VOLATILITY OF FOREIGN FINANCIAL FLOWS AND THE MONETARY TRANSMISSION MECHANISM; EVIDENCE FROM SLOVENIA

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1. INTRODUCTION

In the transition economies, shallow intermediation of loanable funds as well as sizeable and volatile foreign financial flows increase the volatility and uncertainty of exchange and interest rate dynamics as well as money and credit growth. It is therefore highly probable that openness, an unsettled institutional setup and volatile foreign financial flows also considerably influence the transmission mechanism of monetary policy in the more advanced transition economies. However, while the influence of openness, unfinished institutional setup and foreign financial flows on the monetary transmission mechanism is not in question, it is far from clear how these factors propagate and amplify (reduce) the effects of standard channels of the monetary policy transmission mechanism.

The monetary framework of a small and open economy is inherently international in its scope. As the economies in transition are small and open, exchange rate and forex market interventions must have a crucial role in the monetary transmission mechanisms of those countries. The standard exchange rate channel works through its effect on net exports, by changing the price competitiveness of domestic goods, as well as through effects on net flows of foreign capital, by changing the attractiveness of financial instruments offered by domestic banks; in this last-mentioned variant of the exchange rate channel, obviously an interest rate channel is involved too[2]. An exchange rate channel may be expected to be significantly influenced by the transition economy's peculiarities, since exchange rate and forex market interventions are aimed at the harmful consequences of volatile foreign financial flows, but constrained by the openness and incomplete institutional setup.

Volatile foreign financial flows can also activate a credit channel of the monetary policy transmission mechanism in an open, small economy. Namely, volatile foreign financial flows intensify the volatility of banks' and other agents' liquidity; especially if financial (bank) intermediation fragility is enhanced by its shallowness[3]. Yet volatility of banks' liquidity also causes swings in the supply of intermediate credits and, therefore, also in the availability of loanable funds for different segments of economic agents. Corresponding swings in the external finance premium could differ from borrower to borrower[4]. Availability of loanable funds is therefore not only time-dependent but could also differ significantly among segments of agents; some of them could be even rationed out from the bank credit market[5].

It therefore seems probable that the bank lending channel effects could be intertwined (propagated and modified) with the standard exchange rate channel effects, in the transition economies facing openness,

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[1] Economic Institute at the School of Law, University of Ljubljana, Slovenia.

[2] See, for example, Mishkin(1995).

[3] On different sources of liquidity constraints, and policy affecting spending by altering liquidity limitation, see, Tobin(1978).

[4] See, for example, Bernake and Gertler(1995).

[5] As is well known, even in the most developed economies, imperfections are a central feature of intermediation of loanable funds , so that, for example, bank credit allocation is made more by quantity rationing rather than price adjustment.

unsettled financial setup and volatile foreign financial flows[6]. Other interventions (apart from exchange rate) of monetary policy designed to neutralise and contain major swings in forex flows could have similar effects, by changing the size and the volatility of the foreign financial flows[7].

In the chapters below, empirical evidence is presented to corroborate conjectured specific characteristics of the credit channel of the monetary policy transmission mechanism for the Slovenian economy; the interplay of standard exchange rate (and other forex interventions) channel effects and credit channel effects is also documented. Rationing of bank credits to some segments of borrowers is the main characteristic studied, so that key analysed factors of the transmission mechanism could be classified under "credit view", or even more narrowly, under "bank lending view" factors[8]. As the very volatility in the external variables[9] uncovered studied characteristics of the monetary policy transmission mechanism, a focal episode of analysis is determined by phases in swings of the foreign financial flows.

The structure of the rest of the paper is as follows. In the second chapter volatility of foreign exchange flows is presented. In the same chapter, a focal episode of analysis is determined. Elements of the bank lending channel are documented in the third chapter. Pieces of primary as well as more formal evidence are presented, to show that credit rationing is taking place for some segments of borrowers in the focal episode. In the fourth chapter the mechanism of credit rationing is analysed. Vanishing foreign exchange flows activate an interplay between exchange rate and bank lending channel effects; the fifth chapter is devoted to this interplay of effects. At the end of the paper conclusions and a statistical appendix are presented.

2. FOREIGN FINANCIAL FLOWS AND FOCAL EPISODE

Forex flows volatility. In the studied period (1992-1999), the volatility of foreign exchange flows was mainly caused by swings in capital flows, since the current account deviated considerably from zero only at the very beginning and at the end of the analysed period.

In Figure 1 (net) capital flows and the current account balance are given in percentages of GDP[10]. Obviously the volume and the structure of the foreign exchange inflows were cycling considerably in the studied period, from high current account surpluses and small capital inflows in 1992, to negligible current account surpluses and high capital inflows in 1997, and finally to significant current account deficit and small capital inflows in 1999. Short-term volatility of balance of payments components was also high. Extreme quarter changes (in absolute terms) in capital as well as the current account came to around

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[6] Some authors already interpret the credit channel only as a propagation and amplification of the standard interest rate channel effects. For them the credit channel is not a genuine channel of the monetary transmission mechanism (see, for example, Bernake and Gertler(1995) or Mertzler(1995)).

[7] Overview of possible policy measures to contain and neutralise foreign financial flows, see in the paper by Calvo and others (1993).

[8] On a "credit view" ("balance sheet" versus "bank lending view") discussion see, for example, Meltzer(1995), Bernake and Gertler(1995) and Mishin(1995). A theoretical foundation of credit rationing and informational asymmetries on the credit market are given in the classical paper by Stiglitz and Weiss(1981). On quantitative importance of credit rationing factors in transmission mechanism, see McCallum(1991).

[9] In Slovenia, crucial external variables were push factors of foreign financial flows. But cross exchange rates of foreign currencies were also important (especially between the US$, German mark and Italian lira), and economic activity in the EU (especially industrial production in Germany).

[10] Standard balance of payments data are used.

10% of (quarterly) GDP.

