

BOFIT Discussion Papers

15 • 2005

Anna Dorbec

Choice of substitution currency in Russia: How to explain the dollar's dominance



Bank of Finland, BOFIT
Institute for Economies in Transition

BOFIT Personnel 2005

Economists

Mr Pekka Sutela, head

Russian economy and economic policy
Russia's international economic relations
China in the world economy
Pekka.Sutela@bof.fi

Ms Tuuli Juurikkala, economist

Russian economy and economic policy
Private sector development
Tuuli.Juurikkala@bof.fi

Mr Juuso Kaaresvirta, economist

Chinese economy and economic policy
Juuso.Kaaresvirta@bof.fi

Ms Tuuli Koivu, economist

Chinese economy and economic policy
Editor-in-Chief of *BOFIT China Review*
Tuuli.Koivu@bof.fi

Mr Iikka Korhonen, research supervisor

Exchange rate policies in transition economies
Monetary policy in transition economies
Editor-in-Chief of *BOFIT Discussion Papers*
Iikka.Korhonen@bof.fi

Ms Anna Mahlamäki, economist

Russian economy and economic policy
Anna.Mahlamaki@bof.fi

Mr Aaron Mehrotra, economist

Chinese economy and economic policy
Monetary policy in transition economies
Aaron.Mehrotra@bof.fi

Mr Simon Ollus, economist

Russian economy and economic policy
Simon.Ollus@bof.fi

Mr Jouko Rautava, economist

Russian and Chinese economies and economic policies
Editor-in-Chief of *BOFIT Russia Review*
Editor-in-Chief of *BOFIT Online*
Jouko.Rautava@bof.fi

Ms Laura Solanko, economist

Russian regional issues
Public economics
Laura.Solanko@bof.fi

Ms Merja Tekoniemi, economist

Russian regional issues
Merja.Tekoniemi@bof.fi

On leave of absence

Mr **Vesa Korhonen**, email: Vesa.Korhonen@ecb.int

Ms **Seija Lainela**, email: Seija.Lainela@formin.fi

Mr **Jian-Guang Shen**, email: Jian-Guang.Shen@ecb.int

Information Services

Mr Timo Harell, editor

Press monitoring
Editor-in-Chief of *BOFIT Weekly*
Timo.Harell@bof.fi

Ms Liisa Mannila, department secretary

Department coordinator
Publications traffic
Liisa.Mannila@bof.fi

Ms Päivi Määttä, information specialist

Information services
Paivi.Maatta@bof.fi

Ms Tiina Saajasto, information specialist

Information services
Tiina.Saajasto@bof.fi

Ms Liisa Sipola, information specialist

Information services
Liisa.Sipola@bof.fi

Contact us

Bank of Finland
BOFIT – Institute for Economies in Transition
PO Box 160

Phone: +358 10 831 2268
Fax: +358 10 831 2294
E-mail: bofit@bof.fi

BOFIT Discussion Papers
15 • 2005

Anna Dorbec

Choice of substitution currency in Russia: How to explain the dollar's dominance



Bank of Finland, BOFIT
Institute for Economies in Transition

BOFIT Discussion Papers
Editor-in-Chief Iikka Korhonen

BOFIT Discussion Papers 15/2005
1.12.2005

Anna Dorbec: Choice of substitution currency in Russia:
How to explain the dollar's dominance

ISBN 952-462-796-5
ISSN 1456-4564
(print)

ISBN 952-462-797-3
ISSN 1456-5889
(online)

Multiprint Oy
Helsinki 2005

Contents

| | |
|---|----|
| Tiivistelmä | 5 |
| Abstract | 6 |
| 1 Introduction..... | 7 |
| 2 Empirical evidence | 10 |
| 3 Choice of substitution currency: Theories and estimation hypothesis | 15 |
| 4 Econometric analysis | 20 |
| 5 Inertia: Hysteresis, network externalities, routines and conventions..... | 24 |
| 6 Concluding remarks | 28 |
| References..... | 29 |
| Annex I Generic dollarisation in Russia | 33 |
| Annex II Variables | 35 |

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

Anna Dorbec *

Choice of the substitution currency in Russia: How to explain the dollar's dominance?

Tiivistelmä

Vaikka muut Euroopan maat ovat Venäjän tärkeimpiä kauppakumppaneita ja myös investoivat eniten Venäjälle, on euron osuus Venäjän rahoitusmarkkinoilla hyvin pieni. Yhdysvaltain dollaria käytetään paljon yleisemmin erilaisiin rahoitustransaktioihin. Tässä työssä tutkitaan tätä ilmiötä erottamalla Venäjän substituoiva valuuttojen kaksi erilaista käyttötarkoitusta: rahan on sekä vaihdon että arvon säilyttämisen väline. Työssä testatetaan kolmen eri tekijän (inertia, kauppasuhteiden kehitys ja valuuttakurssien muutokset) vaikutusta euron suhteelliseen kysyntään Venäjällä vuosina 1994–2004. Eri valuuttojen käyttö voi teoreettisesti johtua taloudellisten agenttien syvään juurtuneista sovinnaisavoista

Asiasanat: dollarisaatio, euroistuminen, transitio, Venäjä, valuuttasubstituutio, omaisuuserien substituutio, verkostojen ulkoisvaikutukset, hystereesi, sovinnais tapa

Anna Dorbec PhD, University of Paris X Nanterre, anna.dorbec@u-paris10.fr;

University of Paris X Nanterre, EconomiX, Bâtiment G, 200, Avenue de la République, F-92001, Nanterre, FRANCE, +33(0)1.40.97.77.84, +33(0)6.10.27.50.66

Anna Dorbec

Choice of the substitution currency in Russia: How to explain the dollar's dominance?

Abstract

The analysis of external economic relations of Russia reveals a paradox: while Europe is the main trade and direct investment partner of Russia, this is far from being the case concerning its currency's role in Russia's financial activities. The dollar is much preferred by economic agents for financial operations. This paper proposes a disaggregated approach to this issue by separating the 'means of exchange' and 'store of value' components of the use of substitution currencies. The influence of three main factors (inertial component, real trade relations and exchange rate fluctuations) on the relative demand for the euro by Russian economic agents is tested for the period 1999-2004. Finally we suggest a theoretical interpretation of the results based on the conventions theory approach.

Keywords: dollarisation, euroisation, transition, Russia, currency substitution, asset substitution, network externalities, hysteresis, conventions

JEL classification : E52, E41, F31, F41, G20

1 Introduction

Dollarisation is a largely observed phenomenon in emerging economies. Existing studies demonstrate the high level of dollarisation of Latin American economies (Feige et al [2002]) but also of economies in transition (Sahay and Vegh [1995]). These studies focus on dollarisation in the generic sense, including the use of all foreign currencies inside a given country. The impact of dollarisation on policy issues (Baliño, Bennett, Borensztein [1999], Broda, Levy-Yeyati [2002]), banks balance sheets (Ize, Levy-Yeyati [1998], Broda, Levy-Yeyati [2003]), financial crises (Powell and Sturzenegger [2000]) and exchange rate regimes (Arteta [2002]) have been widely documented. Studies on the origins of dollarisation mention a large group of factors including inflation and exchange rate volatility, weakness of local financial markets (Pionktovsky [2003]) coupled with the existence of the "shadow" (unofficial) sector of the economy (the influence of this factor being bi-directional, Feidge et al [2002]). Other researches (Caballero et al [2004], De Nicolo et al [2003]) mention more long term oriented issues, like confidence (in money, monetary policy and the banking system), but also the important persistence effects often qualifying as hysteresis (Shinkevich and Oomes [2002]). Our research focusing on the Russian case suggests the existence of links between dollarisation and the overall uncertainty related to institutional weakness (Khartchenko-Dorbec [2004]).

The discussion on the relevance of de-dollarisation policies versus complete (official) dollarisation is still animated (Goldfajn and Olivares [2000]). Advocates of complete dollarisation or euroisation suggest that adopting a strong foreign currency enables countries to eliminate the temptation of inflationary finance and thereby avoid currency and balance of payment crises, reduce the level and volatility of interest rates, and ultimately to stimulate growth. IMF [1999] suggests that reliance on a foreign currency could facilitate the development of financial intermediation in a high inflation environment. It can also foster closer integration with international financial markets, increase competition and make available a more complete set of assets for domestic investors.

Edwards and Igal Magendzo [2002], however, found a strong evidence for the negative impact of full dollarisation on economic growth (albeit it helps to significantly reduce inflation), thus the evidence on complete dollarisation's positive impact on economic dynamics is still ambiguous.

Advocates of de-dollarisation measures cite the loss of seigniorage and loss of an independent monetary policy for dollarized countries (Feige et al [2002]). When dollarisation or euroisation is widespread, the effective money supply is much larger than the domestic money supply and is also less easily controlled by the monetary authority because of the public's propensity to substitute foreign and domestic currency. Extensive currency substitution not only makes domestic monetary policy less effective, it also makes active exchange rate intervention more dangerous. Currency substitution also has fiscal consequences that are particularly salient for transition countries. Foreign cash transactions reduce the costs of tax evasion and facilitate participation in the underground economy. By obscuring financial transactions, currency substitution reduces the cost of enterprise theft and facilitates corruption and rent seeking (Feige [1994]). This weakens the government's ability to divert real resources from the private sector and deepens fiscal deficits. The wide use of the dollar as a saving instrument weakens the ability of the national banking system to reallocate liquidity inside the economy and thus reduces the supply of financing to domestic producers (Khartchenko-Dorbec [2004]).

In Russian economy, as in many transition economies, foreign currencies are used not only in international trade, but also as domestic money. According to the definition, unofficial euroisation and dollarisation results from individuals and firms voluntarily choosing to use foreign currency as either a means-of-exchange substitute (currency substitution) or store-of-value substitute (asset substitution). In practice, asset substitution concerns not only foreign currency denominated assets (deposits and securities) but also cash acquisitions realised by households.

In this paper we focus on dollarisation/euroisation in a more narrow sense by trying to understand factors determining the choices of substitution currency by economic agents. The Russian case is particularly interesting from this point of view because of the existence of important dollar domination in a country that is geographically and economically close to the European Union. This situation exposes the Russian financial system to an additional exchange rate risk: while the main trade flows are with Europe (Europe's top ranking holds even if we adjust for oil exports), the major part of assets is still denominated in US dollars.

The dominance of the dollar in international financial markets and its importance as an international reserve currency matters for the choice of currency of substitution. According to the analysis of the ECB [2005], the US dollar is used to denominate 43% of all

debt securities issued on international financial markets (issued outside of borrower's country of residence) while the share of the euro is about 31% (this share has continually increased during past 6 years). However, the study indicates the important 'regional' aspect of international use of the euro: the European currency is largely used in countries geographically close to the European Union. In this situation the dominance of the dollar for Russia and the CEI needs to be examined in more detail.

The purpose of this paper is to define the factors influencing the choice of Russian economic agents between the two main international reserve currencies: the euro and the dollar.

This type of probing should help us to better understand the main issues in dollarisation and the motivations of different types of agents. Such research seeks evidence on the relative efficiency of different de-dollarisation policy measures.

