

Monetary Policy – Transmission Channels to Prices: a Year of Inflation Targeting

Jasna Dimitrijević* **The article below presents a general overview of transmission channels of monetary policy in the inflation targeting regime (IT) and their specific features in Serbia. We conclude that during the first year of IT the main transmission channel was the exchange rate channel, while it proved difficult to influence the quantity of credit through monetary policy measures (interest rate channel and credit channel). Analyzing the current situation and perspectives of monetary policy transmission, we use the existing data observations on Serbia, as well as other countries' experiences. Our conclusions are supported through an econometric assessment of the NBS interest rate effect on the growth of credit in Serbia.**

Introduction

Inflation in Serbia was 17.7% at end-2005, and 6.6% at end-2006, with core inflation standing at 14.6% in 2005 and 5.8% in 2006. For end-2007, the NBS targets core inflation in the interval from 4% to 8%, while for end-2008 from 3% to 6%. The level of inflation in Serbia appears, for the second year in a row, rather a result of a systematic active policy of the NBS, entitled “the road to inflation targeting” when it was introduced in August 2006 (hereinafter: IT), than a result of circumstantial events or sporadic efforts by some institutions aimed at stabilization. Although this policy, whose main instrument is the repo interest rate under the direct control of the NBS, has been in force for more than a year, one can often find reactions and interpretations of monetary policy, which come even from professional circles, testifying to a lack of understanding of the mechanisms of its transmission to prices in Serbia. Thus, for instance, following an increase in the reference interest rate of the central bank, one can hear comments that it will cause a rise in interest rates on loans and a decline in borrowing by enterprises and households, which will then in turn adversely affect economic growth. Underlying such argumentation is correct but a purely theoretical interpretation of the impact of the central bank's interest rate on aggregate demand. This is only the so-called interest rate channel in the transmission of monetary policy, which is the most influential of the several parallel channels when it comes to developed countries. Is that a scenario that will indeed happen in Serbia? What are the specific features of the transmission of monetary policy in transition countries? What is the relationship between the exchange rate and the interest rate, as well as relative importance of the exchange rate in the transmission of monetary policy? These are the questions that we will attempt to answer in this article. The objective of this article is to, through a comprehensive account of it, point to the specific features of the transmission of monetary policy within the framework of IT in Serbia, and to highlight some critical points of that whole mechanism. This analysis represents our contribution towards the creation of a body of knowledge for public discussion with regard to the efficiency of monetary policy and the rationale for the use of individual instruments. This article will hopefully open topics for further analysis, which can contribute to even better understanding of the operation of monetary policy, a direction of research very scarce in Serbia so far.

We could summarize our main findings in this paper as follows. Although the period that we are looking at is brief and we lack complete relevant information that would give detailed evidence of the mechanism through which monetary policy in Serbia was reflected in its final objective

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– prices, we believe that all available collected information, combined with the experience of other transition countries, offers a complete picture after all. That picture speaks in favor of IT as a concept, because it introduces order and predictability into the sphere of monetary policy, thus additionally stabilizing inflationary expectations. Although the main transmission channel of monetary policy in the IT regime in developed countries is the interest rate channel through which this rate translates into other interest rates and affects aggregate demand and prices, in Serbia, as in other small and open economies at the stage of transition with a high degree of euroization, this channel has played a very secondary role. Likewise, it appears that the main role in the stabilization of inflation in the first year of IT in Serbia was played by the exchange rate channel. The exchange rate was influenced, in addition to independent foreign capital inflows to Serbia, by inflows that came for the purpose of investing in repo transactions of the NBS, in which manner the NBS practically indirectly – through its interest rate – impacted upon the flows on the foreign exchange market and on the exchange rate which was increasingly formed, in the course of time, without direct interventions of the NBS on the foreign exchange market. And finally, from the all-encompassing review of monetary policy in Serbia, it is possible to conclude that monetary policy could not impact upon the volume of lending to the domestic private sector significantly, particularly not through the NBS interest rate. Limited results with respect to the impact on credit growth were achieved by using high reserve requirement ratios or macroprudential measures aimed at reducing an increase in certain categories of bank loans and advances. All those results of efforts to contain credit growth often turned out to be short-lived, because a flexible financial system managed to find ways to meet high demand for loans, in the longer run, through an alternative channel, even if it meant through direct foreign loans extended to local companies in Serbia. This is how we gained an impression that credit growth, in the medium term, was determined primarily by demand for credit, which has remained high with just a limited space to influence it through monetary policy. Still, experiences of other countries suggest to us that the interest rate channel will strengthen over time, as will the possibility to change aggregate demand through other rates by changing the reference interest rate, and thus affect credit growth as well, while the significance of the exchange rate in the price fixing is expected to gradually weaken.