In the studied period, major factors of capital flows could be classified among the "push factors", so that swings in capital flows were exogenous for monetary policy [11]. The current account dynamic was only partly determined by factors independent of (monetary) policy; the deterioration in the balance of services after 1997, and the drop in the balance of trade in 1999 were probably the only important external changes for monetary policy[12].

Monetization on the retail forex market. In comparison with components of the balance of payments, monetization on the retail forex market[13] enables additional insights into the monetary policy transmission mechanism effects of foreign financial flows. There are at least three reasons why those additional insights are especially valuable in studying the effects of credit and exchange rate channels of the monetary policy transmission mechanism.

In the analysed period, the scale of the currency substitution was still substantial in Slovenia[14]. Therefore the size and dynamics of (net) monetization had more direct effects on the bank credit supply (than components of the balance of payments), as they directly affected the "tolar" part of bank balance sheets. Because of the managed floating exchange rate regime and significant currency substitution, the exchange rate was explicitly driven by monetization on the retail forex market[15]. The importance of monetization (in comparison with balance of payments items) is also corroborated by the very timing of the launch of new instruments for containing and neutralising foreign financial inflows. Indeed all these instruments were launched in periods when monetization on the retail forex market attained peak values[16]. So, monetization on the retail forex market could actually figure in the (revealed preference) reaction function of the monetary authority.

In Figure 2, monetization on the retail forex market is given in percentages of quarterly GDP. Dates of launching new instruments for containing and neutralising foreign financial inflows are marked by a star. The dynamics of monetization illustrate, even more clearly than components of the balance of payments, that the studied period (1992-1999) covers three major swings in net forex flows. Swings in net monetization on the retail foreign exchange market were considerable. In all three periods of low monetization, net forex bought from the non-banking sector dropped to zero, or even reached negative values. In other periods, net monetization on the retail foreign exchange market was much higher; in 1992 and 1994 average values exceeded almost 10%, and in 1997 5% of broad money.

The drop in monetization at the beginning of the downward phase of swings in monetization was also very fast. In all three swings, a considerable drop in monetization of more than 4.5% of quarterly GDP took place in a period not longer than one quarter.

The low monetization phase as focal episode. Large drops of net foreign financial inflow would have

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[11] On "push factors" of foreign financial flows see, for example, Fernandez_Arias and Montiel(1996); on factors of foreign financial flows in Slovenia, see, Bole(1999a).

[12] In 1997, shuttle trading fell significantly after Italy introduced lower prices of gasoline in the parts of Italy near the border with Slovenia. In 1999/II, deterioration of balance of trade was caused by speculative increase in import before introduction of VAT in July 1999.

[13] Net forex bought by the banking sector from the nonbanking sector.

[14] In 1999, forex deposits still encompassed 28% of M3 (see, Monthly Bulletin BS).

[15] See, for example, Bole(1997).

[16] See, Bank of Slovenia Annual Report (different numbers) and Bole(1999a).

to coincide with the cutting of credits from abroad and (ceteris paribus) also with an increase in demand for credits from other (domestic) sources.

It has been documented elsewhere that falling monetization caused domestic bank credits to rocket: the acceleration of credits was so strong that credit growth endangered even the soundness of the banking system[17]. Taking into account also the familiar argument that "tightening of monetary policy may have a strong effect on the real sector when credit is already tight but a weak effect when credit is initially plentiful" [18], periods of sizeable and rapidly falling monetization could be appropriate for studying the monetary policy transmission mechanism. In the first stage of low monetization periods, when sources of foreign credits were drying up, policy intervention in the supply of (bank) credits would have to have a much greater effect than in other phases of forex flows. The behaviour of financial variables crucial for bank credit markets therefore has to be studied in the periods of low monetization[19].

To define a focal episode, first the periods of "high monetization" have to be identified. Such periods encompass, heuristically speaking, those periods in which the Central Bank explicitly increases, that is through additional measures[20], efforts to mitigate the adverse effects of high net forex inflows (of huge monetization on the retail forex market). As mentioned, in the Figure the dates of launching additional measures are marked by a star. Corresponding "intervention" periods identify three "high monetization" periods.

The term "low monetization phase" indicates periods in which monetization on a retail forex market fell "considerably" (in comparison with the nearest "intervention" periods) or even became negative. More formally, "low monetization phase " is defined by periods between two consecutive "troughs" in cycles of monetization; that is by periods in which monetization was smaller than half the difference between the nearest "intervention" peak monetization and the nearest bottom of the corresponding monetization cycle[21]. In Figure 2 periods of the low monetization phase are shadowed. According to the definition, the low monetization phase encompasses the periods 1992/IV-1993/IV, 1995/I-1996/II and 98/IV-1999/IV. The defined low monetization phase is the focal episode for the present analysis of a monetary policy transmission mechanism.

3. BANK CREDIT RATIONING - EVIDENCE

Bank lending channel - descriptive analysis. A key element of the credit channel (of the monetary policy transmission mechanism) is the external finance premium, that is the difference between the cost of external funds and funds generated internally. According to the way monetary policy affects an

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[17] See, Bole(1999b).

[18] See, Blinder(1987).

[19] In limiting the analysis to a focal episode, the basic strategy of the analysis is similar to idea of the known paper on the credit channel for the US economy (see, Romer and Romer (1990)). However, contrary to the methodology of that paper, in the present analysis the focal episode is determined by explicit policy maker actions. In the afore mentioned paper, the focal episode is determined by "words spoken in its boardroom and not its actions" (see comments by B.F.Friedman(1990)).

[20] The Central Bank exercised sterilised foreign exchange intervention systematically in the whole studied period. But in the periods of extreme increase of foreign financial inflows, as a rule it launched additional measures for containing and neutralising foreign financial inflows (see, Bank of Slovenia Annual Report, and Bole(1999a).