We analyse data from early 1999 to late 2004. In order to better understand the different aspects of use of the euro and of the dollar in the Russian economy we analyze separately the different aspects of dollarisation by type of economic agent. Bordo and Choudri [1982] point out that focusing exclusively on the financial (or speculative) approach in the dollarisation issue omits the transaction demand for currency. The authors suggest (particularly for analysis of dollarisation in low and moderate inflation countries, which is actually the Russian case) that in order to obtain a proper measure of the dynamics of currency substitution, explicit measures of the transaction demand are essential. Accepting this idea, we disaggregate dollarisation and euroisation indicators by separating flows of cash conversion operations, mainly realized by households approximating a store-of-value role for the substitution currency, and currency exchange operations which concern banks and enterprises and better approximate the transaction demand for substitution currencies. This disaggregated approach points out the existence of substantial heterogeneity of agents' behaviour and confirms that a variety of policy approaches is needed to reduce dollar domination (and more generally to reduce dollarisation in the generic sense). Finally we suggest a theoretical interpretation of our results by using the approach of the theory of conventions.

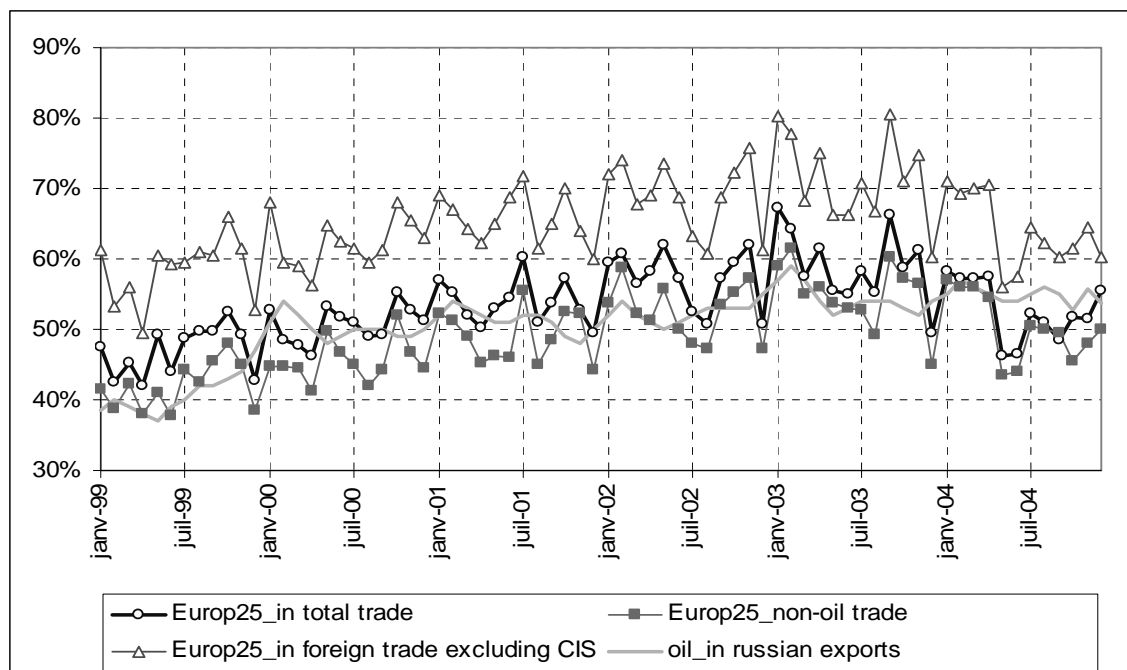
The paper is organised as follows. The first section contains a descriptive data analysis of different aspects of the choice of Russian economic agents as between the euro and the dollar. The second section gives a brief survey of existing theories in the field of Dollarisation, which could be applied to the problem of the choice of a substitution cur-

rency. The third section contains the econometric estimation results. Section 4 presents a theoretical interpretation of observed results, and the fifth section concludes.

2 Empirical evidence

We first examine Real aspects of economic relations with euro- and dollar- dominated countries. Secondly we analyse in more detail the financial aspects of this issue.

Figure 1. Europe in Russian international trade



Source: Eurostat, Central Bank of Russia, Russian Federal Service of State Statistics, High College of Economics database

As we can observe from Figure 1, 25 European Union countries account about 50-60 per cent of Russian foreign trade. The importance of trade with European countries for Russia is accentuated by the indicator of trade with non-CIS countries. Here European countries' share is about 80 per cent in 2003 and 60 per cent at the end of 2004. It is interesting to notice that if we exclude oil from exports (negotiated in dollars), Europe is still the main trade partner of Russian enterprises. The dominance of European countries cannot, therefore, be reduced to oil exports, and necessarily contains other euro-denominated components.

At the same time, the share of the USA in Russian foreign trade is still small (3.8 per cent for 2003 and 2004, 3.5 per cent for 2002).

CIS countries are the second most attractive zone for Russia's trade relations. Their share in Russian external turnover was 17 per cent in 2002, 17.5 per cent in 2003, and 18.3 per cent in 2004. Such trade relations could be the basis for the development of an international role for the rouble, but, given the influence of the dollar in the CIS zone and the weakness of the CIS as an institution, one can argue that trade with the CIS is mainly dollar-based.

If the dollar zone is defined in a broad sense, its share in Russian foreign trade accounts for about half. In such a case, on the basis of international trade relations, one would expect considerable euro demand and supply in national currency markets and consequently an important anchoring of monetary policy on the bi-currency basket.

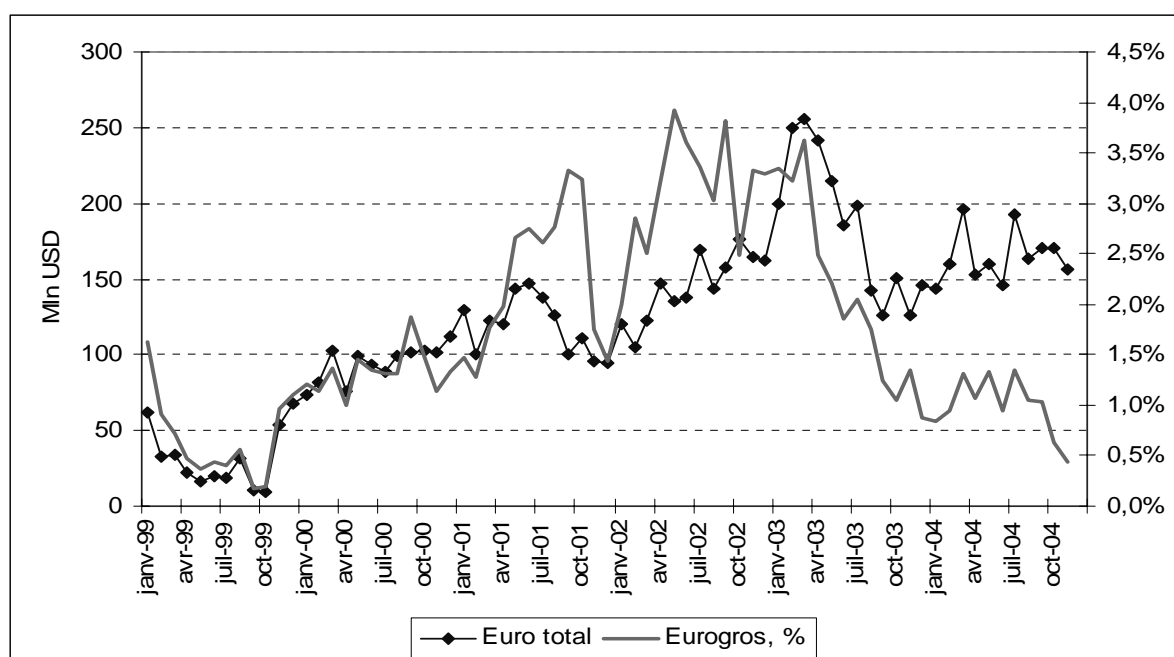
Foreign direct investment is another area of application for international currencies, in addition to trade: FDI flows can account for the development of close economic integration between countries, so a quick review of these statistics could be useful as an indicator of the existence of economic links. We should, however, notice that FDI does not represent the main international capital flows for Russia: according to official statistical data, it accounts for only 19.2 per cent of foreign investment in Russia for the period January-September 2004 (22.3 per cent for the same period of 2003). Official statistics suggest however that more than 49 per cent of total FDI accumulated in Russia came from one of the European countries (we excluded the 13 per cent for Cyprus, due to its particular offshore status and use largely by Russians in capital flight operations and undoubtedly including the return of previously exported capital). USA takes 6th place with 9 per cent of total accumulated investment. It can be seen that the share of euro area countries is much greater than that of other investors, even of Russians repatriating capital from offshore. This situation should also reinforce the euro's influence on the Russian economy, currency market, and expectations.

However, even a rapid overview of macroeconomic statistics published by Russian government agencies (Federal Statistical Service, Central Bank of Russia) and analytical materials issued by the financial and economic press (Rosbusinessconsulting, Expert, Cbonds) makes it clear that the US dollar, while not a legal and institutionalised monetary unit, acts as the main unit of account for both private economic agents and the government. In this situation, the role of public institutions is controversial: on the one hand, it is more

useful for them to publish statistics in the most common unit while, on the other, this dollar bias in public administration tends to strengthen the dollar's role in the economy.

The above-mentioned situation in Russian foreign trade and the inflow of FDI should have led to high volumes of euro sales on the national currency market. One would expect these operations to account for 35-50 per cent of all the currency purchases and sales in the Russian market.

Figure 2. Euro in the trade of Russian currency exchanges



Source: Central Bank of Russia

However, as can be seen from Figure 2, the real situation is far from this hypothetical one; the dollar is obviously predominant in the Russian interbank currency market (as we observe from Figure 2, its share was never under 96 per cent during 1999-2004). These data are confirmed by the analysis of interbank conversion operations by currency (including operations realised outside currency exchanges): euro-to-dollar conversion operations account for about 80 per cent of total conversion operations realised in the euro in Russia during 2003-2004, the rouble-to-euro operations' share is quite insignificant. Thus the euro is converted into dollars and not into roubles as one might expect. As far as the dollar is concerned, the major part of conversion operations concerns conversion into roubles (share between 63 and 78 per cent of total volume of exchange operations during 2003-2004) and into euros (16-25 per cent for the same period). So we can conclude that the dollar is a ve-

hicle currency supporting all kinds of conversion operations. This information gives us additional evidence concerning the dominance of the dollar in Russian financial activity, which confirms the data presented in Figure 2 on the share of operations in euro on the official currency exchanges.

Accordingly, currency demand factors clearly favour the dollar, despite the importance of Europe in Russian foreign trade. One can conclude that commercial contacts with Europe are denominated in dollars: in fact, according to a recent review of the international role of the euro by the ECB [2005], even for European countries (Belguim, France, Germany, Greece, Italy, Luxembourg, Portugal, Spain) the euro is used as a settlement/invoicing currency for only 54% of exports and 51% of imports. The observed data for Russia also reflect the evidence that euros and dollars are not used exclusively for international trade. While transactions in dollars between residents are officially forbidden (and so are very difficult to estimate), the euros and dollars are widely used for asset nomination¹. The following data provides some evidence about euro and dollar shares as the currencies of asset nomination. If we break down the stock of debt financing nominated in foreign currencies between euro and dollar financing (data for the end of 2004) the obtained evidence also confirms the dollar domination of financial sphere.