The following text has been structured as a three-section paper. The first section „Theoretical and Practical Framework for the Implementation of Monetary Policy in Serbia“ provides an overview of all main channels of transmission of monetary policy proposed by the theory and with specific features in evidence in Serbia. The main conclusion of the first section, that in the initial period of the switch to IT the main role in curbing inflation was played by the exchange rate, is corroborated in the second section of the text „Achievements of Monetary Policy Concerning the Impact on the Volume of Credit in the First Year of IT in Serbia“. With an empirical finding, we document here that there was no major impact on bank credit growth through the basic instrument of monetary policy – the interest rate of the central bank, based on the data from balance sheets of individual banks in the period from Q2 2004 to Q2 2007. The third section, “Conclusion”, systematizes the basic theoretical and empirical findings about the conduct of monetary policy with a special emphasis on the situation in Serbia.

I. Theoretical and Practical Framework for the Implementation of Monetary Policy in Serbia

1. Concept of „ Inflation Targeting “: Basic Terms

Inflation targeting (IT) is a framework for the conduct of monetary policy to which the NBS¹ switched in August 2006. That regime, incidentally, has been in use in a large number of developed countries since the 1990s², and almost all transition countries in Europe have

1 The Memorandum of the National Bank of Serbia on the Principles of a New Monetary Policy Framework, 30 August 2006. The NBS has officially switched to a new monetary policy framework by virtue of this document, which has been announced as a „road toward inflation targeting“.

2 It was first introduced by New Zealand, followed by Canada, the UK, Sweden, Finland, Australia and Spain.

introduced it, one by one. The framework implies that the central bank announces in advance a defined target for inflation in the coming period, and then commits itself to the achievement of that objective. The main monetary policy instrument within this regime is the reference (repo) interest rate. The central bank, by using that rate on 2w repo agreements, withdraws liquidity from the system or vice versa, injects it back into the system through transactions with banks that appear on the market for reserve money, commensurate with the interest in short-term repos. The reserve requirement ratio is just an auxiliary instrument in the hands of the monetary authorities. IT also implies a flexible exchange rate, as well as marked transparency of monetary policy, which is achieved through frequent communication of the central bank with the public – sharing information on its work and intentions for the coming period regarding monetary policy. Likewise, it is believed that the expectations of the public vis-à-vis price stability are thus reinforced, by building confidence in the commitment on the part of the central bank to achieving the set target.

In addition to the repo interest rate set by the NBS through its decisions, which constitutes the basic monetary policy instrument, also in use are: (a) the reserve requirement ratio (hereinafter: RRR) on deposits of commercial banks, which has only an ancillary role³ and (b) interventions on the foreign exchange market, which, after the adoption of the Memorandum, have, in principle, ceased to be a direct instrument of monetary policy; the exchange rate regime of free float is introduced, but the central bank has not ruled out the possibility to intervene, particularly if fluctuations over the short run threaten to jeopardize the financial stability of the market.

Since a central bank cannot directly influence prices, although its primary objective is price stability⁴, it exerts influence, through direct control over the monetary policy instruments, on macroeconomic flows which, at the end of the day, produce a certain price level. One of the preconditions for successful conduct of monetary policy is, therefore, good knowledge of all transmission mechanisms that exist on the path from the interest rate of the central bank to prices and which can be influenced, to a certain degree and in a particular period of time, by monetary policy instruments. These so-called *transmission mechanisms of monetary policy* are complex and therefore often called in the economic literature the black box⁵ since they consist of multiple parallel channels with *different and changeable lags* in the response of the final target (price) to the changes in the instrument controlled by the central bank (the short-term interest rate). Similarly, *different channels have different importance in the transmission of impulses originating from the same monetary policy instrument: (a) in different countries and (b) in different periods of the development of the economic system in a single country.*

Box 1. Model for Projections and Analysis of Monetary Policy

Central banks rely on well elaborated econometric models which integrate within them, in the form of a number of related equations, the behavior over time and mutual influence of basic macroeconomic variables. Such a model (or sometimes several different models) is often combined with the „feeling“and „experience“of monetary policy decision-makers. By using the model, the central bank first arrives at a forecast for inflation in the coming period. Then, as the end-result, it obtains a simple instruction in terms of the necessary level of the reference interest rate (that it has the right to change by its own decisions) in order to bring the projected inflation for the coming period (inflation that would have happened without a change in the rate) to the level announced as a target for that same period. One such model has been developed in Serbia as well, as part of activities for the introduction of a new monetary policy framework (IT).