[21] Definining "intervention" peaks by launching new policy measures for containing and neutralizing forex inflows, seriousness of possible objections to the "objectivity" of chosen focal episode is diminished (see, for example, Friedman critics of the definition of focal episode in Romer and Romer(1990), Friedman(1990)).

external finance premium, two variants of a credit channel are distinguished, the balance sheet view and bank lending view[22]. In the case of the bank lending view, an external finance premium reflects asymmetries on the credit markets, and therefore potential adverse selection contamination of the credit market. Equilibrium on such a market usually involves restrictions (and not price adjustment) on the size of credits, known as credit rationing[23].

It has been documented elsewhere that a drop in forex net inflows accelerated bank credit growth. As banks were unable to manage either credit risks or increasing maturity mismatch, when credit supply considerably accelerated, a significant drop in foreign financial flows also endangered the soundness of the banking system in Slovenia[24].

However, the effects of volatile foreign financial flows impinging on the economy were not confined only to the banking sector. The rapid increase of bank credits in the low monetization phase not only jeopardized banking soundness but also aggravated(!) the liquidity of the business sector. Namely, increased domestic bank credit supply replaced the falling loanable funds inflow from abroad, but the increased volume of bank credits was not channelled uniformly across banking clients. Differences in the external finance premium among segments of economic agents increased considerably, so that some segments were actually rationed out from the bank credit market. The divergence in liquidity of different segments of economic agents increased considerably.

The scale of rationing is illustrated in Figure 3. Two graphs are given: the first presents net monetization on the retail forex market (in percentages of GDP), and the second, the increment in bank credits to the business sector in percentages of an increment of total bank credits [25]. In the Figure, periods of low monetization phase are shadowed.

The second graph illustrates that in the later stage of all three periods of a low monetization phase, growth of bank credits to the business sector fell considerably behind the growth of overall banking credits. In the high monetization phase, increments in bank credits to the business sector (non-financial corporations) attained more than 60% of total bank credit increments. In the low monetization phase, increments in bank credits to the business sector fell to around 50% of increments in total bank credits in 1993, to almost zero (nominal stagnation of domestic bank credits to the business sector) in 1996 and even to negative values (nominal shrinking of credits to the business sector), in 1999.

Liquidity of the business sector. To ascertain that the fall in the relative increment in credits to the business sector actually affected the real performance of the economy, it is necessary to document that it was not caused by changes in the credit demand structure and (or) by access to alternative domestic sources of credit.

Being rationed out from the bank credit market in the low monetization phase, the business sector could have offset the relative fall in bank credits only by accessing alternative domestic sources of credit. Indeed, as illustrated in Figure 1, swings in the current account balance have been considerably smaller and less systematic than swings in monetization, so alternative credit sources only of domestic (and not foreign) provenance could be important. However, the supply of alternative domestic credit instruments

[22]See, Bernake and Gertler(1995).

[23]See, for example, Stiglitz and Weiss(1981).

[24]See, for example, Bole(1999b).

[25]Credits to non-financial corporations are denoted as credits to the business sector.

was limited mainly to trade credit, while possibilities of using other capital market instruments were almost negligible. Trade credit, however, could not alleviate the drop in funding of a whole business sector.

If the business sector was not able to completely offset the corresponding (relative) squeeze in loanable funds in the low monetization phase, rationing of the credit supply to the business sector would have to have a serious real effects[26]. To illustrate such effects, and therefore to document that enterprises were not able to get additional access to other (non-bank) credit, Figure 4 presents the assessed liquidity position of enterprises and broad money (in percentages of GDP). Again periods of a focal episode are shadowed. Data on the assessed liquidity position of enterprises are from regular quarterly surveys made by the Chamber of Commerce (survey data on liquidity position are available from the middle of 1993). Survey data on assessed liquidity position is calculated using Munich IFO Institute methodology[27].

According to the judgement of management, the liquidity position of enterprises was seriously aggravated in the periods of a low monetization phase. The deterioration was greatest in 1999, when in net terms more than 40% of enterprises assessed their liquidity position as bad. In 1995, assessed liquidity of the business sector was also aggravated, in net terms for at least 10% of enterprises. A graph of broad money illustrates that there was no aggregate deterioration in liquidity in the periods of a low monetization phase.

Statistical evidence. Descriptive analysis of the bank lending channel presence must be backed up by more formal evidence. The basic purpose of following two statistical experiments is to document the statistical significance of the low monetization phase effects on business sector credits.

First, univariate autoregression of domestic bank credit increments is estimated, using a dummy for the low monetization phase periods as an exogenous variable. Autoregression is run for the following dependent variables: increment in the credits to the business sector (per unit of GDP), increment in credits to other (non-business) sectors (per unit of GDP) and increment in credits to the business sector per unit of total credit increment. In the estimated equations, the order of autoregression is 3, while the exogenous dummy is distributed over three lags using the linear Almon weighting polynomial. All equations are estimated using quarterly data for the period 1992/I-1999/IV. Variables used in estimation are checked for unit root; in all cases ADF statistics were significant at 5% statistical significance[28]. Key statistics of estimated autoregression are presented in Table 1. Statistical significance of estimated equations as well as t-statistics of the sum of coefficients at distributed lags of a low monetization phase dummy are given.

Autoregression of relative increments in the credits to the business sector corroborates the significance of the low monetization phase effects; the equation and negative sum of coefficients at lags for the low monetization dummy are significant at a 0.05 level of significance. The equation for increments in the bank credits to the business sector is significant at 0.05 and the sum of the low monetization dummy is negative, but not significant. The equation for increments in credits to other (non-business) segments is not significant, the sum of coefficients at lags of the low monetization dummy is positive and not significant.

The cycling of increments in credits to the business sector (per unit of total credit increments) could result

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[26] The arguments that "tightening of monetary policy has strong effects on the real sector when the credit is already tight and weak effects when credit is initially plentiful" are well known (see, Blinder(1987)).

[27] See, "Business Expectations of Enterprises" (in, Slovenian), Chamber of Commerce, Ljubljana, 2000.

[28] Corresponding results are available from the author upon request.

from cyclical movements of the economy, independent of foreign financial flows. Such movements of the economy could change the structure of credit demand and therefore also effective bank credit supply. To examine the significance of the low monetization phase effects, when controlling for variables of standard business cycling, we also estimate simple VAR model (of order one) encompassing such business cycling. Three endogenous variables are used in the model: (relative) increment in credits to the business sector, GDP growth rate, and wage bill (per unit of GDP)[29]. A dummy for a low monetization phase is used as an exogenous variable. Because the ADF test denies unit root presence for all mentioned variables, a standard VAR model is estimated. Parameters of the model are given in Table 2.

In Figure 5 a twelve quarters response to the impulse of low monetization period is illustrated for the increment in credits to the business sector (in percentages of total bank credits increment). The simulated impulse of low monetization period is six quarters long[30]. Although parsimonious criteria (Swartz) as well as the short time series (32 quarters) used in the analysis are in favour of the lowest possible order of VAR model, an impulse response function is given for VAR of order one and two[31]. In Figure 5 one standard deviation error bands are added in both cases.

The simulated impulse of low monetization period significantly cut the relative increment in credits to the business sector. Peak values of decline, of over one standard deviation, are attained one quarter after the impulse of the low monetization period disappears. Just two quarters after the low monetization impulse started, a relative increment in credits to the business sector dropped by more than half of its standard deviation. The responses of relative credit increments are essentially the same for both VAR models.

4. BANK CREDIT RATIONING - MECHANISM

The role of information capital and collateral - hypothetical explanation. As documented, in the low monetization phase, considerable acceleration of bank credit growth was triggered by vanishing foreign financial flows. In banks, acceleration of credit growth caused not only maturity mismatch but also a deterioration of claims quality. The strong acceleration of credit growth increased the agency problem considerably, especially in smaller banks[32]. Facing the fast-growing number and volume of credits, smaller banks had no capacities to keep the quality of screening and monitoring unchanged.

So, despite the high minimum capital requirement for a full bank licence and strong average capital adequacy[33], the quality of collateral became a much more important condition for keeping the pace of credit growth, after falling monetization triggered significant credit acceleration. Because of much lower information capital, for smaller banks, solvency and especially liquidity of collateral were crucial.

The quality of available collateral differed considerably among the main segments of bank clients. Short-term (consumer) credits to the household sector were, in principle, insured by insurance companies, if the

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[29] Wage-bill variable is included in the studied VAR model because the bulk of the bank credits to non-business sectors present credits to the household sector. At the end of 1999, credits to the household sector represented 77% of total credits to non-business sectors; see, Monthly Bulletin BS.

[30] Average length of actual low monetization periods was 5.4 quarters.

[31] Estimated parameters of VAR with order 2 are available from the author upon request.

[32] See, Bole(1999b).

[33] After 1995, the minimum capital requirement for a full licence was 60 millions German marks. In the studied period, capital adequacy was smoothly declining; in 1999, it attained 13.9%.

client was already a customer of the bank (had a deposit account with the bank) and was employed in a solvent enterprise. Long-term credits to the household sector (housing loans) were usually collateralized additionally by mortgage. Other (non-bank) financial organizations used to offer liquid collateral (government bonds, commercial papers, bonds and stocks of blue chip enterprises, etc). Enterprises from the business sector (non-financial corporations) had much less liquid collateral, mainly immovable assets, for which the market was almost illiquid.

Bigger and older banks had disproportionately larger information capital. They were able to forecast net worth of clients more accurately, because they had a long business track record of clients, knew their suppliers and customers, knew their product niches, etc. Older and bigger banks also had an advantage in estimating net worth of potential new clients by knowing the performance of their existing clients, being active on similar buying or selling markets, and by knowing (their) clients which had business relationships with potential new clients. Therefore, existing information capital enabled bigger (and older) banks to mitigate an adverse selection problem with running in new clients more efficiently than smaller banks[34].

Many of the potential new clients from the business sector were among the better performing enterprises from the tradable sector (and exporters). So the low monetization phase was an opportunity to get new clients also for longer periods. By getting new clients from the business sector in a low monetarisation phase, bigger banks and banks with strong capital adequacy facilitated an increase in their market share, that is, they crowded out other (foreign and domestic) suppliers of credit in the long run.

Therefore, it could be expected that in the low monetization phase, smaller banks, banks with small information capital or banks with a relatively low capital adequacy ratio would step up credits predominantly to the household sector and to other (non-bank) financial institutions. Meanwhile, banks with larger information capital and stronger capital adequacy would not channel an increase in credits mainly to the household sector and to other (non-bank) financial institutions, at least not at the expense of growth of credits to the business sector.

Statistical evidence. The previous hypothetical explanation of the credit rationing mechanism stresses the role of fast credit growth and factors determining costs of deterioration in expected credit solvency. The most important factors would have to be information capital, quality of collateral and capital adequacy.

Identified factors of bank credit rationing are tested by the model

$$(1)\quad rBC_{it} = a_0+(a_1+a_2*LMP_{it})*rOC_{it}+(a_3+a_4*LMP_{it})*CA_{it-1}+(a_5+a_6*LMP_{it})*BS_{it-1}+u_{it}$$

Subscripts i and t indicate bank and year respectively. The meaning of variables in the model is as follows: rBC and rOC denote a rate of growth of credits to the business sector and to other sectors respectively; CA stands for capital adequacy and BS for the size of balance sheet; LMP is the dummy variable for the low monetization phase. Parameters at the dummy for a low monetization phase enable a testing of the significance of the low monetization modification effects on growth of credits to the business sector for the following factors: credit rationing (a_2), capital adequacy ratio (a_4) and the size of bank (a_6). It is supposed that the information capital of a bank is correlated with the relative size of its balance sheets. Therefore, significance of a_6 could indicate the low monetization modification effect of information capital on bank credit growth (information capital effect on rationing). The significance of the high monetization

[34] See, Bole(1999b).

effect of capital adequacy, balance sheet and growth of credits to other sectors on the growth of credits to the business sector could be evaluated through testing the significance of parameters a_1, a_3 and a_5.