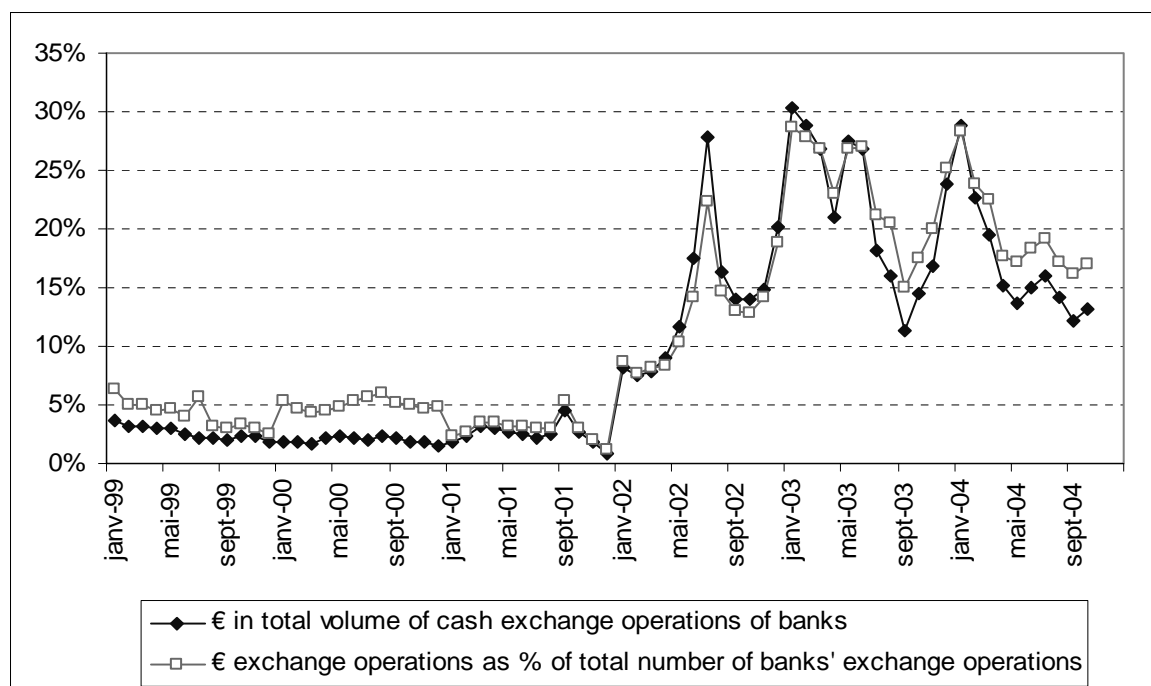
Table 1. Euro and dollar denominated assets in Russia (end of 2004)

| | Euro, m (1) | % volume* (2) | Dollar, m (3) | % volume* (4) | Total* (5) |
|---|-------------|------------------|------------------|------------------|---------------|
| Federal government | 1 250 | 4% | 40 148 | 96% | 41 694 |
| Subfederal government | 774 | 91% | 100 | 9% | 1 058 |
| Eurobonds** private | 1 430 | 7% | 23 320 | 93% | 25 089 |
| Bank forex denominated credit to non financial private sector | nd | nd | nd | nd | 29 692 |

* The average 2003-2004 euro-dollar exchange rate is applied in order to calculate totals and percentages in columns (2), (4) and (5).

** The term Eurobonds is used here to define all foreign currency denominated bonds.

Data presented on the above table leave no doubt about the dominance of the US dollar in financial operations, despite important trade relations with Europe.

Figure 3. Euro share in cash conversion operations of Russian banks

Operations in euro before 2002 are approximated by DM operations (other currencies' shares being insignificant)

The third important indicator of the use of foreign currencies inside Russia concerns household savings. As we noted earlier, household savings in Russia are held largely in foreign currency cash and, in this case approximate quite well the 'store of value' role of euros and dollars in Russia.

One can see from Figure 3 that the share of household's currency exchange operations in euros rose steadily starting in 2002 (when euro cash currency was introduced), peaked at 30 per cent in 2003, and was 20 per cent in 2004. These dynamics lead us to conclude that personal savings are being diversified: households have rapidly appraised the exchange rate risk (the rouble/dollar exchange rate decreased starting in January 2003 while the rouble/euro exchange rate continued to increase) and payoff opportunities of investing in euros. This suggests that Russian households are behaving quite rationally and the problem of trust in the euro as a new currency does not seem to be very serious. In fact, the Russian population's trust in euros is still stronger than its trust in the national banking system.

The importance of the dollar could be related to policy issues. We should firstly remember the importance of dollar anchoring of the exchange rate policy: the exchange

¹ See Figures 5-6 in Annex I for data about asset substitution in a large sense.

rate corridor of 1995-1998 was exclusively dollar-based. The managed floating after August 1998 devaluation was still dollar-based. Recently the Central Bank of Russia revised this policy: because of the importance of the European Union in external economic relations, the Central Bank of Russia's interventions have since February 2005 not been exclusively based on the dollar rate but on a bi-currency basket (10 per cent euro and 90 per cent dollar initially; in May 2005 the share of the euro was increased to 30 per cent). The structure of the central bank's currency reserve portfolio is another important signal to agents (primarily banks) about exchange rate policy: actually the euro's share in the foreign reserves of the Central Bank of Russia is increasing. Whereas before 2002 the share of currencies other than USD (including DM, £, Yen) never attained 10 per cent, the euro's share in reserves reached 25 per cent in mid-2003 and 30-35 per cent in 2004. These dynamics are a positive indicator of the importance of Europe in foreign trade relations, but its effectiveness can be estimated only in the future.

Based on our empirical analysis, we would make two observations: in spite of relatively good international trade relations with Europe, most of supporting the financial operations are settled in dollars, and the exchange rate dynamics do not seem to have any impact on this. As far as households' saving behaviour is concerned, we would view the diversification of their currency portfolios as a reaction to the exchange rate dynamics despite the euro's brief history as a currency.

3 Choice of substitution currency: Theories and estimation hypothesis

Although an international role for the euro is not a direct objective of the ECB, discussion of the importance of this issue for Europe is still animated (Portes [1998], ECB [2002] [2005]). The available literature on the choice of substitute currencies is relatively rare (Heimonen [2001]). However, some of the research on dollarisation in the generic sense, could be applicable to our study. In this section we list some factors that may explain a country's choice of a foreign currency as a currency of substitution.

The first explanation of the choice between currencies which we should test comes from international trade relations between countries, which should be followed by a transaction demand for foreign currency balances (Milner, Mizen and Pentecost [2000], de Vries [1988], Ratti and Jeong [1994]). The foreign currency demand within a country

should be related to transaction needs emerging from foreign trade. From the point of view of the choice of the substitution currency we should test the possible significant impact of trade with euro area countries on euro balances of economic agents in Russia, at least regards the currency exchange operations of enterprises. Notice however that similar research concerning Estonia (Heimonen [2001]) did not produce evidence of a significant impact of real factors on the aggregated indicator of choice between euro and dollar, largely because of extensive use of foreign currency in domestic transactions.

Agents' behaviour concerning the demand for foreign currencies is often examined by estimating the opportunity costs of holding domestic money. We can distinguish three main factors affecting the opportunity cost of holding foreign currency denominated money balances which could influence the choice of substitute currency.

The first of these is the inflation rate. The depreciation of local currencies at the beginning of transition, coupled with the liberalisation of foreign currency markets and the new possibility for households to hold foreign currencies, is the most often cited dollarisation factor (Calvo and Vegh [1996]). The theoretical interpretation of this fact addresses the existence of households' sunk costs due to holding their savings in local currency. This cost clearly depends on the effective (anticipated) inflation rate. The use of the dollar or euro as stable unit of account which anchors prices is justified especially in situations where the exact future inflation dynamics are difficult to forecast. When we apply this framework to the problem of choice between dollar and euro currency balances, we should also expect that differences in inflation rates between euro area and USA could affect agents' choices. In our estimation we include inflation by adjusting nominal exchange rates.

The second variable affecting the opportunity cost of holding foreign currency balances is the interest rate. When we adjust for the inflation rate, we obtain the real interest rate. Thus, the opportunity cost of holding money can be separated into factors, i.e. the opportunity cost of holding money due to the interest rate and the opportunity cost of holding money due to relative inflation rates. Accordingly, 'asset substitution' should be affected by nominal or real interest rates. More generally, the use of foreign currencies as reserve assets depends on interest rates (nominal or real) in the case where households make foreign currency denominated deposits or buy other forex assets. We should however note that in the case of holding cash (dollars or euros) as a store of value (because of a lack of

confidence in the banking system, independent of opportunity costs) interest rates should have less explicative power.

The third variable impacting on the opportunity costs of holding currencies is the dynamics of nominal and real exchange rates (Heimonen [2001]). This affects either foreign currency cash holdings or foreign currency denominated assets (bank deposits and other securities). We test the possible impact of both nominal and real exchange rates on the structure of demand for the substitute currency.

However, the approach in terms of opportunity costs does not seem to provide a sufficient explanation of the above-mentioned significant differences between dollar domination of the financial activity and the importance of trade with European countries. Opportunity costs of holding dollars should be much lower than costs of holding euros. However, differences in inflation or exchange rate volatility as between the euro area and USA do not seem to be extreme. Other possible factors are related to 'irrational' behaviour of economic agents.

Inertia in currency substitution between domestic and foreign currency balances has been widely documented (Piontkovsky [2003]), yet there is a limited number of studies that specifically address the issue of detecting inertia among substitute foreign currencies. Possible inertia between euro and dollar balances has obvious importance for the dynamics of currency competition between the dollar and the euro. Based on existing studies, we can cite two potential determining factors: hysteresis and network externalities.

Several studies associate inertial behaviour with hysteresis. Feige [2003] notes that observed hysteresis effects in dollarisation ratios in transition countries are closely related to the lack of confidence in domestic monetary assets resulting from past inflations, devaluations and bank confiscations. This behaviour appears to be difficult to reverse, even when macroeconomic conditions stabilise. Ahumada [1992], Guidotti and Rodriguez [1992], Piterman [1988] all find empirical evidence that dollarisation may remain high even when the opportunity cost of holding domestic money has decreased. Decreasing inflation and the relative stabilisation of exchange rates did not reduce the high level of dollarisation in countries touched by this phenomenon. Hysteresis is often modelled as a 'ratchet effect'.

A ratchet effect is said to occur when we observe an asymmetric reaction of the variable to changes in one or more factors, depending on whether the latter rises or falls (Mongardini and Mueller [1999]). This phenomenon is related to the long memory of im-

portant and violent changes in exogenous variable dynamics, which induces important uncertainty aversion in agents' behaviour (Epstein [1999]). In such situations agents' decision are made in reference to the worst-case scenario, its decision weight being dependent on the degree of 'probability imprecision'. The perception of it increases in situations of doubt about the relevance of previously used decision models (Routledge and Zin [2001]). In this case, the stabilisation does not induce a rapid return to the normal level. The adjustment is, therefore, asymmetric and achieved with many lags.

The ratchet effect in dollarisation is often modelled by introducing an adjustment or 'switching' cost associated with learning how to use new financial instruments (Guidotti and Rodriguez [1992], Sturzenegger [1992], Engineer [2000]), which naturally creates certain inflation or currency depreciation bands within which there is no incentive to de-dollarize. In this case, a learning period is necessary for economic agents to understand the functioning of new financial instruments that can substitute for foreign currency (Dornbusch and Reynoso [1989]).

Another interpretation is that inertia is related to the fact that there exist "expectations' adjustment periods before domestic agents become convinced that current macroeconomic stability has permanence and inflationary policies will not be repeated" (Peiers and Wrase, [1997]).