For the projection of inflation and analysis of monetary policy, the NBS uses the *structural model* based on short-term and medium-term interaction between monetary policy, output, inflation and the exchange rate. That model, as a result of simultaneous equations, gives to the central bank a basis for the adoption of a decision on monetary policy in the coming period. The model used by

3 The Memorandum of the National Bank of Serbia on the Principles of a New Monetary Policy Framework, 30 August 2006, p.6.

4 The statutorily defined primary objective of the NBS is to ensure price stability. Article 3, The Law on the NBS, RS Official Gazette no. 72/2003

5 Bernanke and Gertler (1995)

the NBS, which it develops and makes more complex over time, has three basic equations presented for the first time in the NBS Report on Inflation for Q1 2007.

As an illustration of the model for projections and analysis of monetary policy we shall present here another model that refers to Serbia. It consists of four equations (1 to 4) together with coefficients (Table L3-1). The model is taken over from a presentation (March 2007 at the NBS) of a working version of the material about the model for analysis of monetary policy in Serbia, by E. Mottu, a Senior Economist of the IMF European Department. As a methodological basis of the presented model another IMF working paper (Berg, A. Karam, Ph. and Laxton D, 2006) has served, which contains a summary of experiences from many countries in which those models are applied and instructions of the author for the specifications of such models and for the selection of values of coefficients. Although the model in the mentioned presentation refers to Serbia, neither the equations nor the coefficients are identical to those applied by the NBS in its model, but they constitute a good simulation in which account has been taken of the specific features of the Serbian economy and experiences of other comparable countries. The coefficients, both those in the simulated model and in the model applied by the NBS, were not obtained by means of an econometric estimate based on time series, but by means of a calibration procedure¹.

In four basic equations the most important relationships between the interest rate of the central bank, aggregate demand, supply, the exchange rate and inflation are contained. They include: (1) the equation of aggregate demand or the output gap (the so-called IS curve), (2) the price fixing equation (adjusted Philips's Curve which takes expectations into account), (3) the exchange rate equation – the so-called uncovered interest parity and (4) the equation of the monetary policy response – so-called Taylor's Rule.

(1) **Aggregate demand: measured by the output gap** – the variable $ygap$ (by the deviation of the actual quarterly GDP from the medium-term trend)

$$ygap_t = \beta_1 ygap_{t+1} + \beta_2 ygap_{t-1} - \beta_3 RRgap_{t-1} + \beta_4 zgap_{t-1} + \beta_5 ygap_t^{EU} + \varepsilon_t^{ygap}$$

where $RRgap$ constitutes a deviation of the real interest rate from the equilibrium value (which can be approximated by the medium-term trend), the variable $zgap$ stands for the deviation of the real exchange rate from the medium-term trend, and ε random deviation.

(2) **Core (targeted) and headline inflation: the Phillips curve, rational expectations**

$$\pi_t = \alpha_1 \pi_{t+4} + (1 - \alpha_1) \pi_{t-1} + \alpha_2 ygap_{t-1} + \alpha_3 (z_t - z_{t-1}) + \alpha_4 \pi_{rpoil,t} + \alpha_5 \pi_{rpoil,t-1} + \varepsilon_t^\pi$$

$$\pi_{core,t} = \alpha_{c1} \pi_{t+4} + (1 - \alpha_{c1}) \pi_{t-1} + \alpha_{c2} ygap_{t-1} + \alpha_{c3} (z_t - z_{t-1}) + \alpha_{c4} (\pi_{t-1} - \pi_{c,t-1}) + \varepsilon_t^{\pi core}$$

(3) **The dinar exchange rate: the equation of the uncovered interest parity, the relationship between the differential of interest rates and the exchange rate**

$$z_t = \delta_1 z_{t+1} + (1 - \delta_1) z_{t-1} - (RR_t - RR_t^{EU} - \rho^*)/4 + \varepsilon_t^z$$

where z stands for the real exchange rate, RR^{EU} the real interest rate on the money market of the euro area, and ρ^* the premium for investing in Serbia.

On the basis of projected values for the period t , which arise from the relationships in the first three equations of the model, in the equation (4) the instruction for the central bank is obtained – the level of the nominal interest rate of the central bank RS , which is necessary to achieve the inflation target, i.e., to bring the forecast inflation, in the case of status *quo* with respect to monetary policy π_{t+4} in the coming period, down to the targeted π_{t+4}^* .