The model is estimated on a panel date for the period 1993-1999. Because capital adequacy data are not available for shorter periods than years, bank-year panel data are used. Because periods of a low monetization phase do not fit completely to calendar years, central years are used. All data on individual banks used in the analysis are from the Central Bank internal database.

Credit growth rates are defined as December over December growth rates of corresponding credits for every particular bank. Capital adequacy is expressed in percentages, and the size of a balance sheet in percentages of the banking sector average size; timing of both variables is the end of the year. In the sample, for a particular year, all banks are included that were active at least in that (particular) year and in the year before. Because of mergers, bankruptcies and establishing of new banks, the panel is not balanced.

Model (1) is estimated by using the fixed effects method[35]. Results are presented in Table 3. In the first column a whole sample is used. Since in 1993 two big banks entered the rehabilitation status, their capital adequacy and balance sheet figures were drastically changed and their business behaviour regulated in the middle of 1993; in the second column of the Table estimates are given for a "clean" sample of the period 1994-1999.

In Table 3 parameter estimates and corresponding t-statistics (in brackets) are given. Estimates and t-statistics are given also for yearly fixed effects. The number of observations and adjusted R^2 are given at the bottom of Table 3.

In the first column, the effect of low monetization on rationing of credits to the business sector is significant at 0.05. Estimates also confirm the expected positive effect of capital adequacy. Capital adequacy mitigates rationing significantly at 0.05, in the low monetization phase. The sign of balance sheet size is expected (positive), but the estimate of the low monetization modification of information capital effect is not significant. Only fixed effects for 1996 and 1999 are significant at 0.05. In the periods of high monetization phase, credit activity of banks channelled to the business sector is positively (and significantly) correlated with credit activity channelled to other sectors (a_1 is positive and significant); capital adequacy and balance sheet are not significant for the periods of high monetization phase.

Figures in the second column (period 1994-1999) further corroborate the results for the whole sample. Low monetization modification of credit rationing effect and capital adequacy effect are again highly significant, but low monetization modification of balance sheet (information capital) effect is also significant, at least at the 0.10 level (t-statistic is equal to 1.8). The effect of a high monetization phase is additionally confirmed, too. Adjusted R^2 is also considerably higher (0.32) for the “clean” sample .

[35] Observing that a considerable correlation of time error component with yearly averages of growth rates of credits to other sectors as well as yearly averages of capital adequacies could exist, consistency of parameter estimates is secured using fixed effects estimation.

5. INTERPLAY OF EXCHANGE RATE AND CREDIT CHANNEL

Exchange rate and credit channel - descriptive analysis. Notwithstanding the exchange rate regime, central banks usually do not neglect the path of an exchange rate [36]. Neither does the Bank of Slovenia. It is documented elsewhere that, in the studied period of transition, the Central Bank massively intervened on the forex market to contain and neutralise the effects of considerable swings in forex flows on exchange rate appreciation and volatility. Forex interventions of the Central Bank were concentrated in high monetization periods[37].

In the low monetization phase, the exchange rate was in principle significantly de-managed: the Central Bank forex interventions for preventing and neutralising effects of net foreign financial inflows were scaled down. In the low monetization phase, appreciation pressures driven by excessive supply of forex diminished considerably or even disappeared altogether, so that in the periods of a focal episode, sterilization efforts of the Central Bank were much smaller or even absent. Therefore, almost free floating of exchange rate took place. Nevertheless, depreciation pressures increased in the later stage of all periods of a low monetization phase because of the considerable and systematic drop in monetization.

To illustrate the dynamics of an exchange rate in the periods of low monetization phase and corresponding dynamics of credit rationing, Figure 6 gives monetization in terms of GDP and growth rates of an exchange rate (for DM).

Comparison of different periods of a low monetization phase illustrates the potential effect of an exchange rate on rationing of bank credits to the business sector (see Figure 6). The period 1999 has to be compared with the periods 1993 and 1995-1996. Contrary to what the Central Bank did in the first two periods of a low monetization phase (1993 and 1995-1996), in 1999, it not only stopped sterilised forex intervention (as it had done in previous periods of low monetization) but launched heavy opposite intervention, to prevent exchange rate depreciation[38]. According to the graphs in Figure 6, it could be heuristically concluded that in 1999, a stable nominal exchange rate (in the period of large demonetization on the retail forex market[39]) was behind much stronger rationing of the credits to the business sector, in comparison with the previous periods of a low monetization phase.

Descriptive evidence shows that, in the low monetization phase, expected depreciation of an exchange rate had to play a crucial role for credit channel effects. Because of increased depreciation expectations, demand for investment goods in the business sector and demand for consumer durables (cars) increased (the planned time horizon of corresponding spending was shortened)[40]. An accelerated build-up of exchange rate depreciation expectations therefore additionally increased domestic credit demand, in the low monetization phase. This meant that adjusting the actual exchange rate path to the expected one (depreciation of exchange rate) effectively curbed further acceleration of bank credits[41]. However, accelerated depreciation (in the later stage of low monetization phase periods) coincided not only with mitigating credit demand but also with diminishing credit rationing of bank credits to the business sector.

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[36] See, for example, Obstfeld(1982).

[37] See, for example, Bole(1999a). See also Bank of Slovenia Annual Report.

[38] Because of inflation fears at the introduction of VAT in July 1999, the Central Bank intervened to curb depreciation pressures on the forex market, driven by a substantial fall in monetization on the retail foreign exchange market.

[39] Through forex operations on the retail forex marketit around 17% of M1 was withdrawn in 1999.

[40] Investment goods in the business sector and consumer durables are mostly imported goods or pure tradable goods.

[41] See, Bole(1999b).

Statistical evidence. To give some more formal evidence on the effects of the exchange rate interventions in the low monetization phase, VAR analysis is made. Using a simple three dimensional VAR model, responses to the exchange rate shock are studied through standard Choleski decomposition and assumed rank of variables exogenity[42].

It is already documented that in the monetization peaks the Central Bank as a rule increased its forex intervention efforts also by launching new instruments for neutralizing and containing costs of large foreign financial inflows. Therefore it is assumed that monetization enters the reaction function of the monetary authority. We assume also that in conducting exchange rate policy, the Central Bank took care also about the size of credit rationing.

Taking into account such assumptions, the analysed VAR model includes three endogenous variables: monetization (in percentages of GDP), ratio of an increment in the credits to business sector with total credits increment and the growth rate of an exchange rate. The rank of variables exogenity in the experiment is determined by the following order of variables: monetization, relative increments in the credits and exchange rate growth.

It is well documented that, in the nineties, capital flows were driven mostly by push factors[43]. So, net foreign financial flows (in percentages of GDP) are added as an exogenous variable to the model. In the opposite case, exogenous impulses (coming from international capital markets) influencing volatility of the monetization variable would not have been explained by the model. Foreign financial flows variable (in percentages of GDP) enters the model in the first difference.

A model is estimated for the period 1992/I to 1999/II. Both the small number of pieces of information and parsimonious criteria (Schwarz) are in favour of the smallest (first) order of VAR model. All variables in the model were tested for the presence of a unit root; ADF test was significant for all of them at least at the 0.05 level of significance.

An estimated model is presented in Table 4; parameter estimates, t-statistics and adjusted R^2 are given. Impulse response function of monetization and relative increments in the credits are illustrated in Figure 7.

Impulse of one standard deviation to the exchange rate growth would push monetization up already in the second quarter. Peak impact on monetization (per unit of GDP) exceeds 21% of standard deviation of the monetization variable; it would be attained three quarters after a shock to the exchange rate policy. The response of relative increments in credits to the business sector follows a similar time shape. Peak value, of around 20% of standard deviation, is attained in the third quarter after impulse to the exchange rate growth path. Taking into account average values of both variables in the studied period, impulse to exchange rate of 1% would in the peak quarter increase the ratio of an increment in business credits with an increment of total credits by 1.5 percentages points. A cumulative increase in relative credit increments in eight quarters would attain slightly less than 75% of standard deviation of a relative increment in credits to the business sector.

[42] See, for example, Christiano,Eichenbaum and Evans(1998).

[43] See, for example, Fernandez_Arias and Montiel(1997). On factors of foreign financial flows in Slovenia , see, for example, Bole(1999a).

CONCLUSIONS

The paper tackles specific bank lending channel effects activated by the volatility of foreign financial flows. Empirical evidence is presented for Slovenia, in the period of transition (1992-1999).

Large swings in foreign financial flows caused considerable volatility of bank credit growth. Aside from banking soundness, volatility of the bank credit supply crucially affected also the bank lending channel of the monetary policy.

Monetization of foreign exchange on the retail forex market identifies appropriately the changes in the monetary policy environment that are decisive for specific credit rationing effects, triggered by foreign financial flows.

Swings in monetization on the retail forex market caused not only cyclical movement in bank credits, but also cyclical segmentation of the borrowers. In the low monetization phase, credits to the business sector (non-financial corporations) were rationed. Real costs of rationing were significant, because alternative (non-bank) domestic credit sources were scarce. Trade credit was the only more important alternative, but it was of negligible relevance for mitigating rationing of a whole business sector.

In the low monetization phase, uncertainty with regard to borrowers' creditworthiness is pinpointed as the main factor behind rationing of the bank credits to the business sector. On the segment of the credit market where information asymmetries are less important (credits with qualitative-liquid collateral) and therefore a smaller entry barrier, the majority of banks were active when falling monetization accelerated credit demand. Just the opposite happened on the segment of the credit market where information asymmetries are important and therefore entry barriers much higher; on that segment, only banks with high information capital or strong capital adequacy were active.

In the low monetization phase, therefore, banks with larger information capital (bigger banks) and banks with higher capital adequacy were not increasing credit supply to the household sector and to other (non-bank) financial institutions at the cost of curbing credit supply to the business sector. Smaller banks and banks with a lower capital adequacy ratio increased credit supply predominantly to the household sector and to other financial institutions; borrowers from those two sectors had better (more liquid) collateral than the business sector.

In the low monetization phase, delayed (or even absent) depreciation of the exchange rate increased rationing of the credits to the business sector.

Three differences from the bank lending channel known from literature are important. Firstly, the studied "channel" amplifies and propagates exchange rate and other forex intervention effects (of the monetary policy transmission mechanism), and not interest rate effects as the conventional bank lending channel does. Secondly, the segmentation of the business sector versus other borrowers is highlighted, and not small versus large enterprises segmentation known from literature. And thirdly, only a specific segment of banks is identified as active in rationing business sector credits.

STATISTICAL APPENDIX

Table 1
Low monetization phase effects

Dependent variable	F - significancy	t - statistics[b]
Increment in credits to other sectors	0.245	0.20
Increment in credits to the business sector	0.042	-0.96
Relative increment in credits to the business sector[a]	0.036	-2.02

Source: Time series data are from Monthly Bulletin BS; own calculations.
Notes: [a] Increment in credits to the business sector in percentages of total bank credits increment.
[b] t -statistics of the sum of coefficients at Almon distributed low monetization dummy.

Table 2
VAR model; business cycles and low monetization effects

	Lag	Credits	GDP	Wage bill
Intercept		-80.19 (-1.2)	-39.10 (-3.4)	3.429 (2.9)
Credits[a]	1	-0.007 (-0.03)	-0.027 (-0.8)	0.005 (1.3)
GDP[b]	1	1.188 (1.6)	-0.405 (-3.0)	0.031 (2.2)
Wage bill[c]	1	17.34 (1.9)	6.000 (3.8)	0.518 (3.2)
Low monetization[d]	1	-17.07 (-1.9)	0.379 (0.2)	-0.132 (-0.8)
R^2		0.26	0.52	0.54

Source: Time series data are from Monthly Bulletin BS; own calculations.
Note: [a]Increment in credits to the business sector in percentages of total credits increment.
[b] Growth rate of GDP.
[c] Wage bill per unit of GDP.
[d] Dummy for low monetization phase.

Table 3
Factors of credit rationing[a]

	sample 93-99	sample 94-99
Intercept	47.299	35.594
	(3.1)	(2.9)
Credits to other sectors		
a_1	0.214	0.214
	(3.1)	(3.9)
a_2	-0.170	-0.286
	(-2.1)	(-4.0)
Balance sheet		
a_5	-0.028	-0.028
	(-0.8)	(-1.0)
a_6	0.024	0.075
	(0.5)	(1.8)
Capital adequacy		
a_3	-0.079	-0.079
	(-0.3)	(-0.4)
a_4	0.850	1.314
	(2.0)	(3.6)
Fixed effects		
1994	-11.70	
	(-0.5)	
1995	-9.749	-8.207
	(-0.6)	(-0.4)
1996	-38.00	-39.64
	(-2.2)	(-2.1)
1997	-32.54	-20.84
	(-1.6)	(-1.8)
1998	-25.15	-13.45
	(-1.2)	(-1.1)
1999	-61.08	-57.71
	(-3.7)	(-3.4)
R^2	0.21	0.32
No observations	175	150

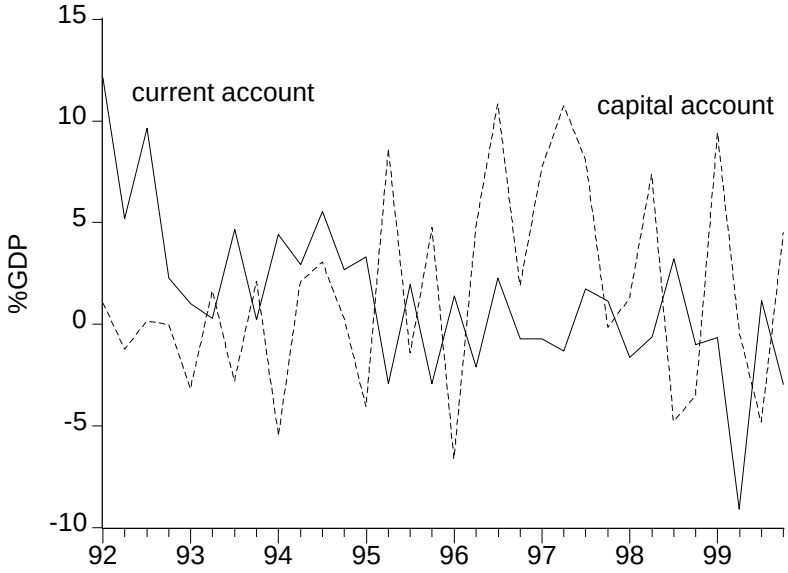
Source: The Bank of Slovenia internal data.
Note: [a] For every factor, first parameter indicates the effect of high monetization phase, and second parameter the effect of low monetization modification.

Tabela 4
VAR model; exchange rate effects

	Lag	Monetization	Credits	Exchange rate
Intercept		1.433	34.73	0.789
		(1.3)	(3.9)	(0.8)
Monetization[a]	1	0.752	2.304	0.023
		(4.7)	(1.8)	(0.2)
Credits[b]	1	-0.029	0.095	0.0004
		(-1.3)	(0.5)	(0.02)
Exchange rate[c]	1	0.293	1.887	0.524
		(1.9)	(1.5)	(3.8)
Capital flow[d]	1	0.016	-1.616	-0.0018
		(0.2)	(-2.9)	(-0.03)
R^2		0.53	0.43	0.41

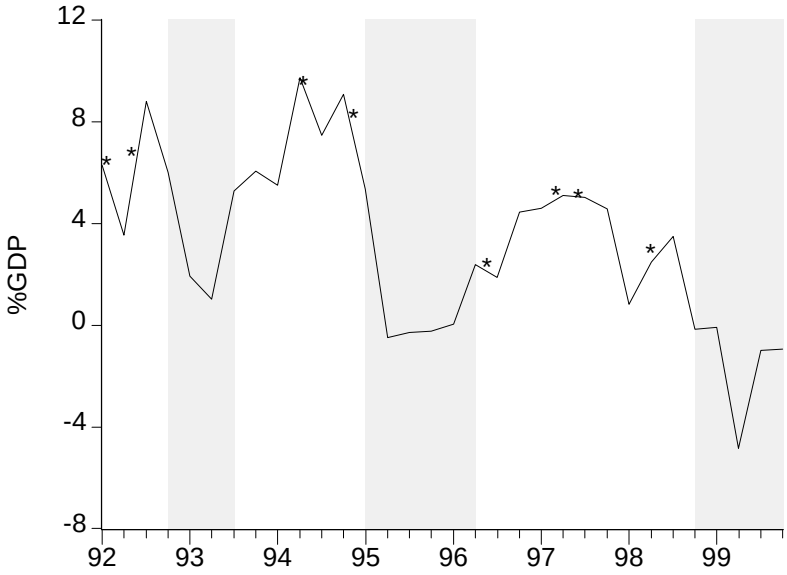
Note: [a] Monetization in percentages of GDP.
[b] Increment in credits to the business sector in percentages of total credits increment..
[c] Growth rate of exchange rate (DEM).
[d] Increment in net capital flow (in percentages of GDP).

Figure 1
Balance of payments



Source: Monthly Bulletin BS; own calculations.

Figure 2
Monetization on the retail forex market

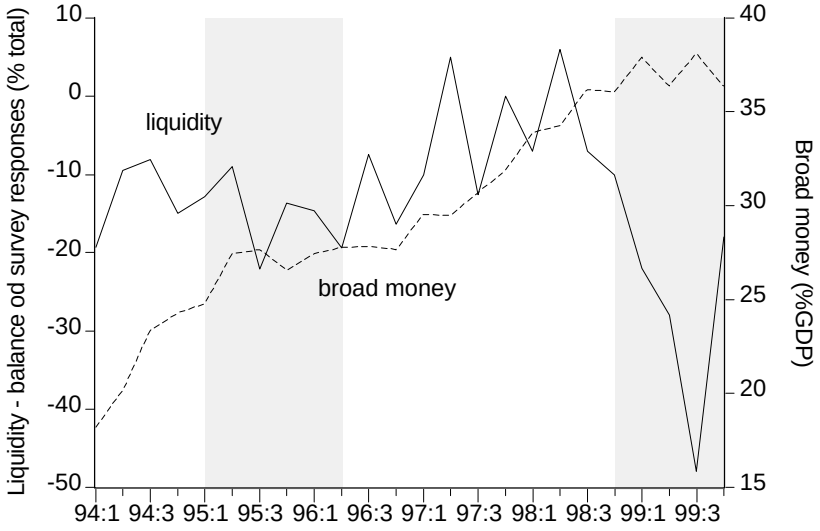


Source: Monthly Bulletin BS; own calculations.
Note: Star indicates launching of new measure (instrument).

Figure 3
Monetization and increment in credits to the business sector

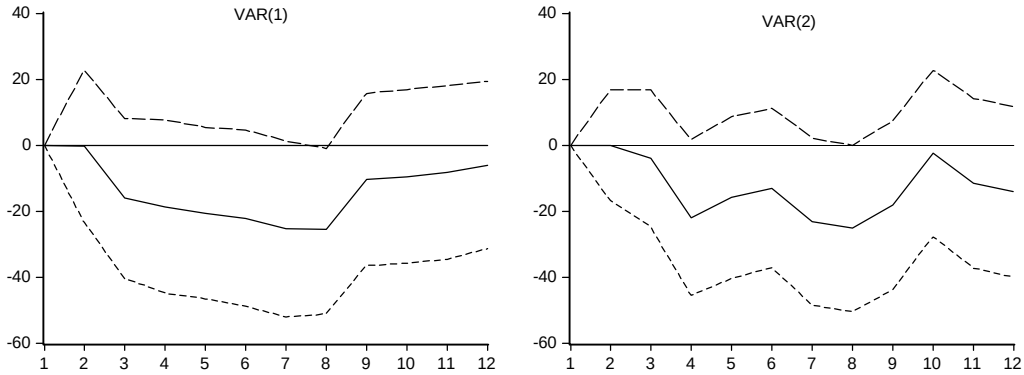
Source: Monthly Bulletin BS; own calculations.

Figure 4
Liquidity[a] of the business sector and broad money



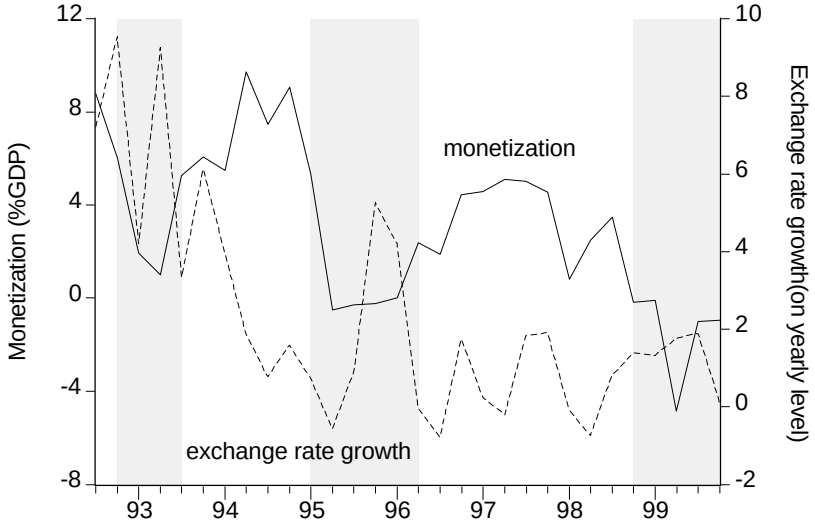
Source: Monthly Bulletin BS; "Business Expectations of Enterprises", Chamber of Commerce; own calculations
Note: [a] Balance of survey responses on assessed liquidity (IFO methodology).

Figure 5
Responses of relative business credits increment[a] to low monetization period impulse



Source: own calculations.
Note:[a] Increment in credits to the business sector in percentages of increment in total credits.

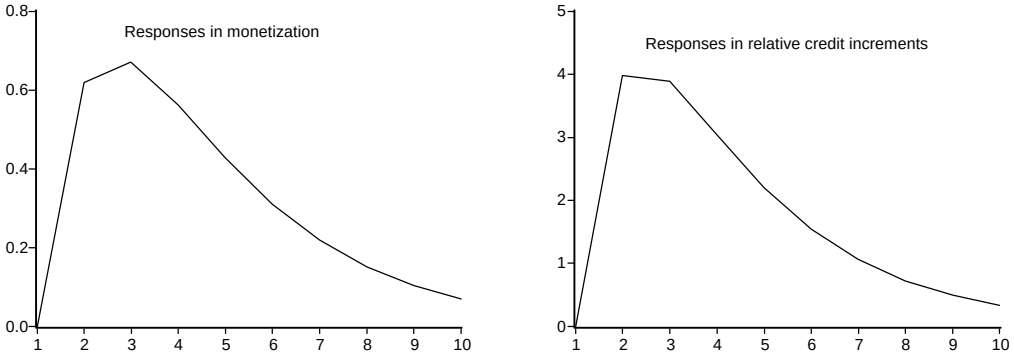
Figure 6
Monetization and exchange rate growth



Source: Monthly Bulletin BS; own calculations.

Figure 7

Responses to impulse in exchange rate growth
(monetization[a], relative credits increment[b])



Source: Own calculations.
Note: [a] Monetization on the retail forex market (in percentages of GDP).
[b] Increment in credits to the business sector in percentages of increment in total credits.

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