The 'learning costs' explanation for ratchet effects/hysteresis does not however seem to be relevant to our study, given the fact that the choice between euro and dollar does not require any special learning procedures. However, the existence of psychological adjustment periods has certainly played a role, especially in light of the fact that the euro is a new currency and some period is necessary to be sure that it will function at least as well as the deutschemark². Logically, this effect should be more visible in financial and reserve aspects of the demand for substitution currency than in enterprises' transactions, which are realised instantaneously and do not require any special learning or long term expectations.

Another important factor explaining the existence of persistence in dollarisation which is directly applicable to the euro/dollar case, is more closely related to the transactions demand for money. Money as a means of exchange produces network externalities (Feige et al [2002], Shinkevich and Oomes [2002])

² This argument is closely related to 'confidence in money' issues.

“Network externalities occur when the benefits for a given agent of holding a certain currency increase with the use of this currency by other agents. In other words, when the use of dollars in a given trade network grows, this increases the value of holding dollars for each member of the network, irrespective of the depreciation rate or other rate of return considerations. If network externalities are strong enough, therefore, a high degree of dollarisation can persist after macroeconomic stabilization”. (Shinkevich, Oomes [2002] , p.6).

The authors use original data from the New York Federal Reserve Bank on exports of dollar denominated banknotes and official Russian statistics to demonstrate the existence of network externalities in the overall dollarisation behaviour in Russia in 1992-1998.

Knowing that the dollar has been a dominant currency of substitution during the transition period³, the use of the dollar as a means of exchange (also in internal transactions) may produce a benefit comparing to the use of the euro because the probability of agent k finding a ‘dollarised’ partner is higher than for a ‘euroised’ one. In other words, it is costly to transact in foreign currency if others do not use it enough (Uribe [1997]). We should notice that this approach is similar to that concerning the origins of money, using evolutionary game theoretic models (De Larquier et al [2001]). Thus, above a certain level of dollarisation, while the dollar is widely used, assuming all monetary functions, changing to another currency of substitution, to the euro (or back to the domestic money) is costly. This explanation seems plausible as a factor in the persistence of the dollar as a means of exchange. If network externalities are strong enough, therefore, a high degree of dollarisation can persist, even in the absence of ratchet variables.

We can easily understand that the transactional and reserve roles of foreign currencies are not equally concerned with network externalities. We should expect a lesser influence for the reserve role of currencies than for their transactional role. When all bank exchange offices carry out both euro and dollar conversion operations (which is true in Russia) savers should worry only about the exchange rate dynamics and be less concerned about network externalities. However, this factor could be present in cases of illegal use of foreign currencies in transactions (which is frequent, particularly in real estate transactions).

The choice of exchange rate regime is another factor related to the choice of substitute currency. As mentioned above, the important anchoring of Russian monetary policy to

³ Illicitly, the dollar was perceived as a truly hard currency even before 1992, but no data exactly quantifying this phenomenon are available.

the dollar (recently, in 1995-1998, the exchange rate corridor fixed the dollar exchange rate fluctuation bands, and the dollar was the main intervention currency of the Central Bank of Russia during the whole estimation period and was used as the unit of account for all official international statistics) contributes to wider private use of dollars and generates network externalities. The signalling interpretation of this phenomenon is also possible. In this case, a recent change in CBR foreign exchange policy should reduce dollar domination in the medium term⁴.

4 Econometric analysis

As follows from our descriptive analysis, but also from our theoretical hypothesis, we should expect possible differences in the behaviour of different types of economic agents (enterprises, banks, households) concerning the choice between currencies of substitution. In this study different aspects of the demand for substitution currencies are analysed separately. Using the available data we calculated proxies to estimate households' cash operations (reflecting their savings behaviour) and total transactions (non cash) realised in the Russian currency exchange market, which can be considered a proxy for the currency structure of the (mainly transactional) demand of enterprises/banks.

We use monthly series for the period from January 1999 to November 2004. All operations related to euro cash in the period 1999-2001 are approximated by operations in Deutschemarks, as the only significant European currency on the Russian forex market during this period.

Three alternative indicators of household demand for foreign currencies cash (source: Central Bank of Russia) and one indicator of the demand of enterprises are used in the estimations⁵.

(I) Share of the euro in total cash conversion operations of banks' currency exchange offices inside Russia ($DECASH = \text{euros exchanged} / (\text{all currencies exchanged during the period})$).

⁴ This parameter cannot be included in this study because it is situated outside of our data set.

⁵ A more detailed description of variables is presented in the Annex II.

(II) Transactions realised in euros as a percentage of the total number of transactions of exchange offices of banks inside Russia ($\text{ETRANSACT} = \text{number of euro-rouble transactions} / \text{total number of conversion transactions}$).

(III) Share of the euro in total imports of foreign currency bills into Russia ($\text{IMPORT_EUROBILLS} = \text{bills in euro imported} / \text{total foreign currency bills imported}$). As this importing is realised by banks, the estimated equations differ slightly.

(IV) As a proxy for the demand for currencies by enterprises and banks including the transactional and partly financial component of the demand for currencies of substitution, we use the share of the euro in total turnover of Russian currency exchanges (EUROGROS). This proxy excludes illegal cash transactions, which are impossible to estimate on the basis of official statistics (and require more informal approaches such as queries).

As no statistical series on the structure of assets by currency for bank credits and deposits are publicly available (however, some data are presented in Section 2), estimation of the ‘financial’ role of the euro and dollar is impossible. Because discussions on the dollar and euro in CBR monetary policy has been quite animated, we are hopeful that this data will be available in the future.

In light of our descriptive analysis and theories discussed, we estimate econometrically the impacts of three main factors on the choice of economic agents between the euro and the dollar.

[A] Lagged endogenous: captures the possible inertia in currency demand behaviour. As mentioned above, in the case of network externalities the importance of this factor should be more pronounced for the EUROGROS variable (which is more closely related to the transactional demand) than for savings demand estimations (I-III indicators). In the case of important hysteresis related to the choice of the currency of substitution, asset substitution is more concerned and we should account for a more important impact of the lagged variable in regressions using indicators I-III.

[B] Exchange rate: for testing the impact of dollar/euro and rouble/euro exchange rates⁶ expressed in nominal and in real terms (to account for possible inflation differential influence).

[C] Real trade: we test three alternative indicators.

-
- i) Share of enlarged Europe in total trade of Russia excluding oil (eu25_nonoil).
 - ii) Share of trade between Russia and enlarged Europe in total external trade of Russia (eu25_total).
 - iii) Share of trade between Russia and enlarged Europe in external trade of Russia excluding CIS trade (eu25_noncis).
- [D] Regressions I and II include an additional variable which could influence the choice between currencies: the relative average margin applied by banks on conversion operations ($\text{Euromarge} = \text{margin on euro operations} / \text{margin on dollars operations}$). We do not include this variable for IMPORT_EUROBILLS estimation because of its weak exogeneity; as the margin is decided by banks, it is necessarily dependent on their stocks of banknotes.
- [E] We also use dummies to capture the possible impacts of the introduction of euro cash in 2002 (DUMMY_EUROCASH) and for the recent banking crisis (summer 2004) (DUMMY_CRISE).

⁶ An increase in the exchange rate means euro appreciation (versus dollar or ruble)

Estimated models: DECASH (I)

1. DECASH=const+ α_1 DECASH(-6)+ α_2 doll_euro+ α_3 eu25_nonoil+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
2. DECASH =const+ α_1 DECASH(-6)+ α_2 doll_euro+ α_3 eu25_total+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
3. DECASH =const+ α_1 DECASH(-6)+ α_2 doll_euro+ α_3 eu25_noncis+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
4. DECASH =const+ α_1 DECASH(-6)+ α_2 rub_euro+ α_3 eu25_nonoil+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
5. DECASH =const+ α_1 DECASH(-6)+ α_2 rub_euro+ α_3 eu25_total+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
6. DECASH =const+ α_1 DECASH(-6)+ α_2 rub_euro+ α_3 eu25_noncis+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
7. DECASH =const+ α_1 DECASH(-6)+ α_2 doll_euro_real+ α_3 eu25_nonoil+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
8. DECASH =const+ α_1 DECASH(-6)+ α_2 doll_euro_real+ α_3 eu25_total+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
9. DECASH =const+ α_1 DECASH(-6)+ α_2 doll_euro_real+ α_3 eu25_noncis+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
10. DECASH =const+ α_1 DECASH(-6)+ α_2 rub_euro_real+ α_3 eu25_nonoil+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
11. DECASH =const+ α_1 DECASH(-6)+ α_2 rub_euro_real+ α_3 eu25_total+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t
12. DECASH =const+ α_1 DECASH(-6)+ α_2 rub_euro_real+ α_3 eu25_noncis+ α_4 euromarge+ α_5 dummy_crise+ α_6 dummy_eurocash+ ε_t

All equations are estimated in first differences using GMM. Significant coefficients (P(t)<10%) are presented in bold

| DECASH | Variable | Specifications | | | | | | | | | | | |
|------------------------------|-----------------------|----------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|--------------|--------------|--------------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Const | Const | 0.015 | 0.015 | 0.015 | 0.000 | 0.000 | 0.000 | -2.347 | -2.394 | -2.389 | 0.034 | 0.042 | 0.041 |
| | P(t) | 0.047 | 0.051 | 0.055 | 0.998 | 0.996 | 0.995 | 0.000 | 0.000 | 0.000 | 0.740 | 0.698 | 0.724 |
| [A] Inertial | DECASH(-6) | 0.544 | 0.533 | 0.533 | 0.425 | 0.410 | 0.410 | 0.531 | 0.504 | 0.503 | 0.414 | 0.397 | 0.401 |
| | P(t) | 0.008 | 0.009 | 0.010 | 0.063 | 0.079 | 0.079 | 0.016 | 0.028 | 0.028 | 0.068 | 0.087 | 0.082 |
| [B] Exchange rate | doll_euro | 1.911 | 1.923 | 1.921 | | | | | | | | | |
| | P(t) | 0.000 | 0.000 | 0.000 | | | | | | | | | |
| | rub_euro | | | | -0.002 | -0.002 | -0.002 | | | | | | |
| | P(t) | | | | 0.665 | 0.616 | 0.625 | | | | | | |
| | doll_euro_real | | | | | | | 2.365 | 2.411 | 2.406 | | | |
| | P(t) | | | | | | | 0.000 | 0.000 | 0.000 | | | |
| | rub_euro_real | | | | | | | | | | -0.034 | -0.043 | -0.041 |
| | P(t) | | | | | | | | | | 0.738 | 0.696 | 0.723 |
| [C] Real trade | eu25_nonoil | 0.039 | | | -0.003 | | | 0.134 | | | -0.005 | | |
| | P(t) | 0.703 | | | 0.967 | | | 0.318 | | | 0.946 | | |
| | eu25_total | | 0.042 | | | 0.005 | | | 0.132 | | | 0.002 | |
| | P(t) | | 0.669 | | | 0.936 | | | 0.317 | | | 0.969 | |
| | eu25_noncis | | | 0.031 | | | 0.004 | | | 0.103 | | | 0.001 |
| | P(t) | | | 0.698 | | | 0.938 | | | 0.334 | | | 0.987 |
| [D] Conversion margin | euromarge | 0.127 | 0.127 | 0.128 | -0.018 | -0.019 | -0.019 | 0.162 | 0.162 | 0.162 | -0.020 | -0.021 | -0.020 |
| | P(t) | 0.047 | 0.049 | 0.048 | 0.619 | 0.609 | 0.605 | 0.044 | 0.046 | 0.045 | 0.597 | 0.573 | 0.578 |
| | J-statistic | 0.080 | 0.080 | 0.080 | 0.099 | 0.099 | 0.099 | 0.049 | 0.049 | 0.051 | 0.100 | 0.100 | 0.100 |
| | P | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| | DW | 1.83 | 1.84 | 1.85 | 1.44 | 1.43 | 1.43 | 1.86 | 1.89 | 1.90 | 1.44 | 1.43 | 1.43 |

Estimated models: ETRANSACT (II)

1. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{doll_euro} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
2. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{doll_euro} + \alpha_3 \text{eu25_total} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
3. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{doll_euro} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
4. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{rub_euro} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
5. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{rub_euro} + \alpha_3 \text{eu25_total} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
6. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{rub_euro} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
7. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{doll_euro_real} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
8. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{doll_euro_real} + \alpha_3 \text{eu25_total} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
9. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{doll_euro_real} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
10. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{rub_euro_real} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
11. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{rub_euro_real} + \alpha_3 \text{eu25_total} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$
12. $ETRANSACT = \text{const} + \alpha_1 ETRANSACT(-6) + \alpha_2 \text{rub_euro_real} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{euromarge} + \alpha_5 \text{dummy_crise} + \alpha_6 \text{dummy_eurocash} + \varepsilon_t$

All equations are estimated in first differences using GMM. Significant coefficients ($P(t) < 10\%$) are presented in bold

| ETRANSACT | Variable | Specifications | | | | | | | | | | | |
|------------------------------|-----------------------|----------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|--------------|--------------|--------------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Const | Const | 0.015 | 0.016 | 0.015 | 0.000 | 0.000 | 0.000 | -1.949 | -1.941 | -1.937 | -0.107 | -0.103 | -0.102 |
| | P(t) | 0.027 | 0.020 | 0.024 | 0.878 | 0.985 | 0.989 | 0.000 | 0.000 | 0.000 | 0.386 | 0.393 | 0.417 |
| [A] Inertial | ETRANSACT (-6) | 0.823 | 0.783 | 0.782 | 0.842 | 0.930 | 0.931 | 1.267 | 1.253 | 1.233 | 0.931 | 0.927 | 0.928 |
| | P(t) | 0.002 | 0.001 | 0.002 | 0.001 | 0.001 | 0.001 | 0.036 | 0.043 | 0.045 | 0.001 | 0.001 | 0.001 |
| [B] Exchange rate | doll_euro | 1.479 | 1.508 | 1.501 | | | | | | | | | |
| | P(t) | 0.000 | 0.000 | 0.000 | | | | | | | | | |
| | rub_euro | | | | 0.003 | 0.004 | 0.004 | | | | | | |
| | P(t) | | | | 0.614 | 0.371 | 0.396 | | | | | | |
| | doll_euro_real | | | | | | | 1.960 | 1.953 | 1.949 | | | |
| | P(t) | | | | | | | 0.000 | 0.000 | 0.000 | | | |
| | rub_euro_real | | | | | | | | | | 0.107 | 0.103 | 0.102 |
| | P(t) | | | | | | | | | | 0.385 | 0.392 | 0.415 |
| [C] Real trade | eu25_nonoil | 0.031 | | | 0.008 | | | -0.130 | | | 0.004 | | |
| | P(t) | 0.747 | | | 0.850 | | | 0.573 | | | 0.968 | | |
| | eu25_total | | 0.042 | | | 0.014 | | | -0.090 | | | 0.011 | |
| | P(t) | | 0.651 | | | 0.841 | | | 0.563 | | | 0.885 | |
| | eu25_noncis | | | 0.032 | | | 0.010 | | | -0.067 | | | 0.007 |
| | P(t) | | | 0.669 | | | 0.869 | | | 0.578 | | | 0.914 |
| [D] Conversion margin | euromarge | 0.115 | 0.111 | 0.114 | 0.012 | 0.021 | 0.020 | 0.104 | 0.117 | 0.118 | 0.022 | 0.024 | 0.023 |
| | P(t) | 0.035 | 0.040 | 0.036 | 0.689 | 0.454 | 0.456 | 0.151 | 0.080 | 0.079 | 0.446 | 0.392 | 0.396 |
| | J-statistic | 0.095 | 0.098 | 0.097 | 0.114 | 0.104 | 0.103 | 0.037 | 0.037 | 0.038 | 0.102 | 0.102 | 0.102 |
| | P | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| | DW | 1.70 | 1.72 | 1.73 | 1.56 | 1.64 | 1.63 | 1.78 | 1.73 | 1.73 | 1.59 | 1.60 | 1.60 |

Estimated models: IMPORT_EUROBILLS (III)

1. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{doll_euro} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
2. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{doll_euro} + \alpha_3 \text{eu25_total} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
3. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{doll_euro} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
4. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{rub_euro} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
5. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{rub_euro} + \alpha_3 \text{eu25_total} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
6. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{rub_euro} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
7. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{doll_euro_real} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
8. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{doll_euro_real} + \alpha_3 \text{eu25_total} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
9. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{doll_euro_real} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
10. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{rub_euro_real} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
11. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{rub_euro_real} + \alpha_3 \text{eu25_total} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
12. $\text{IMPORT_EUROBILLS} = \text{const} + \alpha_1 \text{IMPORT_EUROBILLS}(-6) + \alpha_2 \text{rub_euro_real} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$

All equations are estimated in first differences using GMM. Significant coefficients (P(t)<10%) are presented in bold

| IMPORT_EUROBILLS | Variable | Specifications | | | | | | | | | | | |
|--------------------------|-----------------------------|----------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Const | Const | 0.041 | 0.042 | 0.044 | -0.024 | -0.025 | -0.027 | -7.395 | -7.329 | -7.233 | -6.867 | -6.721 | -6.504 |
| | P(t) | 0.242 | 0.220 | 0.201 | 0.577 | 0.559 | 0.535 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| [A] Inertial | Import_eurobills(-6) | 1.317 | 1.306 | 1.299 | 0.847 | 0.860 | 0.846 | 1.043 | 1.113 | 1.072 | 0.816 | 0.841 | 0.833 |
| | P(t) | 0.015 | 0.019 | 0.016 | 0.095 | 0.094 | 0.099 | 0.042 | 0.046 | 0.045 | 0.074 | 0.073 | 0.080 |
| [B] Exchange rate | doll_euro | 7.739 | 7.687 | 7.633 | | | | | | | | | |
| | P(t) | 0.000 | 0.000 | 0.000 | | | | | | | | | |
| | rub_euro | | | | 0.294 | 0.293 | 0.290 | | | | | | |
| | P(t) | | | | 0.002 | 0.002 | 0.004 | | | | | | |
| | doll_euro_real | | | | | | | 7.434 | 7.373 | 7.279 | | | |
| | P(t) | | | | | | | 0.000 | 0.000 | 0.000 | | | |
| | rub_euro_real | | | | | | | | | | 6.863 | 6.718 | 6.503 |
| | P(t) | | | | | | | | | | 0.000 | 0.000 | 0.000 |
| [C] Real trade | eu25_nonoil | -0.481 | | | 0.525 | | | -1.185 | | | -0.874 | | |
| | P(t) | 0.493 | | | 0.544 | | | 0.150 | | | 0.313 | | |
| | eu25_total | | -0.285 | | | 0.394 | | | -0.748 | | | -0.998 | |
| | P(t) | | 0.571 | | | 0.677 | | | 0.172 | | | 0.241 | |
| | eu25_noncis | | | -0.233 | | | 0.206 | | | -0.575 | | | -0.955 |
| | P(t) | | | 0.534 | | | 0.783 | | | 0.149 | | | 0.142 |
| | J-statistic | 0.079 | 0.085 | 0.086 | 0.026 | 0.027 | 0.029 | 0.044 | 0.054 | 0.056 | 0.062 | 0.062 | 0.058 |
| | P | 1.000 | 1.000 | 1.000 | 0.987 | 0.987 | 0.986 | 1.000 | 1.000 | 1.000 | 0.969 | 0.969 | 0.971 |
| | DW | 1.74 | 1.71 | 1.71 | 1.76 | 1.78 | 1.77 | 1.82 | 1.69 | 1.70 | 1.71 | 1.62 | 1.60 |

Estimated models: EUROGROS (IV)

1. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{doll_euro} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
2. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{doll_euro} + \alpha_3 \text{eu25_total} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
3. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{doll_euro} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
4. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{rub_euro} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
5. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{rub_euro} + \alpha_3 \text{eu25_total} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
6. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{rub_euro} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
7. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{doll_euro_real} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
8. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{doll_euro_real} + \alpha_3 \text{eu25_total} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
9. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{doll_euro_real} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
10. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{rub_euro_real} + \alpha_3 \text{eu25_nonoil} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
11. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{rub_euro_real} + \alpha_3 \text{eu25_total} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$
12. $\text{EUROGROS} = \text{const} + \alpha_1 \text{EUROGROS6} + \alpha_2 \text{rub_euro_real} + \alpha_3 \text{eu25_noncis} + \alpha_4 \text{dummy_crise} + \alpha_5 \text{dummy_eurocash} + \varepsilon_t$

All equations are estimated in first differences using GMM. Significant coefficients ($P(t) < 10\%$) are presented in bold

| EUROGROS | Variable | Specifications | | | | | | | | | | | |
|--------------------------|--------------------|----------------|--------------|--------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Const | Const | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.014 | 0.004 | 0.002 | 0.001 | -0.001 | 0.000 |
| | P(t) | 0.077 | 0.105 | 0.095 | 0.033 | 0.133 | 0.118 | 0.560 | 0.869 | 0.927 | 0.973 | 0.975 | 0.995 |
| [A] Inertial | EUROGROS6 | 1.706 | 1.598 | 1.552 | 1.646 | 1.554 | 1.512 | 1.732 | 1.607 | 1.557 | 1.588 | 1.467 | 1.441 |
| | P(t) | 0.044 | 0.048 | 0.055 | 0.026 | 0.050 | 0.055 | 0.043 | 0.049 | 0.055 | 0.064 | 0.068 | 0.075 |
| [B] Exchange rate | doll_euro | -0.015 | -0.006 | -0.004 | | | | | | | | | |
| | P(t) | 0.493 | 0.788 | 0.853 | | | | | | | | | |
| | rub_euro | | | | -0.001 | 0.000 | 0.000 | | | | | | |
| | P(t) | | | | 0.068 | 0.820 | 0.837 | | | | | | |
| | doll_euro_real | | | | | | | -0.013 | -0.003 | -0.001 | | | |
| | P(t) | | | | | | | 0.592 | 0.902 | 0.960 | | | |
| | rub_euro_real | | | | | | | | | | 0.000 | 0.001 | 0.001 |
| | P(t) | | | | | | | | | | 0.990 | 0.940 | 0.957 |
| [C] Real trade | eu25_nonoil | 0.014 | | | 0.014 | | | 0.014 | | | 0.015 | | |
| | P(t) | 0.089 | | | 0.084 | | | 0.108 | | | 0.135 | | |
| | eu25_total | | 0.014 | | | 0.013 | | | 0.014 | | | 0.014 | |
| | P(t) | | 0.058 | | | 0.078 | | | 0.064 | | | 0.080 | |
| | eu25_noncis | | | 0.011 | | | 0.011 | | | 0.011 | | | 0.011 |
| | P(t) | | | 0.054 | | | 0.067 | | | 0.059 | | | 0.071 |
| | J-statistic | 0.094 | 0.089 | 0.089 | 0.108 | 0.092 | 0.092 | 0.095 | 0.090 | 0.090 | 0.098 | 0.090 | 0.090 |
| | P | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| | DW | 2.03 | 2.08 | 2.09 | 2.03 | 2.08 | 2.08 | 2.02 | 2.08 | 2.09 | 2.05 | 2.11 | 2.12 |

Estimation results

[A] Lagged endogenous. We tested several lags. The best results are obtained with 6-month lags for all four examined indicators. We can interpret this result as the average reaction time necessary to account for a possible switch in agents' behaviour. Note that the impact of the lagged variable is more important for the transactional demand proxy (related coefficient for EUROGROS is positive, statistically significant and between 1.441 and 1.732), than for its use for savings purposes (their values are between 0.397 and 0.544 for DECAH, between 0.782 and 1.267 for ETRANSACT, between 0.816 and 1.317 for IMPORT_EUROBILLS). This result suggests that network externalities do in fact concern the transactional demand for substitution currency. The possible hysteresis influence on households' savings behaviour related to the existence of a psychological adjustment period, though existing, is less important. As no violent changes in euro/dollar rates were observed during the period of our study, this result is not surprising.

[B] Exchange rate.

- No influence on transactional demand (independently of indicator used). This fact confirms our hypothesis about the importance of network externalities. The choice of transactions currency is unrelated to current nominal or real exchange rate dynamics, but probably is related to routine behaviour.
- Dollar/euro exchange rate is a better explicative variable for the choice of a substitution currency as a store of value. We see that the behaviour of Russian households is quite rational. This result suggests appreciation of the euro on international markets would have a positive impact for its role in the Russian economy and thus would increase the euro's international role. The significance of both rouble and dollar to euro exchange rates appears only for IMPORT_EUROBILLS estimation, which presumes the importance of both indicators in banking decisions.
- Differences between the impacts of exchange rates in nominal and real terms do not seem to be very important: both indicators are positive and significant (euro appreciation versus dollar is followed by an increase in its share in Russian household savings flows). We should suppose that inflation differentials have limited direct influence on the choice of substitution currencies, whereas the impact of nominal exchange rates is more important.

[C] Real trade

- Independent of the indicator used, the real factor has no influence on household demand for currency: their choice is based only on their previous practices and financial variables.
- Real trade influence on the transactional component, though positive and significant, is relatively weak. In this case we cannot expect the ‘natural’ equilibration of the market following real needs: routines are well anchored, and a particular policy is necessary to equilibrate it and to induce exporters and importers to use euros when trading with Europe.

[D] The impact of the Euromarge variable on household demand for euros and dollars is inconclusive: counter-intuitively, it appears to be positive for some specifications while it is insignificant for others. Apparently, banks increase relative exchange margins in response to the growing demand for euros, but this does not discourage households from buying euros. On the contrary, we cannot exclude the existence of a temporary shortage of euros for some periods which created some minor panics in this market, implying such non-market behaviour by households.

Finally our estimation confirms the importance of the disaggregated approach: enterprises’ and households’ demands for substitution currencies do not depend on the same variables. While the inertial component seems to be significant for all specifications, which supposes the existence of routines, of network externalities and the necessity of some ‘adaptation’ period, the exchange rate dynamics are important only for households’ choice of reserve currency. The transactional demand of enterprises is driven mainly by routines and network externalities and weakly by real trade.

5 Inertia: Hysteresis, network externalities, routines and conventions

As we have demonstrated econometrically, both the transactional and reserve roles of substitution currencies have an important inertial component. The choice of currency of substitution is dependent not only on exogenous variables (such as exchange rates or trade volumes) but also

on past experience and on the behaviour of others. The existence of network externalities assumes the necessity of including some aspects of interaction between agents. Another aspect explaining the weakness of the euro as a substitution currency is related to routines and the adaptation period necessary to build confidence. These aspects require more detailed understanding, particularly because of their impact on the reaction of concerned economic agents to de-dollarisation policies.

Such dynamics are representative of 'conventional' behaviour: repeatedly used solutions when coordination between agents is necessary. The problem of coordination is central where money is concerned: the coordination of economic agents by using one currency for their trade appears to improve the situation of every agent (Aglietta and Orléan [2002]). According to the theoretical approach of conventions, an example of good coordination (in our case, the large use of the dollar as a substitution currency) leads to the recurrence of a behaviour pattern on a routine basis; once started, the knowledge of the reason why this choice was made is unnecessary and could disappear rapidly; what is important is that the adopted convention is a solution that helps maintain relatively successful coordination. By referring to the theoretical features of convention described by Batifoulier and De Larquier [2001] and Orléan [1994], we readily observe that the dominant position of the US dollar as a main substitution currency in Russia despite the important economic relations with Europe could be considered as a conventional arrangement.

| Convention's theoretical characteristics | Why applicable to dollar dominance case |
|--|---|
| Arbitrariness/conventionality: other coordination is possible | Use of other currencies as unit of account, means of exchange and store of value is possible in Russia |
| No explicit sanctions for non-use of dollar could be mentioned while implicit losses could exist | The dollar is as authorised as euro: no official limitations on euro circulation (compared to dollar) |
| No official definition | Rouble is the official currency in Russia. Officially no currency is defined as the international transaction currency: free market approach is used. |
| Repeatedly/automatically used | Once the dollar is installed as the main substitution currency, its use is repeated quite automatically |

Conventional choices are not necessarily optimal: suboptimal choices can be used continually. Simulations, according to the evolutionary games approach (De Larquier and Gannon [2001]) formally demonstrate the slow and gradual modification of conventional behaviour inside a society. Evolutionary game theory identifies several factors of a convention's inertia.

Conformity preference. One can suppose the existence of an additional payoff from adopting the widespread convention. As in the *network externalities* approach, the overall use of one

currency (rouble, dollar, or euro) reduces potential transaction costs for each economic agent. In principle, it is relatively less important whether a decision is optimal or not—successful coordination's potential payoffs are greater. As we mentioned above, the degree of implication of the operation in social coordination (assuming interactions between agents) is highly important in defining the impact of this factor on the choice of agents.

Path dependency. When a convention appears as an equilibrium of an evolutionary game played in deterministic strategies, replication learning (the procedure close to the 'learning by doing') implies 'path dependency' of the equilibrium (clearly depending of the initial state). In such conditions the modification of a convention cannot be automatic: it requires an initial shock. Such a shock could be introduced as an exogenous modification of a gains matrix, but also by the introduction of a 'mutation' (some fraction of agents adopts non-conventional strategy). Applied to the problematic of choice of substitution currency, such a shock could be produced by an important change in exchange rates but also by legal measures, suggesting use of the euro in some foreign currency denominated operations.

Some conventional choices are stable because of their *versatility*. A convention is versatile if, by following it, one can hope to accommodate oneself, at no additional cost, to another player who is following a different convention. Such a convention is most readily adaptable to possible unforeseen changes in other players' strategies. The 'dollar convention' in Russia seems to be very versatile on account of the widespread use of the dollar around the world, as well as its high internal liquidity: this fact helps in understanding the use of a dollar as a vehicle currency, as observed in Russian national currency markets.

Risk dominance. A risk dominant strategy is the best choice in the case of the worst outcome of a non-cooperative game, i.e. in the case of the least favourable behaviour of others (Harsanyi and Selten [1988]). This factor is closely related to expectations and so to the store-of-value role of foreign currencies. Young [1993], Kandori, Mailath and Rob [1993] have demonstrated that in a game with two possible Nash equilibria – one of which is Pareto optimal and the other risk dominant – all players will gradually come to choose the second.

The risk dominance approach is related to *hysteresis*: agents continue to choose strategies which have given them the best results in the 'worst cases' encountered in the past. In the past, the dollar was a good solution for the majority of economic agents (while the euro did not exist) during banking and currency crises (1994, 1995, and 1998). From this perspective, the preference for the dollar (particularly as a saving instrument) could represent a risk dominant strategy for risk/uncertainty-adverse agents. It is important to notice that past experience mat-

ters as an instrument for defining the ‘worst scenario’. In this sense, the banking crisis of summer 2004 probably afforded a good opportunity to test the robustness of the euro, thus reducing the importance of the hysteresis factor for the choice of the dollar as a substitution currency in Russia.

In the situations where individuals do not have a priori complete information about past and future strategies, conventional practices play a normative role. When it is impossible to obtain complete information about the future strategy of each agent in a society,⁷ repeated practices (conventions) become examples to follow. By analysing the demand for foreign currency of Russian households, we can suppose that the overall use of the dollar induces uninformed agents to use it and thus reinforces dollar dominance ('auto-referential' behaviour as in Orléan [1999]).

The approach in terms of the theory of conventions helps us to understand the nature of the choice of currency of substitution and dominance of dollar in this role in Russia. As we demonstrated in our econometric study, this choice is not exclusively related to exogenous variable dynamics (such as trade relations and exchange rate variations) but is also related to an important inertial component. The conventions approach suggests the importance of including other factors in the analysis of such inertia, especially past experience, degree of implication of each particular form of currency holdings in a collective interactions game, and degree of risk/uncertainty-aversion of the involved economic agents. This approach seems to be relevant not only for the specific analysis of choice between euro and dollar but also for the analysis of the dollarisation phenomenon in general.

⁷ Because of the limited rationality of agents (Simon [1982]) but also because of the uncertainty (Keynes [1937]) which characterises the Russian transition period (Khartchenko-Dorbec, [2004])

6 Concluding remarks

Our analysis of features of choice between substitution currencies in Russia leads to the following conclusions.

- (1) The gap between the geographical structure of real trade and choice of substitution currency in Russia is significant: while the European area dominates in the real sphere, the US dollar is still the main currency used in financial activities.
- (2) Households and enterprises do not behave in the same manner: while the exchange rate dynamics are highly important for households' decisions, its influence on banks/enterprises decisions is quite insignificant. The observed euro appreciation, while favourable for the diversification of currency portfolios of households, does not change the choice of enterprises⁸. On the other hand, the increasing volume of real trade between Europe and Russia seems not to be sufficient to reduce dollar dominance.
- (3) The importance of the inertial component in the choice of substitution currency is confirmed for the Russian case. The interpretation of this result from the point of view of conventions theory (which provides a general framework including network externalities and the hysteresis approach) supports the necessity of a disaggregated approach to dollarisation issues. The implication of each operation in a collective game, the degree of risk-aversion and past experience all seem to need to be taken into account. This fact implies weak short term efficiency of economic policies in this field: a long/medium term approach is necessary.

In the future, this scheme could be applied to dollarisation as a whole in Russia first and then to other countries concerned with dollarisation problem.

⁸ Accordingly, the appreciation of the rouble could be favourable to the conversion of households' savings in national currency. However, rouble appreciation, while it seems to be positive for its reserve role, has negative consequences in terms of national industry's competitiveness, so the overall impact of this policy should be estimated with accuracy. This estimation is an interesting research project but beyond the objectives of this paper.

References

- Ahumada H., [1992] “A Dynamic Model of the Demand for Currency: Argentina 1977-1988”, *Journal of Policy Modelling*, Vol.14, pp.335-361.
- Arteta C., [2002] “Exchange Rate Regimes and Financial Dollarisation: Does Flexibility Reduce Bank Currency Mismatches? Institute of Business and Economic Research Paper C02-123
- Baliño, T., Bennett A., Borensztein, E. ,[1999] “Monetary Policy in Dollarized Economies” IMF Occasional Paper 171
- Batifoulie P. De Larquier G. [2001] « De la convention et de ses usages » in Batifoulie P. (ed), *Théorie des Conventions*, Paris, Economica
- Bordo M., Choudri E., [1982] “Currency Substitution and the Demand for Money”, *Journal of Money, Credit and Banking*, Vol.14, pp.48-57.
- Broda C., Levy-Yeyati E , [2003] “Endogenous Deposit Dollarisation” Federal Reserve Bank of New York Staff Reports, no. 160 February
- Broda C., Levy-Yeyati E. , [2002] “Dollarisation and the Lender of Last Resort”, – Universidad Torcuato Di Tella Business School Working Papers N°16 March
- Caballero R., Cowan K., Kearns J. , [2004] “Fear of Sudden Stops: Lessons from Australia and Chile” NBER Working Papers with number 10519.
- Calvo G., Végh C., [1996] “From Currency Substitution to Dollarisation and Beyond: Analytical and Political Issues”, In *Money, Exchange Rates, and Output*, Calvo G. (Eds.) MIT Press, Cambridge, Massachusetts
- De Larquier G., Abecassis P. Batifoulie P. , [2001] « Dynamique des conventions en théorie des jeux » in Batifoulie P. (ed.) *Théorie des Conventions*, Paris, Economica
- De Larquier, G. Gannon F., [2001] « Rivalité et coexistence des conventions dans les jeux évolutionnistes » dans Batifoulie P. (dir), *Théorie des Conventions*, Paris, Economica
- De Nicolo G., Honohan P., Ize. A.,[2003] “Dollarisation of the Banking System: Good or Bad?”The World Bank Policy Research Working Paper Series N°3116.
- DeVries C., [1988] “Theory and Relevance of Currency Substitution with Case Studies for Canada and Netherlands Antilles”, *The Review of Economics and Statistics*, Vol.70, pp.512-515.
- Dornbusch R., Reynoso A., [1989] “Financial Factors in Economic Development”, NBER Working Papers, No.2889.
- Druck P. Morón E. Stein E., [2001] “The Twin Risks in the Dollarisation Debate: Country and Devaluation – Risks” CEMA Working Papers N° 198.

ECB [2002] Review of the International Role of the Euro, December, www.ecb.int

ECB [2005] Review of the International Role of the Euro, January, www.ecb.int

Edwards S., Igal Magendzo I. , [2002] “Dollarisation and the Economic Performance: What do we really know? Oesterreichische Nationalbank Working Paper,

Engineer, M. , [2000] : “Currency Transactions Costs and Competing Fiat Currencies,” *Journal of International Economics*, 52, 113–136.

Epstein, L. , [1999] , « A Definition of Uncertainty Aversion ». *Review of Economic Studies*, 66, 579-608.

Feige E. , [2003] “The Dynamics of Currency Substitution, Asset Substitution and De facto Dollarisation and Euroisation in Transition Countries”, *Comparative Economic Studies*, Fall

Feige E., Šošić V., Faulend M., Šonje V. , [2002] “Unofficial Dollarisation in Latin America: Currency Substitution, Network Externalities and Irreversibility” in Dean J. Salvatore D., Willett T. , (eds.) *Dollarizing the Americas*, New York: Oxford University Press, 2002

Feige, E. , [1994] “The Underground Economy and the Currency Enigma.” *Public Finance* 49, pp. 119-39.

Feige, E. , [2002] “Currency Substitution, Unofficial Dollarisation and Estimates of Foreign Currency Held Abroad: The Case of Croatia.” in Blejer, Mario and Skreb, Marko, eds., *Financial Policies in Emerging Markets*, Cambridge, MA: MIT Press

Goldfajn I. Olivares G. , [2000] “Is adopting Full Dollarisation the solution? Looking at the evidence” *Department of Economics PUC-Rio (Brazil) Textos para discussão*, N° 416.

Guidotti P., Rodriguez C., [1992] “Dollarisation in Latin America; Gresham’s Law In Reverse”, *IMF Staff Papers*, Vol.39, pp.518-544

Harsanyi J., Selten R. , [1988] *A General Theory of Equilibrium Selection in Games*, Cambridge, MIT Press

Heimonen K. , [2001] “Substituting a Substitute Currency –The Case of Estonia” *Bank of Finland Institute for Economies in Transition (BOFIT) Discussion Paper*, N°11.

International Monetary Fund , [1999] “Monetary Policy in Dollarized Economies”, *Occasional Paper* N°171

Ize A., Levy-Yeyati E. , [1998] “Dollarisation of Financial intermediation: Causes and Policy Implications, *IMF Working Paper* N°WP/98/28, March

Kandori M., Mailath G., Rob R., [1993] « Learning, Mutation and Long Run Equilibria in Games », *Econometrica* , vol. 61

- Keynes J.M. , [1937] , « The General Theory of Employment », *Quarterly Journal of Economics*, N°51 reprinted in *Collected Writings* (1973) Vol.XIV, New York
- Khartchenko-Dorbec A., [2004] “Banques et financement du secteur productif dans la transition en Russie” PhD thesis, University of Paris X-Nanterre, December
- Mendoza E. , [2002] “Why Should Emerging Economies Give up National Currencies: A Case for ‘Institutions Substitution’”, University of Maryland Working Paper
- Milner C., Mizen P., Pentecost E., [2000] “A Cross-Country Panel Analysis of Currency Substitution and Trade”, *Economic Inquiry*, Vol., pp. 206-217.
- Mongardini, J., Mueller J., [1999] “Ratchet Effects in Currency Substitution: An Application to the Kyrgyz Republic,” Working Paper 99/102, International Monetary Fund.
- Orléan A., [1994] (ed.), *L’analyse économique des conventions*, PUF
- Orléan A., [1999], *Le pouvoir de la finance*, Paris, Odile Jacob
- Peiers, B., Wrase J., [1997] “Dollarisation Hysteresis and Network Externalities: Theory and Evidence From an Informal Bolivian Credit Market,” Working Paper 97-21, Federal Reserve Bank of Philadelphia.
- Piontkovsky R., [2003] “Dollarisation, Inflation Volatility and Underdeveloped Financial markets in Transition Economies” EERC Working Paper N°03/02
- Piontkovsky R. , [2003] “Dollarisation, Inflation Volatility and Underdeveloped Financial Markets in Transition Economies” EERC Working paper 03/02
- Piterman S., [1988] “The Irreversibility of the Relationship Inflation and Real Balances”, *Bank of Israeli Economic Review*, Vol.60, pp.72-83.
- Powell A., Sturzenegger F. , [2000] “Dollarisation: The Link between Devaluation and Default Risk” Business School, Universidad Torcuato Di Tella Working Paper , October
- Portes R. [2001] “The euro and the international financial system” London Business School Economic Discussion Paper N°DP2001/4
- Ratti R., Jeong B. , [1994] “Variation in the Real Exchange Rate as a Source of Currency Substitution”, *Journal of International Money and Finance*, Vol.13, pp.537-550.
- Routledge B., Zin S. [2001] , “Model Uncertainty and Liquidity » NBER Working Paper 8683, Décembre
- Sahay, R., Vegh C. , [1995] “Dollarisation in Transition Economies,” *Finance and Development*, 32(1), 36–39.
- Shinkevich A., Oomes N. , [2002] “Dollarisation Hysteresis in Russia”, EERC Working Paper, January
- Simon, H.A., [1982] , *Models of Bounded Rationality*, Volume II. Cambridge, Mass.: MIT Press.

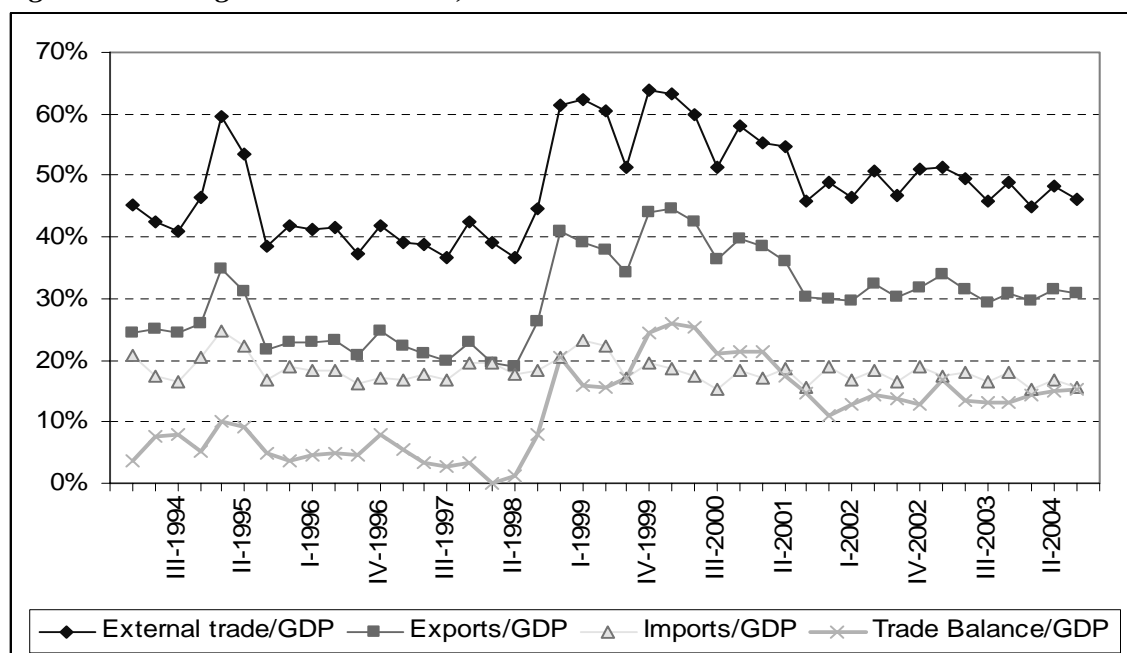
Sturzenegger, F., [1992] “Currency Substitution and the Regressivity of Inflationary Taxation”
Working paper 656 Department of Economics, University of California

Uribe M., [1997] “Hysteresis in the Simple Model of Currency Substitution”, *Journal of Money Credit and Banking*, Vol.40, pp.185-202.

Young H., [1993], « Evolution of Conventions », *Econometrica*, 61(1), pp.57-84

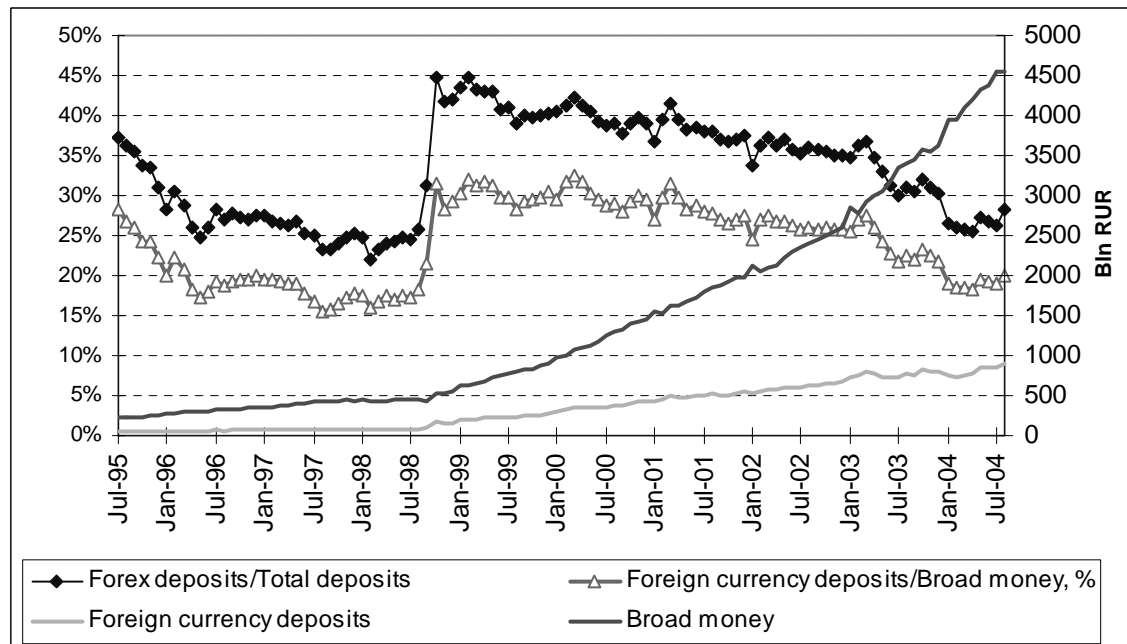
Annex I Generic dollarisation in Russia

Figure 4. Foreign trade in Russia, 1994-2004



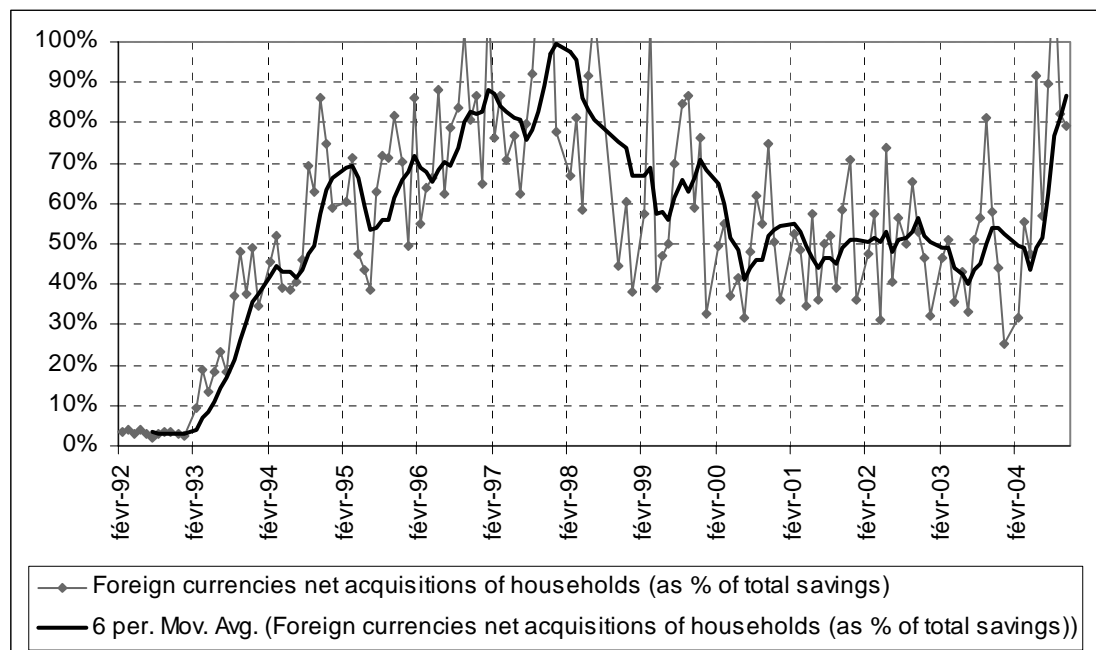
Source: Bank of Russia, Russian Federal Statistical Service

Figure 5. Generic dollarisation in Russia, 1995-2004



Source: Bank of Russia

In Figure 5 we can see that starting from 2001 the share of foreign currency denominated assets is declining (while Figure 4 shows an increase in the foreign trade/GDP ratio), which clearly establishes the important financial component in dollarisation phenomenon observed in Russia.

Figure 6. Dollarisation of households' savings 1992-2004

Source: Bank of Russia

The importance of the financial component in the dollarisation phenomena should take into account the important use of foreign currencies as an instrument of savings. We can clearly see from Figure 6 that this form of savings plays a highly important role (and still proves to be the first means of savings for households). We can observe two important picks of dollar acquisitions related to the periods of high instability in the banking sector.

Annex II Variables

| Name | Status | Construction | Source |
|------------------|--------------|---|------------------------------|
| DECASH | endogenous | Euros exchanged by households in banks' exchange offices during the month [recalculated in dollars using average exchange rate]/all currencies exchanged in banks' exchange offices during the month [recalculated in dollars using average exchange rate] | Central Bank of Russia (CBR) |
| ETRANSACT | endogenous | Number of euro-to-ruble conversion operations in banks' exchange offices during the period/total number of cash exchange operations of banks' exchange offices during the month | CBR |
| IMPORT_EUROBILLS | endogenous | Banknotes in euro imported by all Russian banks during the month [recalculated in dollars using average exchange rate]/total amount of foreign bills imported by all Russian banks during the month [recalculated in dollars using average exchange rate] | CBR |
| EUROGROS | endogenous | Total amount of euros exchanged on all official Russian currency exchanges [non cash exchange operations, recalculated in dollars using average exchange rate]/total amount of currencies traded on Russian currency exchanges during the month [recalculated in dollars using average exchange rate] | CBR |
| rub_euro | exogenous | Nominal euro to ruble exchange rate (for 1 euro) | CBR |
| doll_euro | exogenous | Nominal euro to dollar exchange rate (for 1 euro) | CBR |
| Rub_euro_real | exogenous | Real ruble to dollar exchange rate $e_r = \frac{e^{euro/RUB} * P^{RUS}}{P^{euro}}$ | |
| Doll_euro_real | exogenous | Real euro to dollar exchange rate $e_r = \frac{e^{euro/USD} * P^{USD}}{P^{euro}}$ | |
| eu25_nonoil | exogenous | exports of all goods less oil + imports of Russia to 25 European countries /total exports+imports of Russia | CBR and Eurostat |
| eu25_total | exogenous | exports + imports of Russia to 25 European countries /total exports + imports of Russia | CBR and Eurostat |
| eu25_noncis | exogenous | exports + imports of Russia to 25 European countries/total exports+imports of Russia outside CIS | CBR and Eurostat |
| euromarge | exogenous | average spread on operations with euro in banks' exchange offices inside Russia /average spread on operations with dollars in banks' exchange offices inside Russia | CBR |
| DUMMY_EUROCASH | dummy | 1 for all periods after Jan 2002 | |
| DUMMY_CRISE | dummy | 1 for the periods from June 2004 (beginning of bank crisis) to October 2004 (end of crisis) | |
| ipc_ru | instrumental | Consumer price index in Russia | CBR |
| ipc_euro | instrumental | Consumer price index in euro area | ECB |
| ipc_US | instrumental | Consumer price index in US | Fed |
| id_rub | instrumental | Average deposit rate in Russian banks | CBR |
| ic_rub | instrumental | Average credit rate in Russian banks | CBR |
| id_euro | instrumental | Deposit facility ECB rate | ECB |
| irefi_euro | instrumental | Main refinancing operations ECB interest rate | ECB |
| ifed_doll | instrumental | US Federal Reserve discount rate | FED |
| rub_doll | instrumental | Nominal dollar to ruble exchange rate (for 1 dollar) | CBR |
| eu25_oil | instrumental | Oil exports from Russia to the Europe of 25/total oil exports of Russia | CBR and Eurostat |
| fuite | instrumental | Capital flight from Russia | CBR |

- 2004**
- No 10 Yuko Kinoshita and Nauro F. Campos: Estimating the determinants of foreign direct investment inflows: How important are sampling and omitted variable biases?
 - No 11 Akram Esanov, Christian Merkl, Lúcio Vinhas de Souza: Monetary policy rules for Russia. *Published in: Journal of Comparative Economics vol 33, no 3 (2005) pp. 484-499. ISSN 0147-5967.*
 - No 12 Greetje M.M. Everaert: The political economy of restructuring and subsidisation: An international perspective
 - No 13 Igor Vetlov: The Lithuanian block of the ECSB multi-country model
 - No 14 Michael Funke and Jörgen Rahn: Just how undervalued is the Chinese renminbi. *Published in: World Economy vol. 28, no 4 (2005) pp. 465-489. ISSN: 0378-5920.*
 - No 15 Steven Rosefielde: An abnormal country. *Published in: The European Journal of Comparative Economics vol. 2, no 1 (2005) pp. 3-16. ISSN: 1824-2979.*
 - No 16 Juha-Pekka Koskinen, Tuuli Koivu and Abdur Chowdhury: Selecting inflation indicators under an inflation targeting regime: Evidence from the MCL method
 - No 17 Anna Dorbec: Liquidity provision in transition economy: the lessons from Russia
 - No 18 Iikka Korhonen: Does democracy cure a resource curse?
 - No 19 Bernadina Algieri: Trade specialisation patterns: The case of Russia
 - No 20 Jarko Fidrmuc and Iikka Korhonen: A meta-analysis of business cycle correlation between the euro area and CEECs: What do we know—and who cares?
 - No 21 Anatoly Peresetsky, Alexander Karminsky and Sergei Golovan: Probability of default models of Russian banks.
 - No 22 John Bonin and Paul Wachtel: Dealing with financial fragility in transition economies.
- 2005**
- No 1 Pertti Haaparanta and Jukka Pirttilä: Reforms and Confidence
 - No 2 Paul Wachtel and Iikka Korhonen: A note on exchange rate pass-through in CIS countries. *Published in: Research in International Business and Finance (2005), ISSN 0275-5319. (Forthcoming.)*
 - No 3 Balázs Égert: Equilibrium exchange rates in Southeastern Europe, Russia, Ukraine and Turkey: healthy or (Dutch) diseased? *Published in: Economic Systems vol. 29, no 2 (2005) pp. 123-282. ISSN: 0939-3625.*
 - No 4 Balázs Égert and László Halpern: Equilibrium exchange rates in Central and Eastern Europe: A meta-regression analysis
 - No 5 Pingfang Zhu, Lei Li and Nannan Lundin: S&T activities and firm performance- microeconomic evidence from manufacturing in Shanghai
 - No 6 Michael Funke: Inflation in mainland China – modelling a roller coaster ride
 - No 7 Sophie Claeys: Optimal regulatory design for the central bank of Russia
 - No 8 Balázs Égert and Amalia Morales-Zumaquero: Exchange rate regimes, foreign exchange volatility and export performance in Central and Eastern Europe: Just another blur project?
 - No 9 Stanislav Anatolyev: A ten-year retrospection of the behavior of Russian stock returns
 - No 10 Sophie Claeys, Gleb Lanine and Koen Schoors: Bank supervision Russian style: Rules versus enforcement and tacit objectives
 - No 11 Bruno Merlevede and Koen Schoors: On the speed of economic reform: Tale of the tortoise and the hare
 - No 12 Brian M. Lucey and Svitlana Voronkova: Russian equity market linkages before and after the 1998 crisis: Evidence from time-varying and stochastic cointegration tests
 - No 13 Eugenio Proto: Growth expectations and banking system fragility in developing economies.
 - No 14 Gang Ji: Cross listing and firm value- corporate governance or market segmentation? An empirical study of the chinese stock market.
 - No 15 Anna Dorbec: Choice of the substitution currency in Russia: How to explain the dollar's dominance?

Bank of Finland
BOFIT – Institute for Economies in Transition
PO Box 160
FIN-00101 Helsinki

 + 358 10 831 2268
bofit@bof.fi
<http://www.bof.fi/bofit>