(4) **Taylor's Rule: instructions for monetary policy**

$$RS_t = \gamma_1 RS_{t-1} + (1 - \gamma_1) * [RR_t^* + \pi_t + \gamma_2 (\pi_{t+4} - \pi_{t+4}^*) + \gamma_3 ygap_t] + \varepsilon_t^{RS}$$

where RR^* stands for the equilibrium interest rate in Serbia over the observed period.

¹ *Calibration* is a method for obtaining coefficients that are based on expected theoretical relationships among macroeconomic values, experiences from other countries and the feeling of the author of the model for real relationships in the country to which the model applies. One resorts to it due to short time-series and macroeconomic relationships, which are very unstable in a transition country and which change with undertaken reforms and policy changes, and prevent an efficient econometric estimate of causalities.

Table L3-1 Definition of the Model and Values of Coefficients in Mottu's Simulation, 2007

| Equation and variables | Coefficient | Range | | Serbia | Euro Zone | Czech Republic | Romania |
|--|---------------|----------|----------|--------|-----------|----------------|---------|
| | | From | To | | | | |
| (1) Output gap (ygap_t) | | | | | | | |
| Lagged output gap (ygap _{t-1}) | β_2 | 0.5 | 0.9 | 0.5 | 0.6 | 0.6 | 0.75 |
| Proizvodni jaz u narednom periodu (ygap _{t+1}) | β_1 | 0.05 | 0.15 | 0.1 | 0.1 | 0.1 | 0.1 |
| Realna kamatna stopa u prethodnom periodu (RRgap _{t-1}) | β_3 | zbir 0,1 | zbir 0,3 | 0.02 | 0.15 | 0.1 | 0.1 |
| Realni jaz deviznog kursa u prethodnom periodu (ygap _{t-1}) | β_4 | ... | ... | 0.08 | ... | 0.1 | 0.02 |
| Proizvodni jaz u Evropskoj Uniji (ygap ^{EU} _t) | β_5 | ... | ... | 0.1 | ... | ... | 0.15 |
| (2a) Inflation (p_t) | | | | | | | |
| Expected inflation for the next period (π_{t+1}) | α_1 | 0 | 1 | 0.4 | 0.2 | 0.2 | 0.25 |
| Lagged output gap (ygap _{t-1}) | α_2 | 0.25 | 0.5 | 0.2 | 0.3 | 0.3 | 0.3 |
| Change in real exchange rate ($z_t - z_{t-1}$) | α_3 | ... | ... | 0.8 | ... | 0.1 | 0.08 |
| Change in oil price (p _{poil,t}) | α_4 | ... | ... | 0.01 | ... | ... | ... |
| Lagged change in oil price ($\pi_{\text{poil},t-1}$) | α_5 | ... | ... | 0.01 | ... | ... | ... |
| (2b) Core inflation ($\pi_{\text{core},t}$) | | | | | | | |
| Expected inflation in the future period (π_{t+4}) | α_{c1} | 0 | 1 | 0.4 | 0.2 | 0.2 | 0.25 |
| Lagged output gap (ygap _{t-1}) | α_{c2} | 0.25 | 0.5 | 0.2 | 0.3 | 0.3 | 0.3 |
| Change in real exchange rate ($z_t - z_{t-1}$) | α_{c3} | ... | ... | 0.85 | ... | 0.1 | 0.08 |
| Difference between total inflation and core inflation in the past period ($\pi_{t-1} - \pi_{\text{core},t-1}$) | α_{c4} | ... | ... | 0.25 | 0.25 | 0.25 | 0.25 |
| (3) Foreign exchange rate (z_t) | | | | | | | |
| Expected real exchange rate in the next period (z _{t+1}) | δ_1 | >0 | 1 | 0.4 | ... | 0.4 | 0.4 |
| (4) Monetary policy rule - Taylor rule (RS_t) | | | | | | | |
| Reference interest rate in the previous period (RS _{t-1}) | γ_1 | ... | ... | 0.7 | 0.5 | 0.5 | 0.4 |
| Gap between forecasted and targeted inflation for the future period ($\pi_{t+4} - \pi_{t+4}^*$) | γ_2 | ... | ... | 2 | 2 | 2 | 2.5 |
| Current output gap (ygap _t) | γ_3 | ... | ... | 0.5 | 0.5 | 0.5 | 0.5 |

Source: Mottu, 2007, presentation at the NBS.

Box 2. Reserve Requirement – an Important Ancillary Monetary Policy Instrument

The *repo interest rate* is presented as the main monetary policy instrument in Serbia¹, and the *reserve requirement* as an ancillary instrument which will „contribute to the transmission of the reference rate to the market and to a balanced development of financial markets, without undermining the stability of the financial system²“. However, the reserve requirement on the deposits of banks (dinar and foreign exchange deposits, which include dinar deposits indexed to foreign currencies), although not frequently changed, still constitutes an important anchor of monetary policy with, as it seems, a strong effect on financing flows through bank intermediation. This effect is owed to the level, i.e., a strong repressiveness of this rate which is applied to the foreign exchange base: 45%, except for new foreign exchange savings deposits 40%. On dinar deposits the reserve requirement ratio is considerably lower and amounts to 10% and 5% depending on the term of the deposit³.

If we look at the period from 2001 to end-2007 and the use of the RRR which varied depending on the base, we can conclude that it had a changeable role, though still exerting influence on monetary aggregates: sometimes the role of a *monetary policy instrument* and sometimes of a *prudential control of the financial system*. When it used the RRR as a monetary policy instrument, the NBS was mostly mitigating bad consequences of the open capital account under the conditions of thin financial markets, when relatively low foreign capital inflows (through the mediation of locally present foreign banks) create a credit boom.

Thus the RRR on new foreign exchange savings deposits of households, which the NBS has maintained at a high level since 2001 when the accumulation of savings deposits started (from 50% in 2001 to 40% in 2007) – had an important prudential role to protect holders of savings deposits and strengthen their confidence in the banking system, by preventing banks from managing almost one half of the collected new savings deposits, which they have to deposit with the NBS.

The reserve requirement on other foreign exchange deposits of banks had a pronounced character of a monetary measure. Specifically, it hit foreign sources of banks, and among them especially borrowing by (foreign owned) local banks from their mother banks abroad – a significant source of funding for new investment in 2004, 2005, and the first half of 2006⁴ – and foreign exchange de-

1 The Memorandum of the National Bank of Serbia on the Principles of a New Monetary Policy Framework, 30 August 2006.

2 Idem.

3 For more details on the changes in the base and rates see Box 1, Section 8 “Monetary Flows and Policy” and the Report on Inflation for Q2 2007, annex 1, the NBS.

4 See QM1–QM9, Section 8 “Monetary Flows and Policy”, Table: Bank Funding, Credit and Investment Activity.

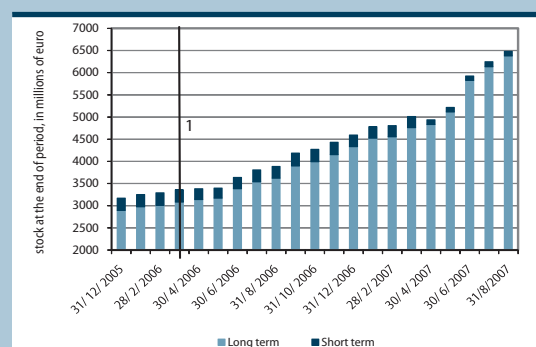
posits of non-residents and companies. The reserve requirement ratio on this part of the foreign exchange base related to the „imported foreign exchange for investment“, started to diverge from the ratio on the dinar base and to go up in May 2005, when it was set at 26% and several times raised to 40%, which is its present level. The most dramatic change regarding the reserve requirement ratio on the foreign exchange base occurred in April 2006 when the ratio on foreign borrowing by local banks with the repayment period of up to two years was increased to 60%.

However, although it is difficult to establish a reliable causality, some data indicates that the tightening of the reserve requirement ratio on the foreign exchange base aimed at “severing” a channel of foreign financing inflows in fact opened another channel. Thus, after the introduction of the reserve requirement on foreign borrowing by banks, this type of borrowing faded out, but the capital of foreign banks started to increase (Table T8-4). Likewise, after May 2006, when the reserve requirement on the part of the foreign exchange base was increased to 60%, it was possible to observe a higher growth of direct foreign borrowing by local companies. For the past two years, those loans were going up at an annual rate of nearly 40%, thus reaching the level of 22% of GDP, which is the level of credit to enterprises from the domestic banking system; these loans have become a significant source of financing for local companies, as well as a challenge for the monetary authorities and financial supervision, since they are not a standard way of borrowing. For the mentioned reason, not very much is known in theory about them, and few registered experiences from international practice give us limited lessons.

Specifically, *direct foreign credit* is a phenomenon which exists in other transition countries and Latin American countries, too. Still, as the data on such credit is difficult to obtain, there are not many analyses which provide an in-depth review of causes and consequences of this phenomenon. It is well-known, however, that the inflow of direct foreign credit in transition countries was more intensive before foreign banks entered the domestic banking system,⁵ while after the entry and expansion of the market of foreign banks the volume of such credit was reduced⁶! The above confirms the previously presented assumption that the accelerated inflow of such loans to Serbia in the last two years probably was a consequence of the high reserve requirement ratio on foreign borrowing by banks. From the standpoint of financial stability, on the experience of Latin America⁷, it was recorded that in the periods of crises on local financial markets, foreign banks were with-

drawing from these investments more rapidly than foreign banks which had invested locally through the domestic banking system!

Graph L3-2. Direct Foreign Borrowing by Enterprises, Total Stock of Credit in Millions of Euros, 2005–007



Source: the NBS

1) The introduction of the reserve requirement ratio of 60% on foreign borrowing by banks up to two years.

The second possible negative consequence of the high reserve requirement on foreign exchange sources of banks in Serbia – which is exactly linked to direct foreign borrowing by enterprises – is a distortion in access to loans for different types of companies. Namely, larger companies with better international reputation have access to direct foreign credit, while small- and medium-sized local companies have none. The only remaining option for them is funding from the domestic system, where the volume of credit supply for enterprises goes down considerably, because it is more expensive for banks due to the high and repressive reserve requirement ratio. In this manner, a

danger is created in terms of a more favorable access to financing sources for larger companies, in which manner one can find himself in a situation, through their strengthening at the expense of small- and medium-sized companies, where there will be monopolies and potential sources of inflation of the so-called structural nature!

5 The entry and dominating position of foreign banks is immanent to all transition countries with the exception of Slovenia, where foreign banks took only a smaller segment of the market.

6 Haas R.T.A. and van Lelyveld I.P.P, 2004.

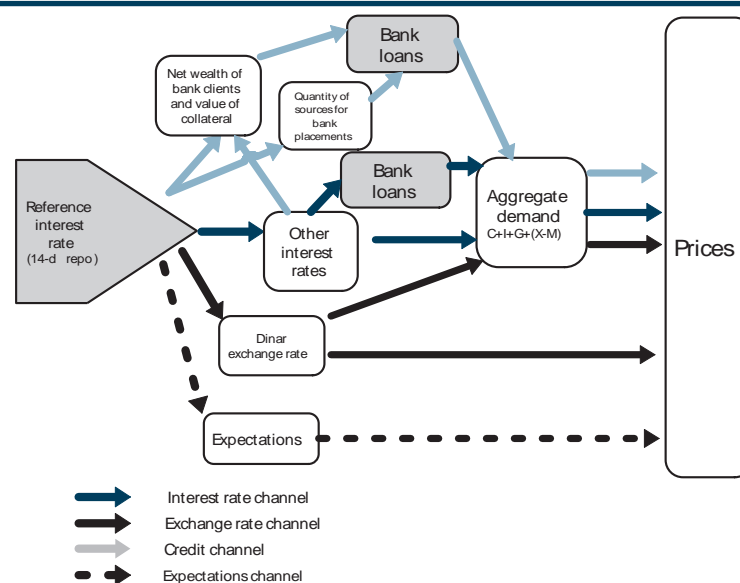
7 Peek J. and Rosengren E, 2000.

Still, long-term successful practice of many central banks in the world shows that it is possible to establish a framework/rule by which one can be guided in the conduct of monetary policy. That rule rests on good knowledge of the functioning of a specific economy and transmission mechanisms of monetary policy characteristic of that economy. That requires models which contain in themselves the basic macroeconomic relations in a country (Box 1).

2. Transmission Channels of Monetary Policy and Specific Features in Transition Countries and in Serbia

The theoretical and empirical research into transmission channels of monetary policy can be summarized in the form of four main channels through which prices are influenced (Figure L3-3): (1) the interest rate channel, (2) the exchange rate channel, (3) the credit channel and (4) the expectations channel. Empirical studies⁶, on the other hand, indicate that there are certain specific features in transition countries and in small open economies when it comes to the already established transmission channels which operate in developed market economies. In most of the cases, these specific features also apply to the transmission of monetary policy in Serbia. The further text will discuss in more detail the characteristics of each of these channels, as well as their relevance in transition economies in general and in Serbia in particular.

Figure L3-3. A Chart of Transmission of Monetary Policy, which Uses the Reference Interest Rate as an Instrument, to Prices



Source: The author.

2.1. Interest Rate Channel

The interest rate channel is the main („textbook“) channel which explains and studies the impact of the interest rate on prices. It consists of the following two stages: (1) transmission from the short-term nominal rate, which is under the influence of the central bank, to short-term and long-term *real interest rates* and (2) *the impact of the real interest rate on aggregate demand and output*.

More specifically, *first*, if real interest rates on the money market and real interest rates on bank credit are changed under the influence of the change in the nominal interest rate of the central bank, a change will occur in the components of aggregate demand (consumption and investment, C and I), which will give rise to a change in the use of resources, which will then exert an impact on the change in prices, with a time lag. Specifically, higher interest rates will result in reduced household spending, mostly because they act as an incentive to save and discourage households

⁶ For a more comprehensible and complete overview see Coricelli, Balasz and MacDouglas, 2006.

from taking out new loans. *Second*, an increase in interest rates will make companies more reluctant to make new investments, resulting in a drop in new investment in the coming period. Thus, due to a drop in both consumption and investment, total demand of households and companies will decline. Lower total demand will result in reduced economic activity. Likewise, the link between the level of economic activity and prices is explained by means of the so-called Phillips curve, according to which prices and wages normally grow more slowly at a lower level of production activity. This adjustment of prices and wages is usually not concurrent, that is, a decline in economic activity brings about a reduction in prices and wages only after a certain period of time, because they are not adjusted on a regular monthly basis but rather less frequently.

Accordingly, it follows from the previous theoretical explanation that the assumptions for the effect of the interest rate of the central bank on prices in a country (the operation of the interest rate channel) are the following: (1) that the short-term interest rate which is directly controlled by the central bank is transmitted to other interest rates and on loans and deposits with longer maturities (the so-called yield curve). In Serbia, this applies primarily to banks' interest rates, since neither the government nor companies issue dinar-denominated debt securities with longer maturities and (2) that this changed interest rate on savings deposits and long-term borrowing really constitutes an element in the decisions of citizens and companies about their consumption/saving and investments. In addition, it is necessary for the changed level of output to affect companies, i.e., their decisions on the level/change of prices and wages.

The effect of the interest rate on economic activity in a country can be observed in the simulated model (Mottu, 2007) presented in Box 1, in the output gap equation (1) through the coefficient with the variable – the real interest rate from the previous period (0.02 for Serbia, Table L3-1). At the same time, that channel can be observed in the price fixing equation (2) through the coefficient with the variable – the output gap from the previous period (0.2 for Serbia, Table L3-1). The values of these coefficients for Serbia are at the floor of the band within which they range in other countries, which suggests that the authors of the model presented in Box 1 assigned to this *monetary policy transmission channel* to prices a relatively low importance in Serbia.

The existing empirical research in countries of Central and East Europe has shown that *at the first stage of the interest rate channel* – the interest rate pass-through, which is under the direct control of the monetary authorities, *to* the interest rates on the money market and other interest rates in the country (on savings, loans, debt contracts with longer maturities) – at the beginning of IT is weak. This pass-through grows stronger with time so the long-term pass-through becomes ever more complete, that is, closer to one. Likewise, it has been noted that the response period of other interest rates to changes in the reference rate gets shorter with time (empirical estimates for the Czech Republic, Poland and Hungary for the period 1994–2002; Crespo-Cuaresma et al. 2004). Research has also shown that there is high heterogeneity in the adjustment of interest rates on loans to changes in the reference rate: between banks and within one bank among different types of loans. A higher pass-through was recorded in the case of banks that are less profitable and less capitalized, probably due to smaller room for maneuver, i.e., higher dependency on the money market and lower spreads (Chmielewski, 2003). A *higher pass-through* was established in: short-term than in long-term loans and in loans to enterprises than in loans to households (that can be explained by higher spreads of banks on loans to households). As for the *second stage* of this channel – i.e., the effect of changes in other interest rates, which are under the influence of the reference rate, on the real sector, that is, on economic developments, there are not enough analyses related to transition countries. In developed countries in Europe, it was empirically established that a rise in the reference interest rate results in a cut in investment by companies (Chatelain et al. 2001).

We shall list factors that could cause this *channel of monetary transmission* in Serbia in this period to produce *an incomplete* effect, and they include the following:

(a) A large number of banks are refinanced from foreign sources, in addition to domestic sources. To that extent, the interest rate of the central bank constitutes a potential investment for these

banks, rather than the price of the source. It, in turn, sets some kind of a floor for other interest rates charged by those banks, but it in no way affects the costs of funding sources of these banks to the extent to which the interest rate on the money market of the European Monetary Union (EURIBOR), for example, or the ultimate reference rate of the European Central Bank does. Likewise, a large portion of bank credit in Serbia (as much as 80% according to some estimates) has been invested as indexed to a foreign currency, which means that the revenue of banks from such loans is constant when converted into euros and almost insensitive to domestic monetary conditions if a bank has matched these loans with total liabilities in foreign exchange.

(b) The lack of competition among banks: interest rates of banks on loans and deposits do not respond fully to the changes on the money market due to incomplete competition among banks,⁷ which operates in such a way that although refinancing costs go up (down), a bank does not have to change the interest rate because its spread is high. It is a conclusion on the basis of the results of a survey of banks on interest rates⁸ that FREN conducted in 2005. The following was observed: an unusually high disparity in the recorded interest rates on the same type of loans in different banks, as well as unjustifiably high effective interest rates on certain types of loans in individual banks (e.g. 35.8% p.a. on a loan of up to 12 months for working capital, indexed to a foreign currency, for small- and medium-sized companies) which cannot be explained only by the higher risks of a particular type of the client, but, clearly, by a monopolistic position of banks and insufficiently sensitive demand to the price of financing.

(c) Demand of households for loans seems not to be sensitive to the interest rate, i.e., to the price. This applies in particular to short-term loans where interest rates are extremely high and the differences among banks unusually wide, as noted in the same survey by FREN of 2005. A survey of the general public in 2007 (by the agency Medium Gallup) on financial literacy in Serbia recorded that about 33% of the population who use loans consider that the key criterion in deciding on taking out a loan is the monthly installment (which, let us recall, declines with the extension of the repayment period although the interest rate remains high), while 29% sees as the key criterion the sum of money which has to be repaid, while a mere 26% of loan beneficiaries consider that the key criterion in deciding on borrowing is the interest rate. An anecdotal example is also a statement of a manager in a big bank in Serbia that the basic criterion for the majority of citizens is the speed at which a loan is extended, while the level of the interest rate plays a secondary role. In the same survey it was established that 48% of loan beneficiaries do not know what an indexed loan means (indexation of a loan to a foreign currency, which means that with the depreciation of the dinar rate the debt and the installment of the loan also go up, which often does not apply vice versa, in the case of appreciation), and 31% do not pay attention to the rate at which a bank calculates the amount borrowed.

(d) Companies are probably more sensitive to the costs of the interest rate, but under the following circumstances:

- only about 20% of financing sources are based on loans, which can ultimately depend on the interest rate of the central bank, while the rest they finance out of their own sources, direct foreign borrowing, arrears to suppliers, informal loans, Table L3-4. This finding is confirmed both by the data in the aggregated enterprise balance sheet for 2006, and the results of the World Bank's survey named BEEPS for 2005. (Beeps-at-a-glance 2005, Serbia, section Firm financing);

- part of companies can substitute the funding by bank loans, if, for instance, a domestic loan becomes more expensive, from one of the above sources, Table L3-4 (foreign borrowing).

⁷ Dimitrijević, J. and Najman, B. (2006) provide an explanation for lack of competition among banks due to the segmentation on the credit market in Serbia based on data from 2001 to 2006.

⁸ , J. Dimitrijević, "Interest Rates in Serbia", QM no. 2.

Table L3-4 Bank Credit to Enterprises – Share in Total Liabilities

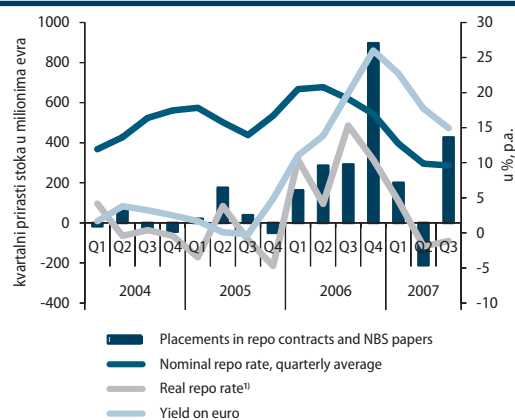
| | | | Incremental growth in | | Incremental growth in | |
|---|---------------------|--------|-----------------------|-------------|-----------------------|-------|
| | 2006 | 2005 | 2006 | 2006 | 2005 | 2006 |
| | in millions of euro | | | in % of GDP | | |
| Sources of financing of enterprises | | | | | | |
| Data from balance sheet of companies ¹⁾ | | | | | | |
| Capital | 40,998 | 31,950 | 9,048 | 182.22 | 116.57 | 36.36 |
| Liabilities | 38,797 | 29,796 | 9,001 | 172.43 | 108.71 | 36.17 |
| Long term debt | 10,730 | 8,030 | 2,700 | 47.69 | 29.30 | 10.85 |
| Short term debt | 28,067 | 21,766 | 6,301 | 124.74 | 79.42 | 25.32 |
| Data from consolidated balance sheet of banks and from balance of payments for Serbia | | | | | | |
| Loans to enterprises from domestic banking sector | 4,652 | 4,205 | 447 | 20.68 | 15.34 | 1.79 |
| