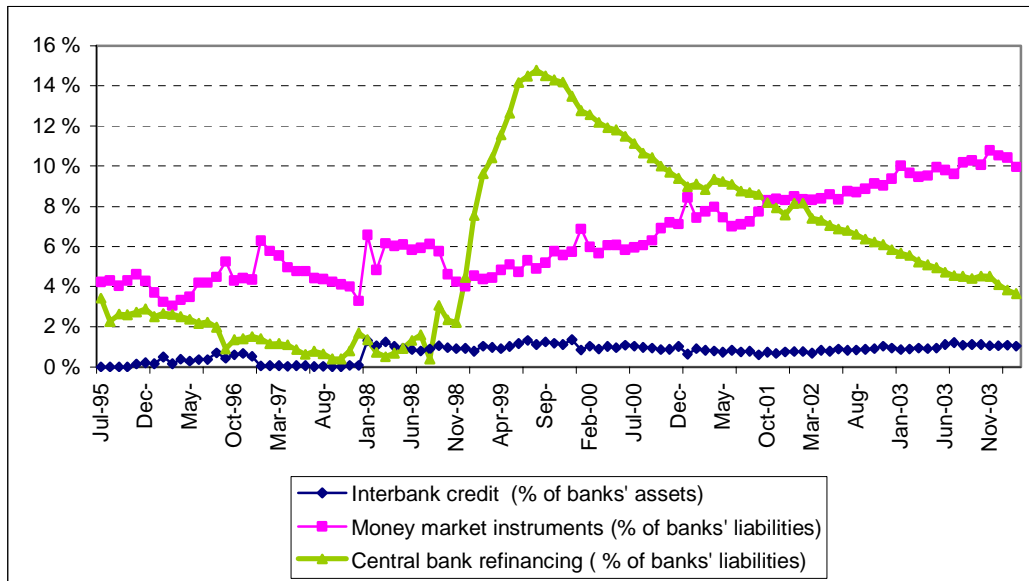
**1. Bank-client.** By asking for a credit (or credit line) the firm is asking for liquidity for financing its activities until cash inflows are effectively realized.

Our econometric estimations confirmed a well functioning bank-client liquidity providing activity.

**2. Bank-Bank.** In the interbank credit market banks provide liquidity to each other. Generally speaking, the interbank credit market involves the same type of liquidity provision to banks as banks offer to their customers. In this sense, the interbank credit market can compensate for the absence of a secondary market for loans (Fama [1985])



Figure 6. Liquidity providing on the macroeconomic level (stocks)



Source: Bank of Russia

We clearly see from the chart the weakness of the interbank liquidity market in Russia: the interbank claims weight is insignificant in bank liabilities (about 1%)<sup>55</sup>. However, money market instruments include some interbank credit operations (for example, deposit certificates), so that the weight of total interbank credit is slightly larger than interbank claims alone. Our estimations based on detailed data from the Central bank of Russia suggest a ratio of about 5% of asset operations for end-2003. Considering that the share of interbank credit in bank operations in France and Germany is about 30-40%, the 5% level in Russia seems extremely low. This weakness of interbank liquidity provision makes the overall bank liquidity providing system fragile and reveals a general interbank trust problem. At the same time, the weakness of interbank credit hampers the functioning of the financial surplus transfer mechanism, especially in the highly segmented<sup>56</sup> Russian bank system.

**3. Central bank** runs a well functioning payment system with unconditional conversion of bank money into central bank money. It provides liquidity on the interbank level. By taking responsibility for the functioning of the payment system, it has to provide an insurance

<sup>55</sup> This situation is partly a consequence on interbank crisis of 1995

<sup>56</sup> We observe industrial segmentation, but also an important concentration of households savings (80%) in one bank - Sberbank

mechanism for bank runs, an essential element for insuring trust in money and in the banking system as a whole.

Concerning the third level of the liquidity providing mechanism, we can see from Figure 6 that the weight of central bank refinancing varies notably over the period. In fact, the restrictive monetary policy of 1995-1998 was supported by the near absence of central bank refinancing. Coupled with the weakness of the interbank credit market, this was one of the causes of banking system fragility and general demonetization of the economy. Central bank refinancing increases importantly after the 1998 collapse, up to 15% of bank liabilities (due to remonetization of banking system in order to maintain its functioning in the trust crisis) and decreases actually (about 4% of bank liabilities at end-2003). We see that after 1998 the central bank performed better in its role as ultimate liquidity provider for the banking sector in liquidity crises. However, we know that the role of the central bank cannot be limited to interbank liquidity intervention: a deposit insurance mechanism and other institutional supervisory rules must be in place in order to avoid bank runs. In the Russian case the discussion of the a creation of a deposit insurance mechanism collides with a lack of trust in the banking community but also with a particular position of the biggest Russian bank – Sberbank, the publicly owned bank which benefits from the implicit public deposit guarantee. This position gives it a privileged position in the household deposit market (80% of household deposits) but, with the paucity of interbank financial flows redistribution, it hampers the reallocation function of the Russian banking system.

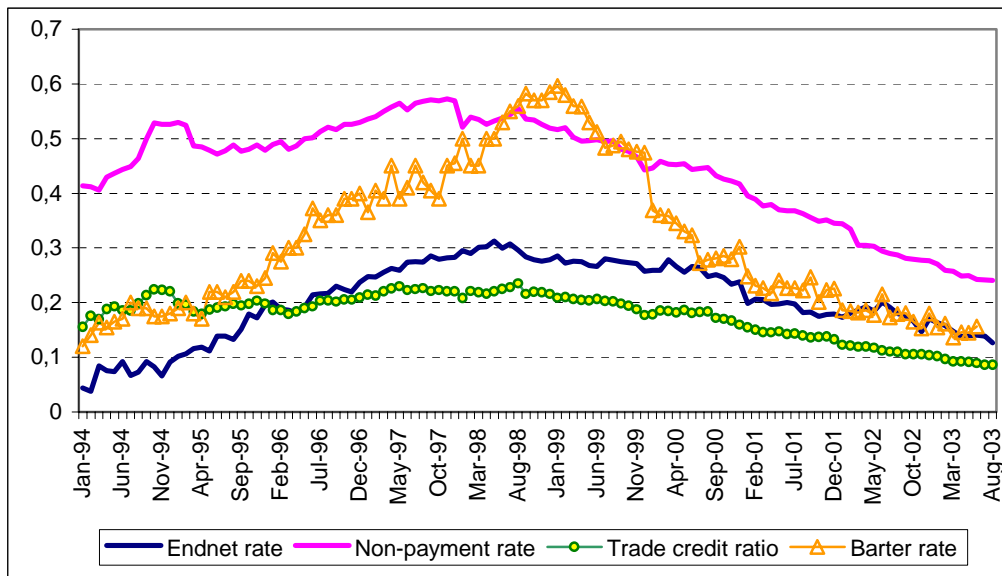
Thus, we can conclude that although the Russian banking system does provide liquidity to the real sector, this liquidity providing role is weakened by the incompleteness of the macroeconomic (systemic) liquidity providing elements.

## 4 What economic role for banks' liquidity provision?

In order to evaluate the overall importance of banks' liquidity provision we establish empirical relations between main liquidity sources of the economy and four proxies of its demonetization. The first is a payment crisis; the second is the use of trade credit by real sector enterprises, the third is the use of wages and budget arrears as alternative sources of

financing by Russian firms, and the forth is barterization. The importance of these phenomena is shown in Figure 7 and is widely known as a feature of Russian transition period<sup>57</sup>.

Figure 7. Demonetization indicators



Source: author's calculations basing on GKS & Russian Economic Barometer data

Non-payment rate (IMPAY variable) is calculated as the percentage of inter-enterprise debt not paid on time to a total inter-enterprise debt. Trade credit ratio (TCREDIT variable) is an estimate of resources received by enterprises from their suppliers. It is constructed as trade credit/total liabilities. Total liabilities are the difference between enterprises' assets and capital (data provided by Goskomstat). The ENDNET rate indicator represents an estimate of net resources received by enterprises as wage and budget arrears. It is constructed as follows:  $(\text{Creditor indebtedness} - \text{Debtor indebtedness}) / \text{Total liabilities}$ . Creditor indebtedness includes goods delivered but not paid for by enterprises (commercial credit received), budget and extra-budget debts, salaries debts, advances received, affiliated debts, vexels (bills of exchange) issued. Debtor indebtedness includes goods delivered to customers but not paid for by them (commercial credit extended to customers), advances paid, vexels (bills of exchange) accepted, affiliated debts. Since budget and salaries debts are included only in creditor

<sup>57</sup> Lugovoy, Semenov, [2000], Brana and Maurel [1999] Linz and Krueger [1998], Earle and Sabirianova [2002] Scaffer M., Alfandari G.[1996] "Arrears" in the Russian Enterprise Sector, CERT Discussion Paper 96/8 Hildebrandt A. [2002] "Too many to fail? Inter-enterprise arrears in transition economies", IDEAS working Paper

indebtedness, the netting on the aggregate level between creditor and debtor indebtedness gives a measure of budget and salary debts of the enterprise sector. BARTER rate indicator is the part of transactions paid for in non-monetary form (vexels (bills of exchange), barter, compensation, etc) as a percentage of total transactions.

Our estimations are based on macroeconomic Goskomstat and Bank of Russia data and microeconomic surveys of Russian Economic Barometer (BARTER variable) and cover the period from July 1995 to May 2003. All estimations were done using Generalized Method of Moments. We use instruments to correct for missing variables (monetary supply growth, dollar monetary supply growth, bank assets growth, real exchange rate, federal deficit, exports). To the extent that the 1998 crisis period is included in our estimation period, we have to adjust our estimate. We evaluated separately for two sub-periods: pre-crisis period July 1995-March 1998 and post-crisis period January 1999 – May 2003. Sub-samples estimation results are presented in Annex III-e.

Generally speaking, find three sources of liquidity provision to the economy (Renversez, Dorbec, [2003]): bank credit, central bank refinancing and the external trade surplus. The question is: did the liquidity provided to the economy via bank credit influence the general payment crisis (which peaked in 1998)? We establish simple empirical relations between the demonetization indicators and two relatively independent liquidity sources:

BC – is a part of credit to enterprises as a percentage of bank asset portfolios (Central Bank of Russia data). This variable represents the interest of the banking sector in enterprise financing and should have a negative impact on demonetization.

EXTERN – is calculated as external trade surplus (in rubles) as a percentage of the M2 aggregate (Central Bank of Russia and Goskomstat data). This variable is a proxy for an external liquidity source and should also have a negative impact on demonetization, being at the same time an alternative to bank credit liquidity provision (liquidity provision is realized in this case thorough the inter-enterprise and intra-conglomerate channel)

## 4.1 Results

For stationarity reasons all regressions are evaluated in first differences. More detailed estimation data are presented in Annexes III. Stationarity tests on variables are presented in Annex IV.

Estimated models are:

$$\begin{aligned}\Delta\text{IMPAY} &= \text{CONST} + \alpha_1 \Delta\text{BANKCREDIT} + \alpha_2 \Delta\text{EXTERN} + \varepsilon_t \\ \Delta\text{TCREDIT} &= \text{CONST} + \alpha_1 \Delta\text{BANKCREDIT} + \alpha_2 \Delta\text{EXTERN} + \varepsilon_t \\ \Delta\text{ENDNET} &= \text{CONST} + \alpha_1 \Delta\text{BANKCREDIT} + \alpha_2 \Delta\text{EXTERN} + \varepsilon_t \\ \Delta\text{BARTER} &= \text{CONST} + \alpha_1 \Delta\text{BANKCREDIT} + \alpha_2 \Delta\text{EXTERN} + \varepsilon_t\end{aligned}$$

Table 2. Results for banks' liquidity provision

|             | DIMPAY     | DTCREDIT   | DENDNET     | DBARTER    |
|-------------|------------|------------|-------------|------------|
| CONST       | -0.002925  | -0.000928  | 0.000228    | -0.001884  |
| Std. Error  | 0.001100   | 0.000651   | 0.001187    | 0.002611   |
| t-Statistic | -2.659270  | -1.426244  | 0.192415    | -0.721721  |
| Prob        | 0.0093     | 0.1572     | 0.8478      | 0.4723     |
| DBC         | -0.432989  | -0.468923  | -0.669819   | -1.283910* |
| Std. Error  | 0.181575   | 0.137458   | 0.219531    | 0.726280   |
| t-Statistic | -2.384634  | -3.411381  | -3.051143   | -1.767788  |
| Prob        | 0.0192     | 0.0010     | 0.0030      | 0.0804     |
| DEXTERN     | -0.137737  | -0.063147  | -0.107583   | 0.138957   |
| Std. Error  | 0.067633   | 0.027779   | 0.048997    | 0.107868   |
| t-Statistic | -2.036526  | -2.273200  | -2.195714   | 1.288210   |
| Prob        | 0.0446     | 0.0254     | 0.0307      | 0.2009     |
| J-statistic | 0.075346   | 0.011056   | 0.058096    | 0.058999   |
| P           | 0.99462209 | 0.99969184 | 0.996339997 | 0.99625534 |

Significant coefficients are presented in bold.

\* significant at the 10% level

## 4.2 Interpretation of results

We clearly see that banks liquidity provision has a significantly negative impact on all four endogenous demonetization variables. This result confirms our hypothesis on the importance of the bank credit liquidity providing function: the difficulties of enterprises to obtain bank credit (due to extremely restrictive monetary policy but also to speculative banks' priorities) were responsible for the use of alternative financial sources by enterprises. On the other hand, the appearance of positive bank credit dynamics, due to an improving economic situation and to a change in banks' investment strategy, have improved the monetization of the economy.

The negative impact of EXTERN as an external source of liquidity appears to be lower: it is however significantly negative for IMPAY TCREDIT and ENDNET. This result can be explained by two factors: the first is the weaker liquidity spreading effect of small number of exporters on the overall economy (which is also related to weakness of the redistribution role of the highly segmented Russian banking system). Our second hypothesis concerns the important capital flight phenomenon (particularly the non-return to Russia of foreign currencies gained by exporters). So, the relation could be improved if we correct our estimation of the external trade surplus for capital flight.

In fact, our econometric estimations confirm the Dorbec and Renversez [2003]<sup>58</sup> empirical results that the liquidity shortage of 1995-1998 was a main reason for demonetization and for the appearance of alternative financing schemes. Nonbank credit, wage and budget arrears, inter-enterprise arrears and barterization appear to be second best solutions adopted by liquidity constrained enterprises in the period of extremely restrictive anti-inflation policy and speculative proclivities of banks. Amelioration of the situation with liquidity provision (and particularly the increase in bank credit) was one of the reasons for amelioration of the payment situation and remonetization of the economy.

## 5 Liquidity provision versus investment financing: the role of uncertainty

In our previous sections we have demonstrated the existence and the importance of bank liquidity provision for the Russian economy during the transition period. In fact, Russian banks provide liquidity to the real sector and this liquidity provision is an important factor in promoting the general monetization of economy. However, the question still persists as to why banks provide liquidity but do not provide long and medium term financing. Some clarifications is gained by looking at the concept of uncertainty.

We know that radical market reforms in the Russian transition process made irrelevant the existing business practices and consequently the expectations formation process. However,

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<sup>58</sup> Dorbec A., Renversez F., [2003] "Incidence de la transformation des contextes financiers depuis 1992 sur les conditions du financement de l'investissement privé en Russie", paper presented at the 23th session of Franco-Russian seminar, Moscow, December, forthcoming in Studies on Russian Economic Development

institutions which could facilitate expectations formation and create a new conventional basis for expectation were not in place (Stiglitz, [1999]). In fact, the appearance of new institutions is not a completely exogenous process (Aoki, [2001]): the institutional system needs time to gain agents' acceptance, to be adjusted to the environment, and to test its enforcement mechanism.

More generally we can easily demonstrate that the Russian transition is a good example of a radical non-probabilistic uncertainty situation. A deep economic crisis accompanied by several financial crises added confusion to expectations formation. Expectations formation came with increased knowledge about the dynamics of economic variables. In this case, information on future developments during the transition-related economic reforms cannot be considered as some exogenous probabilistic parameter, but rather as the result of 'learning by doing'.

Theoretically speaking, we make a distinction between risk and uncertainty (Knight, [1921], Keynes [1936], Tobin [1971]). When we are talking about risk, we mean probabilistic risk, the theoretical framework where future states of nature can be evaluated in terms of probabilities. In other words, probability laws for all processes and variables are known. However, in such a risky environment some informational imperfections could exist: probabilistic knowledge could be unequally distributed among agents: in such case we face the informational asymmetry problem. In this situation, the institutions (particularly banking institutions) are instrument for facilitating informational diffusion and transparency in order to diminish the asymmetry problem and reduce transaction costs and, more generally, by issuing signals, so as to facilitate economic agents' expectations formation<sup>59</sup>.

The uncertainty situation differs fundamentally from probabilistic risk.<sup>60</sup> The Keynesian definition of uncertainty is the following:

*“By ‘uncertain’ knowledge [...], I do not mean merely to distinguish what is known for certain from what is only probable. The game of roulette is not subject in this sense, to uncertainty; nor is the prospect of a Victory bond being drawn. Or again, the expectation of life is only slightly uncertain. Even the weather is only moderately uncertain. The sense in which I am using the term is that, in which the prospect of a European War is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention or the position of private wealth owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know”*

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<sup>59</sup> See North [1990] for the general concept of institutions. For banking specificity, see for example Diamond's [1984] concept of delegated monitoring

<sup>60</sup> Keynes J.M., [1938], « After the General Theory », Collected Writings, 1973, vol. XIV, p. 113-115

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In this framework banks liquidity provision consists of monetizing claims whose real values are fundamentally uncertain. By offering a credit line, a claim on an enterprise, whose value is not known with certainty, is transformed into money - uncontestable payment means accepted at nominal value (Aglietta [1988]). In this framework banks, as institutions providing liquidity on demand, must manage the uncertainty.

On the other hand, the financing activity is related to the possibility of forming accurate expectations about future yields. The analyses of Nishimura and Ozaki, [2002]<sup>61</sup> and Aizenman [1995]<sup>62</sup> regarding ambiguity and sub-additive probabilities (imprecise knowledge of probabilities in an investment project) shows that the value of waiting to launch an investment project increases as the imprecision of the probability estimation increases. Moreover, the impossibility of forecasting future earnings renders impossible the financing of an investment project. In the situation where banks, as other external finance providers, are subject to principal agent problems, such funding from external sources is always more difficult than their self financing. So the problems of investment finance by Russian banks can be explained by uncertainty or the impossibility of making realistic forecasts about the future economic dynamics. Russian enterprise survey results (Kovalin, Moiseev [2004]) reveal that in fact enterprises experience difficulties in forecasting future demand but also future financial variables for more than one year ahead and this fact is perceived by firms as an important limitation to their investment.

In this situation we have observed an important concentration of banks on the liquidity providing role – their only natural and one which consequently could be realized in an uncertain environment. From the other hand, the ‘financing’ function and, more specifically, investment finance naturally require a more predictable environment. The recent stabilization and return to growth dynamics confirms the importance of this issue: five years after the 1998 financial crisis and a return to growth, we observe the first signs of the appearance of medium term (more than 3 years) bank credits.

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<sup>61</sup> Nishimura K., Ozaki H., [2002], « Irreversible investment and Knightian uncertainty ». ISER Seminar Series 3/5/03.

<sup>62</sup> Aizenmann J. [1995] « Investment in new activities and the welfare cost of uncertainty », NBER Working Paper N°5041, February.



## 6 Concluding remarks

Thus, our findings suggest that in the fundamental uncertainty situation which characterizes a period of transition economic reforms in Russia banks are unable to realize a long term investment financing. However, our econometric estimations demonstrate that the banks' role is far from being null. In fact, banks provide liquidity to real sector enterprises, and this plays a very important role in the smooth functioning of a monetary economy. However, our analysis reveals some incompleteness of the overall liquidity providing mechanism due to the weakness of the interbank credit market and deposit insurance mechanism.

In this situation, special institutional policies dedicated to the anchoring of expectations and to restoring trust between economic agents, in order to make the future better foreseeable, could induce banks to do more than just provide liquidity. Moreover, such policies (legal rules, transparency, corporate governance, etc.) could promote the development of financial intermediation as a mechanism for ensuring the transfer of financial surplus from extracting-exporting industries to the manufacturing sector; a need that has become urgent with the industrial structural changes that occur in Russia actually.

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## Annex I

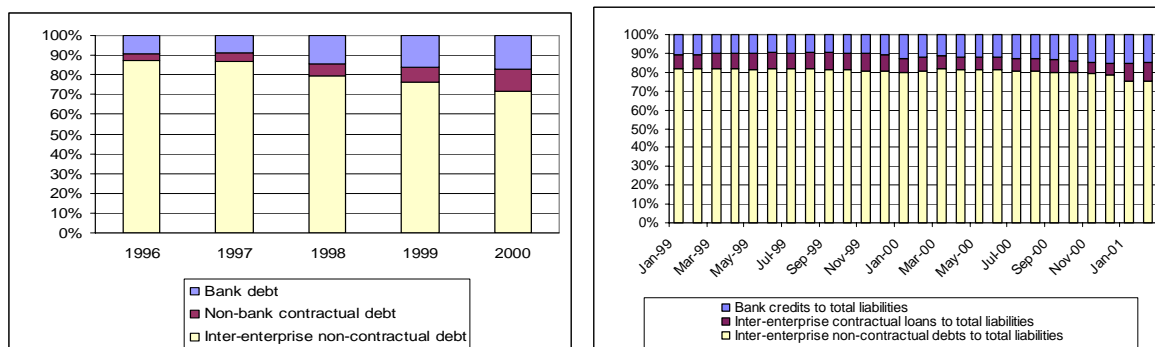
### General Sample Representativeness

First, we compare enterprise profit to GKS profit for the economy

|  | 1999  | 2000   |
|--|-------|--------|
| Profit-loss of total economy                     | 579.0 | 1046.5 |
| Profit-loss of sample after outliers elimination | 51.0  | 77.5   |
| %  | 9%    | 7%     |

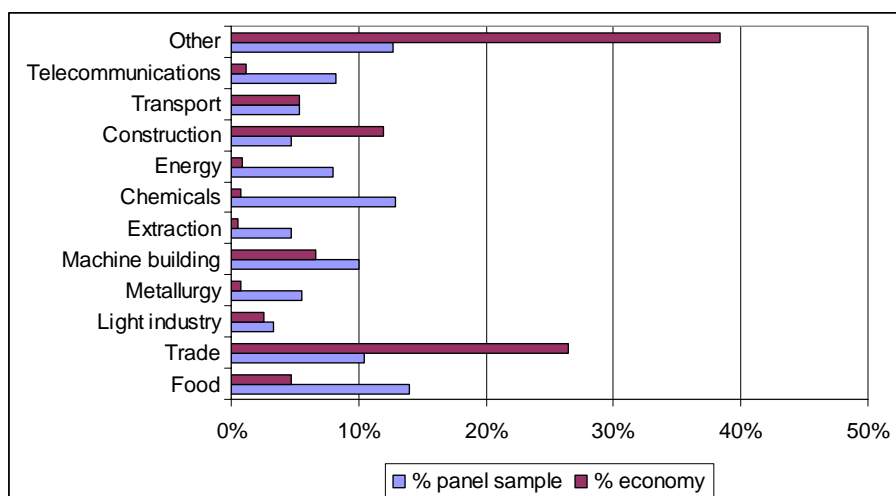
### Indebtedness

Another necessary evaluation of our panel representativeness can be done by comparing the debt structure of enterprises of our sample with that of the economy as a whole (from GKS data). We see from the chart that these structures are quite similar.



Sources: Goskomstat, Russian Economic trends, author's calculations

## Industrial Representativeness



Source: GKS

Concerning the industrial structure, we see that our sample is biased toward ‘hard’ industries. However, the abundance of trade organizations in the overall economic landscape is biased by the existence of a large number of ‘one-day’ organizations used in fiscal fraud and other opaque deals. In fact, the elimination of such enterprises was one of our selection objectives and one of the reasons of using balanced panel data.

## Annex II-a

### Balance sheet determinants of bank indebtedness of firms

Significant coefficients are presented in bold. Standard errors are heteroscedasticity consistent.

The static model is estimated by FGLS and Within methods with random effects.

Estimated static model is:

$$\text{dette\_bq} = \alpha_1 L10 + \alpha_2 L240 + \alpha_3 \text{creditiec} + \alpha_4 \text{affilies} + \alpha_5 * l627 + \alpha_6 * l210 + \alpha_7 l120 + \alpha_8 l410 + u_i + \varepsilon_{it}$$

The dynamic specification uses the GMM instrumental variables method. The estimation is based on first differences of variables and includes a lagged endogenous variable and period dummies. Variables are instrumented by their past level data lagged by 2 periods and other balance sheet variables.

Estimated dynamic model:

$$\Delta \text{dette\_bq} = \text{lag} \Delta \text{dette\_bq} + \alpha_1 \Delta L10 + \alpha_2 \Delta L240 + \alpha_3 \Delta \text{creditiec} + \alpha_4 \Delta \text{affilies} + \alpha_5 \Delta l627 + \alpha_6 \Delta l210 + \alpha_7 \Delta l120 + \alpha_8 \Delta l410 + \alpha_9 T_1 + \alpha_{10} T_2 + \alpha_{11} T_3 + u_{it}$$

| Variable                           |                | GMM       | QGLS     | Within   |
|------------------------------------|----------------|-----------|----------|----------|
| Y <sub>-1</sub>                    | Lag dette_bq   | 0.4137784 |          |          |
|                                    | Standard error | 0.0323596 |          |          |
|                                    | t Value        | 12.78     |          |          |
|                                    | (Pr>/t/)       | 0         |          |          |
| Turnover                           | L10            | 0.0128852 | 0.0711   | 0.04707  |
|                                    | Standard error | 0.00934   | 0.00854  | 0.00846  |
|                                    | t Value        | 1.3790849 | 8.32     | 5.56     |
|                                    | (Pr>/t/)       | 0.168     | <0.0001  | <0.0001  |
| Profit                             | L2140          | -0.243371 | -0.17556 | -0.09666 |
|                                    | Standard error | 0.0286916 | 0.02433  | 0.0236   |
|                                    | t Value        | 8.4823103 | -7.21    | -4.10    |
|                                    | (Pr>/t/)       | 0         | <0.0001  | <0.0001  |
| Inter-enterprise contractual loans | CREDITIEC      | 0.0784733 | 0.04459  | 0.05089  |
|                                    | Standard error | 0.0188367 | 0.2807   | 0.02693  |
|                                    | t Value        | 4.1659792 | 1.59     | 1.89     |
|                                    | (Pr>/t/)       | 0.000031  | 0.1123   | 0.0589   |
| Commercial credit                  | L621           | -0.031128 | -0.04547 | -0.01128 |
|                                    | Standard error | 0.0218863 | 0.01876  | 0.02014  |
|                                    | t Value        | 1.4222395 | -2.42    | -0.56    |
|                                    | (Pr>/t/)       | 0.1549    | 0.0154   | 0.5756   |
| Affiliated loans                   | AFFILIES       | -0.136321 | -0.06946 | -0.06871 |
|                                    | Standard error | 0.0218021 | 0.03552  | 0.03341  |
|                                    | t Value        | 6.252639  | -1.96    | -2.06    |
|                                    | (Pr>/t/)       | <0.0001   | 0.0506   | 0.0398   |



|   |                |              |                     |                     |
|---|----------------|--------------|---------------------|---------------------|
| Advances received                                 | L627           | 0.554879     | 0.11532             | 0.14168             |
|   | Standard error | 0.0536681    | 0.04379             | 0.0443              |
|   | t Value        | 10.339082    | 2.63                | 3.20                |
|   | (Pr>/t/)       | 0            | 0.0085              | 0.0014              |
| Stocks  | L210           | 0.8849016    | 0.64465             | 0.71399             |
|   | Standard error | 0.0846058    | 0.05214             | 0.05727             |
|   | t Value        | 10.459112    | 12.36               | 12.47               |
|   | (Pr>/t/)       | 0            | <0.0001             | <0.0001             |
| Machinery and equipment                           | L120           | -0.050901    | -0.04291            | -0.04944            |
|   | Standard error | 0.0149389    | 0.00772             | 0.00986             |
|   | t Value        | 3.4072733    | -5.55               | -5.01               |
|   | (Pr>/t/)       | 0.0006562    | <0.0001             | <0.0001             |
| Social capital                                    | L410           | -0.019275    | 0.04466             | 0.06312             |
|   | Standard error | 0.0323593    | 0.01592             | 0.01656             |
|   | t Value        | 0.8287048    | 2.81                | 3.81                |
|   | (Pr>/t/)       | 0.4072715    | 0.0051              | <0.0001             |
| Individuals (N)                                   |                | 487          | 487                 | 487                 |
| Periods (T)                                       |                | 5            | 5                   | 5                   |
| Observations (NT)                                 |                | 2435         | 2435                | 2435                |
| Explanatory variables (K)                         |                | 9            | 9                   | 9                   |
| Instruments (P)                                   |                | 60           |                     |                     |
| Lag   |                | 2            |                     |                     |
| Sargan (P)  |                | 36,50 (0,92) |                     |                     |
| R2  |                |              | 0,3042              | 0,2767              |
| R2 adj  |                |              | 0,3016              | 0,274               |
| F value (P)                                       |                |              | 117.80<br>(<0.0001) | 103.12<br>(<0.0001) |
| DLB   |                |              | 475                 |                     |
| DLW   |                |              | 1937                |                     |
| Test of absence of individual random effect F (P) |                |              | 3.6407509 (0)       |                     |

**Instruments used are the following:**

DETTE\_BQ – bank credit all terms confounded

L10 - turnover

CREDITIE – long term inter-enterprise contractual loans + affiliated debt (AFFILIES)

L512- short term inter-enterprise contractual loans

L621- trade credit

L627- advances perceived

L210- stocks

L622- vexels issued by the enterprise

L120- machinery and equipment

L410- social capital

All instruments are in levels with 2 period lag

A set of instrumental variables for a given individual  $i$  is calculated as follows<sup>63</sup>

$$z_i = \begin{bmatrix} z_{i_1} & 0 & 0 \\ 0 & z_{i_1} z_{i_2} & 0 \\ 0 & 0 & z_{i_1} z_{i_2} z_{i_3} \end{bmatrix} \quad T = 3$$

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<sup>63</sup> Duguet E.[1999].

## Annex II-b

### Balance sheet determinants of bank indebtedness of firms

#### Estimation by sub-periods

Significant coefficients are presented in bold. Standard errors are heteroscedasticity consistent.

The static model is estimated by FGLS, Between and Within methods. Dynamic GMM estimation is impossible due to extremely small temporal dimension of sub-samples.

Estimated model is:  $dette\_bq = \alpha_1 L10 + \alpha_2 L240 + \alpha_3 creditiec + \alpha_4 affilies + \alpha_5 * l627 + \alpha_6 * l210 + \alpha_7 l120 + \alpha_8 l410 + u_i + \epsilon_{it}$

| Variable                           |                | Period 1 1996-1997 |         |          | Period 2 1999-2000 |          |          |
|------------------------------------|----------------|--------------------|---------|----------|--------------------|----------|----------|
|                                    |                | QGLS               | Within  | Between  | QGLS               | Within   | Between  |
| Turnover                           | L10            | 0.02722            | 0.09508 | 0.01791  | 0.05003            | 0.01591  | 0.13559  |
|                                    | Standard error | 0.00486            | 0.00712 | 0.00592  | 0.01085            | 0.00735  | 0.02247  |
|                                    | t Value        | 5.59               | 13.35   | 3.02     | 4.61               | 2.16     | 6.03     |
|                                    | (Pr>/t)        | <0.0001            | <0.0001 | 0.0026   | <0.0001            | 0.0309   | <0.0001  |
| Profit                             | L2140          | -0.13639           | -0.0539 | -0.1872  | -0.2519            | -0.1131  | -0.50378 |
|                                    | Standard error | 0.01404            | 0.01747 | 0.0186   | 0.03747            | 0.02715  | 0.07166  |
|                                    | t Value        | -9.71              | -3.08   | -10.06   | -6.72              | -4.17    | -7.03    |
|                                    | (Pr>/t)        | <0.0001            | 0.0021  | <0.0001  | <0.0001            | <0.0001  | <0.0001  |
| Inter-enterprise contractual loans | CREDITIEC      | 0.00976            | -0.0779 | 0.02103  | -0.01994           | 0.03111  | -0.10676 |
|                                    | Standard error | 0.01955            | 0.02162 | 0.02526  | 0.03991            | 0.02912  | 0.07355  |
|                                    | t Value        | 0.5                | -3.6    | 0.83     | -0.5               | 1.07     | -1.45    |
|                                    | (Pr>/t)        | 0.6177             | 0.0003  | 0.4057   | 0.6175             | 0.2857   | 0.1473   |
| Commercial credit                  | L621           | -0.03313           | -0.0922 | -0.033   | -0.0844            | -0.064   | -0.19739 |
|                                    | Standard error | 0.00981            | 0.01065 | 0.01336  | 0.02681            | 0.02291  | 0.05154  |
|                                    | t Value        | -3.38              | -8.66   | -2.47    | -3.15              | -2.8     | -3.83    |
|                                    | (Pr>/t)        | 0.0008             | <0.0001 | 0.014    | 0.0017             | 0.0053   | 0.0001   |
| Affiliated loans                   | AFFILIES       | -0.00136           | -0.1052 | -0.0606  | 0.01272            | -0.02005 | 0.035    |
|                                    | Standard error | 0.02551            | 0.03076 | 0.03459  | 0.04645            | 0.0344   | 0.10238  |
|                                    | t Value        | -0.05              | -3.42   | -1.75    | 0.27               | -0.58    | 0.34     |
|                                    | (Pr>/t)        | 0.9576             | 0.0006  | 0.0803   | 0.7842             | 0.5601   | 0.7326   |
| Advances received                  | L627           | 0.14444            | 0.01768 | 0.12187  | 0.12022            | 0.17389  | 0.23104  |
|                                    | Standard error | 0.04799            | 0.0601  | 0.058947 | 0.06754            | 0.11026  | 0.09679  |
|                                    | t Value        | 3.01               | 0.29    | 2.05     | 1.78               | 1.58     | 2.39     |
|                                    | (Pr>/t)        | 0.0027             | 0.7687  | 0.041    | 0.0754             | 0.1151   | 0.0174   |
| Stocks                             | L210           | 0.16941            | 0.20381 | 0.18437  | 0.95052            | 1.04028  | 0.79512  |

|   |                |                |           |           |           |           |           |
|---|----------------|----------------|-----------|-----------|-----------|-----------|-----------|
|   | Standard error | 0.0229         | 0.0358    | 0.02741   | 0.07239   | 0.005763  | 0.13096   |
|   | t Value        | 7.4            | 5.69      | 6.73      | 13.13     | 18.05     | 6.07      |
|   | (Pr>/t)        | <0.0001        | <0.0001   | <0.0001   | <0.0001   | <0.0001   | <0.0001   |
| Machinery /equip.                                 | L120           | 0.00789        | 0.0171    | 0.00727   | -0.0206   | -0.0709   | 0.00257   |
|   | Standard error | 0.00273        | 0.00453   | 0.00334   | 0.01548   | 0.0146    | 0.02521   |
|   | t Value        | 2.89           | 3.77      | 2.18      | -1.33     | -4.86     | 0.1       |
|   | (Pr>/t)        | 0.0039         | 0.0002    | 0.0301    | 0.1834    | <0.0001   | 0.9187    |
| Social capital                                    | L410           | -0.00743       | -0.00468  | -0.00089  | -0.01071  | -0.079    | 0.02931   |
|   | Standard error | 0.0093         | 0.01316   | 0.0113    | 0.02462   | 0.02065   | 0.3853    |
|   | t Value        | -0.8           | -0.36     | -0.08     | -0.43     | -3.83     | 0.76      |
|   | (Pr>/t)        | 0.4242         | 0.7222    | 0.9371    | 0.6638    | 0.0001    | 0.4472    |
| Individuals (N)                                   |                | 487            | 487       | 487       | 487       | 487       | 487       |
| Periods (T)                                       |                | 2              | 2         | 2         | 2         | 2         | 2         |
| Observations (NT)                                 |                | 974            | 974       | 974       | 974       | 974       | 974       |
| Explanatory variables (K)                         |                | 9              | 9         | 9         | 9         | 9         | 9         |
| R2  |                | 0.4371         | 0.3196    | 0.558     |           | 0.3375    | 0.4219    |
| R2 adj  |                | 0.4319         | 0.3133    | 0.5497    |           | 0.3314    | 0.411     |
| F value (P)                                       |                | 83.19 (0)      | 50.37 (0) | 66.91 (0) | 60.55 (0) | 54.63 (0) | 38.68 (0) |
| DLB/DLW   |                | 475/476        |           |           | 475/476   |           |           |
| Test of absence of individual random effect F (P) |                | 1.193 (0.0275) |           |           | 6.963 (0) |           |           |

## Annex II-b

### Balance sheet determinants of bank indebtedness of firms Size sub-samples

Significant coefficients are presented in bold. Standard errors are heteroscedasticity consistent.

The static model is estimated by FGLS, Between and Within methods. We prefer not to use GMM estimation in the case of relatively small size of sub-samples.

Estimated model is:  $dette\_bq = \alpha_1 L10 + \alpha_2 L240 + \alpha_3 creditiec + \alpha_4 affilies + \alpha_5 l627 + \alpha_6 l210 + \alpha_7 l120 + \alpha_8 l410 + u_i + \varepsilon_{it}$

| Variable                           |                | Small and medium firms <200 employees |          | Big enterprises >1000 employees |          |
|------------------------------------|----------------|---------------------------------------|----------|---------------------------------|----------|
|                                    |                | QGLS                                  | Within   | QGLS                            | Within   |
| Turnover                           | L10            | -0.01794                              | -0.07755 | 0.07691                         | 0.06707  |
|                                    | Standard error | 0.01024                               | 0.0187   | 0.01763                         | 0.01707  |
|                                    | t Value        | -1.75                                 | -7.13    | 4.36                            | 3.93     |
|                                    | (Pr>/t)        | 0.0808                                | <0.0001  | <0.0001                         | <0.0001  |
| Profit                             | L2140          | -0.0586                               | -0.05648 | -0.1635                         | -0.09833 |
|                                    | Standard error | 0.02278                               | 0.01893  | 0.04399                         | 0.04227  |
|                                    | t Value        | -2.57                                 | -2.98    | -3.72                           | -2.33    |
|                                    | (Pr>/t)        | 0.0106                                | 0.0031   | 0.0002                          | 0.0202   |
| Inter-enterprise contractual loans | CREDITIEC      | 0.29507                               | 0.11348  | -0.06944                        | -0.04959 |
|                                    | Standard error | 0.02781                               | 0.03543  | 0.05352                         | 0.0511   |
|                                    | t Value        | 10.61                                 | 3.20     | -1.3                            | -0.97    |
|                                    | (Pr>/t)        | <0.001                                | 0.0015   | 0.1948                          | 0.3321   |
| Commercial credit                  | L621           | -0.15012                              | -0.12297 | -0.1085                         | -0.05084 |
|                                    | Standard error | 0.04521                               | 0.04783  | 0.03273                         | 0.03499  |
|                                    | t Value        | -3.32                                 | -2.57    | -3.32                           | -1.45    |
|                                    | (Pr>/t)        | 0.001                                 | 0.0106   | 0.001                           | 0.1466   |
| Affiliated loans                   | AFFILIES       | -0.85768                              | -0.23041 | 0.06786                         | 0.05025  |
|                                    | Standard error | 0.17439                               | 0.096629 | 0.06596                         | 0.06211  |
|                                    | t Value        | -4.92                                 | -2.38    | 1.03                            | 0.81     |
|                                    | (Pr>/t)        | 0.0000                                | 0.0177   | 0.3039                          | 0.4187   |
| Advances received                  | L627           | 4.34588                               | 3.08144  | 0.15547                         | 0.19804  |
|                                    | Standard error | 0.50428                               | 0.45311  | 0.07641                         | 0.07644  |
|                                    | t Value        | 8.62                                  | 6.80     | 2.03                            | 2.59     |
|                                    | (Pr>/t)        | <0.0001                               | <0.0001  | 0.0422                          | 0.0097   |
| Stocks                             | L210           | 0.8595                                | 0.8809   | 0.93502                         | 0.86412  |
|                                    | Standard error | 0.22444                               | 0.22565  | 0.11305                         | 0.11703  |
|                                    | t Value        | 3.83                                  | 3.90     | 8.27                            | 7.38     |

|   |                |                  |            |           |           |
|---|----------------|------------------|------------|-----------|-----------|
|   | (Pr>/t)        | 0.0002           | 0.0001     | <0.0001   | <0.0001   |
| Machinery and equipment                           | L120           | -0.21887         | 0.08063    | -0.0307   | -0.0183   |
|   | Standard error | 0.04815          | 0.12708    | 0.01484   | 0.02064   |
|   | t Value        | -4.55            | 0.63       | -2.07     | -0.89     |
|   | (Pr>/t)        | <0.0001          | 0.5262     | 0.0391    | 0.3755    |
| Social capital                                    | L410           | -0.41715         | -0.27225   | 0.04226   | 0.06865   |
|   | Standard error | 0.04577          | 0.0817     | 0.03266   | 0.03454   |
|   | t Value        | -9.11            | -3.33      | 1.29      | 1.99      |
|   | (Pr>/t)        | <0.0001          | 0.001      | 0.196     | 0.0472    |
| Individuals (N)                                   |                | 64               | 64         | 161       | 161       |
| Periods (T)                                       |                | 5                | 5          | 5         | 5         |
| Observations (NT)                                 |                | 320              | 320        | 805       | 805       |
| R2  |                | 0.9264           | 0.91116    | 0.3502    | 0.3233    |
| R2 adj  |                | 0.9243           | 0.9091     | 0.3428    | 0.3156    |
| F value (P)                                       |                | 433.61 (0)       | 356.49 (0) | 47.6 (0)  | 42.25 (0) |
| DLB/DLW   |                | 52/245           |            | 149/633   |           |
| Test of absence of individual random effect F (P) |                | 1.79<br>(0.0019) |            | 3.748 (0) |           |

## Annex II-c Balance sheet determinants of bank indebtedness of firms

### Branches sub-samples

We used only relatively well represented branches (their number was reduced from 15 to 7). However, the number of estimations in each sub-sample is still relatively small, so we have to be prudent in interpreting the results. Significant coefficients are presented in bold. Standard errors are heteroscedasticity consistent.

The static model is estimated by FGLS and Within methods. We prefer not to use GMM estimation because of relatively small size of sub-samples.

**Estimated model :**  $dette\_bq = \alpha_1 L10 + \alpha_2 L240 + \alpha_3 creditiec + \alpha_4 affiliates + \alpha_5 i627 + \alpha_6 i210 + \alpha_7 i120 + \alpha_8 i410 + \alpha_9 i1 + \epsilon_{it}$

| Sector            | Telecommunications |                 | Energy          |                 | Chemicals and petrochemicals |                | Trade and supplying |                 | Food and beverages |                 | Metallurgy      |                 | Machine building |                 |
|-------------------|--------------------|-----------------|-----------------|-----------------|------------------------------|----------------|---------------------|-----------------|--------------------|-----------------|-----------------|-----------------|------------------|-----------------|
|                   | MCQG               | Within          | MCQG            | Within          | MCQG                         | Within         | MCQG                | Within          | MCQG               | Within          | MCQG            | Within          | MCQG             | Within          |
| Turnover          | -0.00731           | 0.03799         | <b>0.0194</b>   | <b>0.01535</b>  | <b>0.06373</b>               | <b>0.04594</b> | 0.01183             | 0.00568         | 0.00285            | 0.03928         | <b>0.10156</b>  | <b>0.06847</b>  | <b>-0.01307</b>  | 0.00102         |
| Standard error    | 0.05732            | 0.06771         | 0.00736         | 0.00806         | 0.01742                      | 0.01769        | 0.01207             | 0.00977         | 0.04843            | 0.03797         | 0.018           | 0.01761         | 0.00654          | 0.00799         |
| t Value (Pr>t)    | -0.13 (0.8987)     | 0.53 (0.5754)   | 2.64 (0.0091)   | 1.90 (0.0584)   | 3.66 (0.0003)                | 2.60 (0.0098)  | 1.15 (0.2505)       | 0.58 (0.5616)   | 0.06 (0.9531)      | 1.03 (0.3017)   | 5.64 (<0.0001)  | 3.89 (0.0002)   | -2 (0.0474)      | 0.13 (0.8988)   |
| Profit            | -0.03147           | -0.05796        | <b>-0.06611</b> | <b>-0.07611</b> | <b>0.3141</b>                | <b>0.31016</b> | <b>-0.32039</b>     | <b>-0.2764</b>  | <b>-0.51509</b>    | <b>-0.33088</b> | <b>-0.4399</b>  | <b>-0.40334</b> | 0.04664          | 0.1912          |
| Standard error    | 0.06143            | 0.05831         | 0.01929         | 0.01886         | 0.05405                      | 0.05263        | 0.06053             | 0.0543          | 0.07306            | 0.04605         | 0.06237         | 0.05615         | 0.04595          | 0.04237         |
| t Value (Pr>t)    | -0.51 (0.6090)     | -0.99 (0.3215)  | -3.43 (0.0008)  | -4.04 (<0.0001) | 5.81 (<0.0001)               | 5.89 (<0.0001) | -5.29 (<0.0001)     | -5.09 (<0.0001) | -7.05 (<0.0001)    | -7.19 (<0.0001) | -7.05 (<0.0001) | -7.18 (<0.0001) | 1.01 (0.3116)    | 0.45 (0.6523)   |
| Inter-firms loans | 0.03379            | 0.00043976      | <b>0.05746</b>  | <b>0.07708</b>  | -0.02333                     | -0.04269       | <b>-0.22386</b>     | <b>-0.29733</b> | <b>-0.29355</b>    | <b>-0.34681</b> | <b>0.09887</b>  | <b>0.11967</b>  | <b>0.19807</b>   | <b>0.16767</b>  |
| Standard error    | 0.05098            | 0.05166         | 0.02153         | 0.2257          | 0.05774                      | 0.06521        | 0.0949              | 0.08674         | 0.15789            | 0.10666         | 0.04202         | 0.03745         | 0.02943          | 0.02906         |
| t Value *(Pr>t)   | 0.66 (0.5083)      | 0.01 (0.9932)   | 2.67 (0.0083)   | 3.42 (0.0008)   | -0.40 (0.6865)               | -0.65 (0.5132) | -2.36 (0.0191)      | -3.43 (0.0007)  | -1.86 (0.0639)     | -3.25 (0.0013)  | 2.35 (0.0204)   | 3.20 (0.0018)   | 6.73 (<0.0001)   | 5.77 (<0.0001)  |
| Trade credit      | <b>0.92208</b>     | <b>0.8267</b>   | <b>-0.03018</b> | <b>-0.04192</b> | <b>0.16509</b>               | <b>0.11065</b> | -0.00594            | 0.02269         | <b>0.25622</b>     | <b>0.14938</b>  | <b>-0.20975</b> | <b>-0.14531</b> | <b>0.21302</b>   | <b>0.23297</b>  |
| Standard error    | 0.21773            | 0.20855         | 0.01027         | 0.01274         | 0.04283                      | 0.03896        | 0.03182             | 0.04054         | 0.06717            | 0.06505         | 0.3836          | 0.04059         | 0.01569          | 0.01429         |
| t Value (Pr>t)    | 4.23 (<0.0001)     | 3.96 (0.0001)   | -2.94 (0.0037)  | -3.29 (0.0012)  | 3.85 (0.0001)                | 2.84 (0.0048)  | -0.19 (0.8520)      | 0.56 (0.5763)   | 3.81 (0.0002)      | 2.30 (0.0223)   | -5.47 (<0.0001) | -3.58 (0.0005)  | 13.58 (<0.0001)  | 16.30 (<0.0001) |
| Affiliated debt   | <b>-1.07445</b>    | <b>-1.67325</b> | -0.02807        | -0.04572        | <b>-0.14045</b>              | -0.12915       | <b>0.3303</b>       | <b>1.00292</b>  | -0.14349           | -0.29865        | 0.14936         | <b>0.29939</b>  | <b>-0.12766</b>  | -0.07689        |
| Standard error    | 0.45519            | 0.4885          | 0.02787         | 0.02929         | 0.07516                      | 0.08087        | 0.15903             | 0.14692         | 0.25038            | 0.18387         | 0.1124          | 0.12164         | 0.05502          | 0.06526         |

|   |                |                |                 |                 |                    |                 |                    |                 |                   |                  |                 |                 |                 |                 |
|---|----------------|----------------|-----------------|-----------------|--------------------|-----------------|--------------------|-----------------|-------------------|------------------|-----------------|-----------------|-----------------|-----------------|
| t Value (Pr>t)                            | -2.36 (0.0193) | -3.43 (0.0008) | -1.01 (0.3152)  | -1.56 (0.1202)  | -1.87 (0.0626)     | -1.60 (0.1113)  | 2.19 (0.0296)      | 6.83 (<0.0001)  | -0.57 (0.5670)    | -1.62 (0.1053)   | 1.32 (0.1880)   | 2.46 (0.0154)   | -2.32 (0.0215)  | -1.18 (0.2403)  |
| Advances                                  | 1.24583        | -0.21624       | <b>-0.29867</b> | <b>-0.36668</b> | 0.23619            | 0.032           | 0.22259            | 0.354           | <b>3.68007</b>    | 1.31816          | <b>-0.2024</b>  | <b>-0.2137</b>  | <b>-0.20317</b> | <b>-0.14404</b> |
| Standard error                            | 0.95224        | 0.95641        | 0.15813         | 0.16564         | 0.16695            | 0.015119        | 0.24108            | 0.21747         | 0.99982           | 0.92691          | 0.06378         | 0.07072         | 0.04189         | 0.04067         |
| t Value (Pr>t)                            | 1.31 (0.1923)  | -0.23 (0.8214) | -1.89 (0.0605)  | -2.21 (0.0281)  | 1.41 (0.1582)      | 0.21 (0.8325)   | 0.92 (0.3568)      | 1.63 (0.1049)   | 3.68 (0.0003)     | 1.42 (0.1559)    | -3.17 (0.002)   | -3.02 (0.0031)  | -4.85 (<0.0001) | -3.54 (0.0005)  |
| Capital                                   | -0.00361       | 0.04912        | -0.00945        | 0.00163         | 0.00417            | 0.12792         | <b>0.107</b>       | <b>0.28658</b>  | <b>0.19928</b>    | <b>0.3721</b>    | <b>-0.16032</b> | -0.05737        | 0.00754         | <b>-0.02937</b> |
| Standard error                            | 0.05255        | 0.0837         | 0.00833         | 0.01067         | 0.05178            | 0.07651         | 0.02953            | 0.14444         | 0.04346           | 0.03796          | 0.05794         | 0.06066         | 0.00618         | 0.00698         |
| t Value (Pr>t)                            | -0.07 (0.9453) | 0.59 (0.5580)  | -1.14 (0.2578)  | 0.15 (0.8786)   | 0.08 (0.9358)      | -1.67 (0.0956)  | 3.62 (0.0004)      | 1.98 (0.0484)   | 4.59 (<0.0001)    | 9.80 (<0.0001)   | -2.77 (0.0067)  | 0.95 (0.3463)   | 1.22 (0.2238)   | -4.21 (<0.0001) |
| Machinery and equipment                   | -0.01434       | 0.05962        | 0.00616         | -0.01032        | <b>0.043</b>       | <b>-0.01032</b> | -0.03521           | -0.02152        | <b>-0.1629</b>    | <b>-0.45323</b>  | -0.02959        | 0.0349          | <b>-0.00714</b> | <b>-0.01543</b> |
| Standard error                            | 0.01709        | 0.05164        | 0.00494         | 0.0071          | 0.01816            | 0.02536         | 0.0156             | 0.0144          | 0.04468           | 0.03637          | 0.01948         | 0.03646         | 0.00257         | 0.00276         |
| t Value (Pr>t)                            | -0.84 (0.4026) | 1.15 (0.2497)  | 1.25 (0.2137)   | -1.45 (0.1479)  | 2.37 (0.0186)      | 4.57 (<0.0001)  | -2.29 (0.0227)     | -1.49 (0.1364)  | -3.65 (0.0003)    | -12.46 (<0.0001) | -1.52 (0.1317)  | 0.96 (0.3406)   | -2.78 (0.0061)  | -5.58 (<0.0001) |
| Stocks                                    | <b>1.67005</b> | <b>2.18438</b> | <b>0.10299</b>  | <b>0.1132</b>   | <b>0.26256</b>     | 0.02411         | <b>0.43372</b>     | 0.11326         | <b>0.73625</b>    | <b>0.6216</b>    | <b>0.42372</b>  | <b>0.41906</b>  | 0.03509         | 0.00148         |
| Standard error                            | 0.72443        | 0.86696        | 0.05564         | 0.06072         | 0.09023            | 0.12034         | 0.0881             | 0.08541         | 0.22333           | 0.16491          | 0.09931         | 0.0951          | 0.02398         | 0.02264         |
| t Value (Pr>t)                            | 2.31 (0.0222)  | 2.52 (0.0126)  | 1.85 (0.0658)   | 1.86 (0.0639)   | 2.91 (0.0039)      | 0.20 (0.8413)   | 4.92 (<0.0001)     | 1.33 (0.1861)   | 3.30 (0.011)      | 3.77 (0.0002)    | 4.27 (<0.0001)  | 4.41 (<0.0001)  | 1.46 (0.1452)   | 0.65 (0.5140)   |
| R <sup>2</sup>                            | 0.2445         | 0.2868         | 0.2447          | 0.2254          | 0.5995             | 0.6263          | 0.3953             | 0.4985          | 0.406             | 0.5836           | 0.765           | 0.7327          | 0.8049          | 0.8158          |
| R <sup>2</sup> adj                        | 0.2088         | 0.2253         | 0.2079          | 0.1879          | 0.5876             | 0.6563          | 0.373              | 0.4802          | 0.3898            | 0.5723           | 0.7454          | 0.7106          | 0.7946          | 0.8062          |
| F value (P)                               | 6.83 (<0.0001) | 8.53 (0.0001)  | 6.66 (<0.0001)  | 6.01 (<0.0001)  | 50.72 (<0.0001)    | 56.99 (<0.0001) | 17.79 (<0.0001)    | 27.17 (<0.0001) | 25.06 (<0.0001)   | 51.54 (<0.0001)  | 39.07 (<0.0001) | 33.19 (<0.0001) | 78.36 (<0.0001) | 84.66 (<0.0001) |
| Individuals (N)                           | 40             | 40             | 39              | 39              | 63                 | 63              | 51                 | 51              | 68                | 68               | 25              | 25              | 45              | 45              |
| Periods (T)                               | 5              | 5              | 5               | 5               | 5                  | 5               | 5                  | 5               | 5                 | 5                | 5               | 5               | 5               | 5               |
| Observations (NT)                         | 200            | 200            | 195             | 195             | 315                | 315             | 255                | 255             | 340               | 340              | 125             | 125             | 225             | 225             |
| Explicative variables (K)                 | 9              | 9              | 9               | 9               | 9                  | 9               | 9                  | 9               | 9                 | 9                | 9               | 9               | 9               | 9               |
| DLB                                       | 28             |                | 27              |                 | 51                 |                 | 39                 |                 | 56                |                  | 13              |                 | 33              |                 |
| DLW                                       | 149            |                | 145             |                 | 241                |                 | 193                |                 | 261               |                  | 89              |                 | 169             |                 |
| Test of absence of individual effects (P) | 1.88 (0.0086)  |                | 1.78 (0.0161)   |                 | 1.9168 (0.0006156) |                 | 2.3494 (0.0000719) |                 | 1.5536437 (0.012) |                  | 2.542 (0.005)   |                 | 3.6743744       |                 |
| Theta                                     | 0.7289922      |                | 0.7486665       |                 | 0.7222985          |                 | 0.6524             |                 | 0.8022769         |                  | 0.6272085       |                 | 0.5216849       |                 |



## Annex III-a

### Economic importance of banks' liquidity provision: estimation details

|  |             |                    |             |           |
|--|-------------|--------------------|-------------|-----------|
| Dependent Variable: DIMPAY   |             |                    |             |           |
| Method: Generalized Method of Moments                                  |             |                    |             |           |
| Sample(adjusted): 1995:08 2003:05                                      |             |                    |             |           |
| Included observations: 94 after adjusting endpoints                    |             |                    |             |           |
| No prewhitening  |             |                    |             |           |
| Bandwidth: Fixed (3)   |             |                    |             |           |
| Kernel: Bartlett   |             |                    |             |           |
| Convergence achieved after: 6 weight matrices, 7 total coef iterations |             |                    |             |           |
| DIMPAY=C(1)+C(2)*DBC+C(3)*DEXTERN                                      |             |                    |             |           |
| Instrument list: DM2 FEDDEF D2A DEXP DKD D2EXTERN                      |             |                    |             |           |
|  | Coefficient | Std. Error         | t-Statistic | Prob.     |
| C(1)   | -0.002925   | 0.001100           | -2.659270   | 0.0093    |
| C(2)   | -0.432989   | 0.181575           | -2.384634   | 0.0192    |
| C(3)   | -0.137737   | 0.067633           | -2.036526   | 0.0446    |
|  |             | Mean dependent var |             | -0.002404 |
|  |             | S.D. dependent var |             | 0.011270  |
| S.E. of regression   | 0.012575    | Sum squared resid  |             | 0.014390  |
| Durbin-Watson stat   | 2.142864    | J-statistic        |             | 0.075346  |
|  |             | P                  |             | 0.994622  |

For stationarity reasons, all regressions are estimated in first differences.

Estimated model:  $\Delta\text{IMPAY} = \text{CONST} + \alpha_1 \Delta\text{BANKCREDIT} + \alpha_2 \Delta\text{EXTERN} + \varepsilon_t$

#### Variable details:

DIMPAY – first difference of non-payment ratio: overdue debts/total debts

DBC- first difference of bank credit ratio: bank credit to enterprises/total bank assets

DEXTERN- first difference of external liquidity ratio trade surplus in roubles/ $M_2$  monetary aggregate

#### Instrument details

DM2= $M_2(t)-M_2(t-1)$ ,  $M_2$  monetary aggregate

FEDDEF – federal deficit (%)

D2A is the second difference of total bank assets

DEXP= $\text{export}\$(t)-\text{export}\$(t-1)$ ,  $\text{export}\$$  is Russian export in USD

DKD is a first difference of 'quasi money' aggregate (including dollar deposits)

D2EXTERN= $\text{EXTERN}(t)-\text{EXTERN}(t-2)$

## Annex III-b

## Economic importance of banks' liquidity provision: estimation details

|  |             |                    |             |           |
|--|-------------|--------------------|-------------|-----------|
| Dependent Variable: DTCREDIT   |             |                    |             |           |
| Method: Generalized Method of Moments                                  |             |                    |             |           |
| Sample(adjusted): 1995:08 2003:05                                      |             |                    |             |           |
| Included observations: 94 after adjusting endpoints                    |             |                    |             |           |
| No prewhitening  |             |                    |             |           |
| Bandwidth: Fixed (3)   |             |                    |             |           |
| Kernel: Bartlett   |             |                    |             |           |
| Convergence achieved after: 3 weight matrices, 4 total coef iterations |             |                    |             |           |
| DTCREDIT=C(1)+C(2)*DBC+C(4)*DEXTERN                                    |             |                    |             |           |
| Instrument list: DM2 DEXP DSOLDET B DIMP DRATEREAL FEDDEF              |             |                    |             |           |
|  | Coefficient | Std. Error         | t-Statistic | Prob.     |
| C(1)   | -0.000928   | 0.000651           | -1.426244   | 0.1572    |
| C(2)   | -0.468923   | 0.137458           | -3.411381   | 0.0010    |
| C(4)   | -0.063147   | 0.027779           | -2.273200   | 0.0254    |
|  |             | Mean dependent var |             | -0.000860 |
|  |             | S.D. dependent var |             | 0.004946  |
| S.E. of regression   | 0.007287    | Sum squared resid  |             | 0.004833  |
| Durbin-Watson stat   | 2.022323    | J-statistic        |             | 0.011056  |
|  |             | P                  |             | 0.999692  |

For stationarity reasons, all regressions are estimated in first differences.

Estimated model:  $\Delta\text{TDCREDIT} = \text{CONST} + \alpha_1 \Delta\text{BANKCREDIT} + \alpha_2 \Delta\text{DEXTERN} + \varepsilon_t$

**Variable details:**

DTCREDIT – first difference of trade credit ratio: trade credit/total debts

DBC- first difference of bank credit ratio: bank credit to enterprises/total bank assets

DEXTERN- first difference of external liquidity ratio trade surplus in roubles/ $M_2$  monetary aggregate

**Instrument details**

DM2= $M_2(t)-M_2(t-1)$ ,  $M_2$  monetary aggregate

DEXP= $\text{export}\$(t)-\text{export}\$(t-1)$ ,  $\text{export}\$$  is Russian export in USD

DSOLDET B- first difference of trade surplus in roubles

DIMP= $\text{import}\$(t)-\text{import}\$(t-1)$ ,  $\text{import}\$$  is Russian import in USD

FEDDEF – federal deficit (%)

DRATEREAL – first difference of real exchange rate index

## Annex III-b

### Economic importance of banks' liquidity provision: estimation details

|  |             |                    |             |          |
|--|-------------|--------------------|-------------|----------|
| Dependent Variable: DENDNET  |             |                    |             |          |
| Method: Generalized Method of Moments                                  |             |                    |             |          |
| Sample(adjusted): 1995:08 2003:05                                      |             |                    |             |          |
| Included observations: 94 after adjusting endpoints                    |             |                    |             |          |
| No prewhitening  |             |                    |             |          |
| Bandwidth: Fixed (3)   |             |                    |             |          |
| Kernel: Bartlett   |             |                    |             |          |
| Convergence achieved after: 6 weight matrices, 7 total coef iterations |             |                    |             |          |
| DENDNET=C(1)+C(2)*DBC+C(4)*DEXTERN                                     |             |                    |             |          |
| Instrument list: DM2 DEXP DSOLDETB DIMP DRATEREAL FEDDEF               |             |                    |             |          |
|  | Coefficient | Std. Error         | t-Statistic | Prob.    |
| C(1)   | 0.000228    | 0.001187           | 0.192415    | 0.8478   |
| C(2)   | -0.669819   | 0.219531           | -3.051143   | 0.0030   |
| C(4)   | -0.107583   | 0.048997           | -2.195714   | 0.0307   |
|  |             | Mean dependent var |             | 0.000164 |
|  |             | S.D. dependent var |             | 0.010809 |
| S.E. of regression   | 0.026652    | Sum squared resid  |             | 0.064641 |
| Durbin-Watson stat   | 2.247715    | J-statistic        |             | 0,058096 |
|  |             | P                  |             | 0,99634  |

For stationarity reasons, all regressions are estimated in first differences.

Estimated model:  $\Delta \text{DENDNET} = \text{CONST} + \alpha_1 \Delta \text{BANKCREDIT} + \alpha_2 \Delta \text{DEXTERN} + \varepsilon_t$

#### Variable details:

DENDNET – first difference of endnet ratio : (creditor indebtedness- debtor indebtedness)/total debts

DBC- first difference of bank credit ratio: bank credit to enterprises/total bank assets

DEXTERN- first difference of external liquidity ratio trade surplus in roubles/M<sub>2</sub> monetary aggregate

#### Instrument details

DM2=M<sub>2</sub>(t)-M<sub>2</sub>(t-1), M<sub>2</sub> monetary aggregate

DEXP=export\$(t)-export\$(t-1), export\$ is Russian export in USD

DSOLDETB- first difference of trade surplus in roubles

DIMP=import\$(t)-import\$(t-1), import\$ is Russian import in USD

DRATEREAL – first difference of real exchange rate index

FEDDEF – federal deficit (%)

## Annex III-d

## Economic importance of banks' liquidity provision: estimation details

|  |             |                    |             |           |
|--|-------------|--------------------|-------------|-----------|
| Dependent Variable: DBARTER  |             |                    |             |           |
| Method: Generalized Method of Moments                                  |             |                    |             |           |
| Sample(adjusted): 1995:08 2003:05                                      |             |                    |             |           |
| Included observations: 94 after adjusting endpoints                    |             |                    |             |           |
| No prewhitening  |             |                    |             |           |
| Bandwidth: Fixed (3)   |             |                    |             |           |
| Kernel: Bartlett   |             |                    |             |           |
| Convergence achieved after: 7 weight matrices, 8 total coef iterations |             |                    |             |           |
| DBARTER=C(1)+C(2)*DBC+C(4)*DEXTERN                                     |             |                    |             |           |
| Instrument list: DM2 DEXP DSOLDET B DIMP DRATEREAL FEDDEF              |             |                    |             |           |
|  | Coefficient | Std. Error         | t-Statistic | Prob.     |
| C(1)   | -0.001884   | 0.002611           | -0.721721   | 0.4723    |
| C(2)   | -1.283910   | 0.726280           | -1.767788   | 0.0804    |
| C(4)   | 0.138957    | 0.107868           | 1.288210    | 0.2009    |
|  |             | Mean dependent var |             | -0.000691 |
|  |             | S.D. dependent var |             | 0.026906  |
| S.E. of regression   | 0.028528    | Sum squared resid  |             | 0.074061  |
| Durbin-Watson stat   | 2.096387    | J-statistic        |             | 0,058999  |
|  |             | P                  |             | 0,996255  |

For stationarity reasons, all regressions are estimated in first differences.

Estimated model:  $\Delta\text{BARTER} = \text{CONST} + \alpha_1 \Delta\text{BANKCREDIT} + \alpha_2 \Delta\text{EXTERN} + \varepsilon_t$

**Variable details:**

DBARTER – first difference of BARTER ratio: bartered and other non monetary transactions/total transactions

DBC- first difference of bank credit ratio: bank credit to enterprises/total bank assets

DEXTERN- first difference of external liquidity ratio trade surplus in roubles/ $M_2$  monetary aggregate

**Instrument details**

DM2= $M_2(t)-M_2(t-1)$ ,  $M_2$  monetary aggregate

DEXP= $\text{export}\$(t)-\text{export}\$(t-1)$ ,  $\text{export}\$$  is Russian export in USD

DSOLDET B- first difference of trade surplus in rubles

DIMP= $\text{import}\$(t)-\text{import}\$(t-1)$ ,  $\text{import}\$$  is Russian import in USD

DRATEREAL – first difference of real exchange rate index

FEDDEF – federal deficit (%)

## Annex III-e

### Economic importance of banks' liquidity provision: estimation details.

#### Estimation by sub-periods

For stationarity reasons, all regressions are estimated in first differences. Estimation method used is GMM.

Due to relatively limited size of our sub-samples, we have to be prudent in interpreting the presented estimation results. Generally GMM estimations give more robust results with relatively long series, so we prefer to draw our conclusions based on the whole series estimation. However, sub-sample estimations give us indications of the existence possible breaks in banks' liquidity provision role due to the 1998 financial crisis. We see that the impact of bank credit on retained demonetization indicators is negative for both sub-periods.

Estimated models:

$$\Delta\text{IMPAY}=\text{CONST}+\alpha_1\Delta\text{BANKCREDIT}+\alpha_2\Delta\text{EXTERN}+\varepsilon_t$$

$$\Delta\text{TCREDIT}=\text{CONST}+\alpha_1\Delta\text{BANKCREDIT}+\alpha_2\Delta\text{EXTERN}+\varepsilon_t$$

$$\Delta\text{DENDNET}=\text{CONST}+\alpha_1\Delta\text{BANKCREDIT}+\alpha_2\Delta\text{EXTERN}+\varepsilon_t$$

$$\Delta\text{BARTER}=\text{CONST}+\alpha_1\Delta\text{BANKCREDIT}+\alpha_2\Delta\text{EXTERN}+\varepsilon_t$$

| Period 1: 1995:09 1998:03                           |                  |                  |                  |                   |
|---|------------------|------------------|------------------|-------------------|
| Included observations: 31 after adjusting endpoints |                  |                  |                  |                   |
|   | DIMPAY           | DTCREDIT         | DENDNET          | DBARTER           |
| CONST   | -0.001102        | 0.000782         | 0.003625         | 0.005282*         |
| Std. Error  | 0.001668         | 0.000573         | 0.000936         | 0.002794          |
| t-Statistic   | -0.660717        | 1.366361         | 3.873578         | 1.890612          |
| Prob  | 0.5142           | 0.1827           | 0.0006           | 0.0695            |
| DBC   | <b>-0.637806</b> | <b>-0.202322</b> | <b>-0.531731</b> | <b>-0.822447*</b> |
| Std. Error  | 0.197666         | 0.069737         | 0.160000         | 0.410480          |
| t-Statistic   | <b>-3.226694</b> | <b>-2.901216</b> | <b>-3.323325</b> | <b>-2.003621</b>  |
| Prob  | 0.0032           | 0.0072           | 0.0025           | 0.0552            |
| DEXTERN   | -0.007094        | -0.020547        | -0.283482        | <b>-0.720927*</b> |
| Std. Error  | 0.132063         | 0.026775         | 0.112155         | 0.385857          |
| t-Statistic   | -0.053717        | -0.767408        | -2.527589        | -1.868379         |
| Prob  | 0.9575           | 0.4493           | 0.0174           | 0.0726            |
| J-statistic   | 0.181263         | 0.143874         | 0.110048         | 0.103487          |
| P   | 0.999982041      | 0.999991882      | 0.999996781      | 0.999997397       |

*Significant coefficients are presented in bold \* significant at the 10% level*

| Period 2: 1999:01 2003:05 |            |             |            |            |
|---------------------------|------------|-------------|------------|------------|
| Included observations: 53 |            |             |            |            |
|                           | DIMPAY     | DTCREDIT    | DENDNET    | DBARTER    |
| CONST                     | -0.003503  | -0.002293   | -0.001942* | 0.003047   |
| Std. Error                | 0.000607   | 0.000269    | 0.001066   | 0.002674   |
| t-Statistic               | -5.769842  | -8.521198   | -1.822146  | 1.139343   |
| Prob                      | 0.0000     | 0.0000      | 0.0744     | 0.2609     |
| DBC                       | -0.182532  | -0.071255   | -0.350457* | -0.790425* |
| Std. Error                | 0.083161   | 0.030591    | 0.178973   | 0.476299   |
| t-Statistic               | -2.194913  | -2.329295   | -1.958159  | -1.659515  |
| Prob                      | 0.0328     | 0.0239      | 0.0558     | 0.1043     |
| DEXTERN                   | -0.027547  | 0.010090    | -0.090536  | -0.044525  |
| Std. Error                | 0.053681   | 0.021083    | 0.032562   | 0.121704   |
| t-Statistic               | -0.513166  | 0.478590    | -2.780450  | -0.365847  |
| Prob                      | 0.6101     | 0.6343      | 0.0076     | 0.7163     |
| J-statistic               | 0.107671   | 0.100833    | 0.053316   | 0.138482   |
| P                         | 0.99999702 | 0.999997621 | 0.99999974 | 0.9999475  |

*Significant coefficients are presented in bold*

*\* significant at the 10% level*

## Annex IV-a Stationarity tests

### *DIMPAY*

|                    |           |                    |         |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -4.135193 | 1% Critical Value* | -3.5023 |
|                    |           | 5% Critical Value  | -2.8928 |
|                    |           | 10% Critical Value | -2.5833 |

\*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(DIMPAY)

Method: Least Squares

Date: 02/03/04 Time: 11:35

Sample(adjusted): 1995:10 2003:05

Included observations: 92 after adjusting endpoints

| Variable           | Coefficient | Std. Error            | t-Statistic | Prob.    |
|--------------------|-------------|-----------------------|-------------|----------|
| DIMPAY(-1)         | -0.773649   | 0.187089              | -4.13519    | 0.0001   |
| D(DIMPAY(-1))      | -0.315786   | 0.149067              | -2.11841    | 0.0370   |
| D(DIMPAY(-2))      | -0.299602   | 0.100640              | -2.97698    | 0.0038   |
| C                  | -0.001972   | 0.001217              | -1.62047    | 0.1087   |
| R-squared          | 0.589988    | Mean dependent var    |             | 0.000175 |
| Adjusted R-squared | 0.576010    | S.D. dependent var    |             | 0.016585 |
| S.E. of regression | 0.010799    | Akaike info criterion |             | -6.17618 |
| Sum squared resid  | 0.010263    | Schwarz criterion     |             | -6.06654 |
| Log likelihood     | 288.1043    | F-statistic           |             | 42.20923 |
| Durbin-Watson stat | 2.004258    | Prob(F-statistic)     |             | 0.000000 |

## Annex IV-b Stationarity tests

*DTCREDIT*

|  |             |                       |                   |        |
|--|-------------|-----------------------|-------------------|--------|
| ADFTest Statistic  | -4.213311   | 1% Critical Value*    | -3.5023           |        |
|  |             | 5% Critical Value     | -2.8928           |        |
|  |             | 10% Critical Value    | -2.5833           |        |
| *MacKinnon critical values for rejection of hypothesis of a unit root. |             |                       |                   |        |
| Augmented Dickey-Fuller Test Equation                                  |             |                       |                   |        |
| Dependent Variable: D(DTCREDIT)  |             |                       |                   |        |
| Method: Least Squares  |             |                       |                   |        |
| Date: 03/03/04 Time: 16:33   |             |                       |                   |        |
| Sample(adjusted): 1995:10 2003:05                                      |             |                       |                   |        |
| Included observations: 92 after adjusting endpoints                    |             |                       |                   |        |
| Variable   | Coefficient | Std. rror             | t-Statistic Prob. |        |
| DTCREDIT(-1)   | -0.747033   | 0.177303              | -4.213311         | 0.0001 |
| D(DTCREDIT(-1))  | -0.300231   | 0.147817              | -2.031101         | 0.0453 |
| D(DTCREDIT(-2))  | -0.206085   | 0.103700              | -1.987330         | 0.0500 |
| C  | -0.000711   | 0.000535              | -1.329239         | 0.1872 |
| R-squared  | 0.540396    | Mean dependent var    | 8.83E-06          |        |
| AdjustedR-squared  | 0.524728    | S.D. dependent var    | 0.007135          |        |
| S.E. of regression   | 0.004919    | Akaike info criterion | -7.749028         |        |
| Sum squared resid  | 0.002129    | Schwarz criterion     | -7.639385         |        |
| Log likelihood   | 360.4553    | F-statistic           | 34.48972          |        |
| Durbin-Watson stat   | 2.014102    | Prob(F-statistic)     | 0.000000          |        |



## Annex IV-c Stationarity tests

### *DENDNET*

|  |             |                       |                   |        |
|--|-------------|-----------------------|-------------------|--------|
| ADF Test Statistic   | -4.116366   | 1% Critical Value*    | -2.5883           |        |
|  |             | 5% Critical Value     | -1.9436           |        |
|  |             | 10% Critical Value    | -1.6176           |        |
| *MacKinnon critical values for rejection of hypothesis of a unit root. |             |                       |                   |        |
| Augmented Dickey-Fuller Test Equation                                  |             |                       |                   |        |
| Dependent Variable: D(DENDNET)   |             |                       |                   |        |
| Method: Least Squares  |             |                       |                   |        |
| Sample(adjusted): 1995:10 2003:05                                      |             |                       |                   |        |
| Included observations: 92 after adjusting endpoints                    |             |                       |                   |        |
| Variable   | Coefficient | Std. Error            | t-Statistic Prob. |        |
| DENDNET(-1)  | -0.757371   | 0.183990              | -4.116366         | 0.0001 |
| D(DENDNET(-1))   | -0.345959   | 0.150724              | -2.295307         | 0.0241 |
| D(DENDNET(-2))   | -0.286956   | 0.100832              | -2.845891         | 0.0055 |
| R-squared  | 0.591246    | Mean dependent var    | -0.000171         |        |
| Adjusted R-squared   | 0.582060    | S.D. dependent var    | 0.016042          |        |
| S.E. of regression   | 0.010371    | Akaike info criterion | -6.267602         |        |
| Sum squared resid  | 0.009572    | Schwarz criterion     | -6.185370         |        |
| Log likelihood   | 291.3097    | F-statistic           | 64.36735          |        |
| Durbin-Watson stat   | 2.052816    | Prob(F-statistic)     | 0.000000          |        |

## Annex IV-d Stationarity tests

*DBARTER*

|  |             |                       |                   |        |
|--|-------------|-----------------------|-------------------|--------|
| ADF Test Statistic   | -5.138122   | 1% Critical Value*    | -3.5023           |        |
|  |             | 5% Critical Value     | -2.8928           |        |
|  |             | 10% Critical Value    | -2.5833           |        |
| *MacKinnon critical values for rejection of hypothesis of a unit root. |             |                       |                   |        |
| Augmented Dickey-Fuller Test Equation                                  |             |                       |                   |        |
| Dependent Variable: D(DBARTER)   |             |                       |                   |        |
| Method: Least Squares  |             |                       |                   |        |
| Date: 03/05/00 Time: 15:58   |             |                       |                   |        |
| Sample(adjusted): 1995:10 2003:05                                      |             |                       |                   |        |
| Included observations: 92 after adjusting endpoints                    |             |                       |                   |        |
| Variable   | Coefficient | Std. Error            | t-Statistic Prob. |        |
| DBARTER(-1)  | -1.034010   | 0.201243              | -5.138122         | 0.0000 |
| D(DBARTER(-1))   | -0.168844   | 0.164244              | -1.028010         | 0.3068 |
| D(DBARTER(-2))   | -0.072558   | 0.106180              | -0.683343         | 0.4962 |
| C  | -0.001090   | 0.002791              | -0.390621         | 0.6970 |
| R-squared  | 0.613298    | Mean dependent var    | -0.000228         |        |
| Adjusted R-squared   | 0.600115    | S.D. dependent var    | 0.042287          |        |
| S.E. of regression   | 0.026741    | Akaike info criterion | -4.362755         |        |
| Sum squared resid  | 0.062926    | Schwarz criterion     | -4.253112         |        |
| Log likelihood   | 204.6867    | F-statistic           | 46.52186          |        |
| Durbin-Watson stat   | 2.022891    | Prob(F-statistic)     | 0.000000          |        |

## Annex IV-d Stationarity tests

|  |             |                       |             |          |
|--|-------------|-----------------------|-------------|----------|
| DBC  |             |                       |             |          |
| ADF Test Statistic   | -3.988989   | 1% Critical Value*    | -3.5023     |          |
|  |             | 5% Critical Value     | -2.8928     |          |
|  |             | 10% Critical Value    | -2.5833     |          |
| *MacKinnon critical values for rejection of hypothesis of a unit root. |             |                       |             |          |
| Augmented Dickey-Fuller Test Equation                                  |             |                       |             |          |
| Dependent Variable: D(DBC)   |             |                       |             |          |
| Method: Least Squares  |             |                       |             |          |
| Date: 02/03/04 Time: 11:34   |             |                       |             |          |
| Sample(adjusted): 1995:10 2003:05                                      |             |                       |             |          |
| Included observations: 92 after adjusting endpoints                    |             |                       |             |          |
| Variable   | Coefficient | Std. Error            | t-Statistic | Prob.    |
| DBC(-1)  | -0.586123   | 0.146935              | -3.988989   | 0.0001   |
| D(DBC(-1))   | -0.248282   | 0.134975              | -1.839459   | 0.0692   |
| D(DBC(-2))   | -0.118016   | 0.105992              | -1.113443   | 0.2686   |
| C  | -0.000395   | 0.001208              | -0.326782   | 0.7446   |
| R-squared  | 0.412318    | Mean dependent var    |             | 1.09E-05 |
| Adjusted R-squared   | 0.392283    | S.D. dependent var    |             | 0.014829 |
| S.E. of regression   | 0.011560    | Akaike info criterion |             | -6.04002 |
| Sum squared resid  | 0.011760    | Schwarz criterion     |             | -5.93037 |
| Log likelihood   | 281.8407    | F-statistic           |             | 20.58027 |
| Durbin-Watson stat   | 1.983795    | Prob(F-statistic)     |             | 0.000000 |

## Annex IV-d Stationarity tests

| DEXTERN  |             |                       |             |           |
|--|-------------|-----------------------|-------------|-----------|
| ADF Test Statistic   | -6.042300   | 1% Critical Value*    |             | -3.5023   |
|  |             | 5% Critical Value     |             | -2.8928   |
|  |             | 10% Critical Value    |             | -2.5833   |
| *MacKinnon critical values for rejection of hypothesis of a unit root. |             |                       |             |           |
| Augmented Dickey-Fuller Test Equation                                  |             |                       |             |           |
| Dependent Variable: D(DEXTERN)   |             |                       |             |           |
| Method: Least Squares  |             |                       |             |           |
| Date: 02/03/04 Time: 11:37   |             |                       |             |           |
| Sample(adjusted): 1995:10 2003:05                                      |             |                       |             |           |
| Included observations: 92 after adjusting endpoints                    |             |                       |             |           |
| Variable   | Coefficient | Std. Error            | t-Statistic | Prob.     |
| DEXTERN(-1)  | -1.362586   | 0.225508              | -6.042300   | 0.0000    |
| D(DEXTERN(-1))   | 0.104387    | 0.170571              | 0.611986    | 0.5421    |
| D(DEXTERN(-2))   | -0.076893   | 0.106483              | -0.722110   | 0.4721    |
| C  | 0.000111    | 0.002392              | 0.046219    | 0.9632    |
| R-squared  | 0.632787    | Mean dependent var    |             | -0.000143 |
| Adjusted R-squared   | 0.620269    | S.D. dependent var    |             | 0.037197  |
| S.E. of regression   | 0.022921    | Akaike info criterion |             | -4.670985 |
| Sum squared resid  | 0.046234    | Schwarz criterion     |             | -4.561342 |
| Log likelihood   | 218.8653    | F-statistic           |             | 50.54773  |
| Durbin-Watson stat   | 1.982030    | Prob(F-statistic)     |             | 0.000000  |

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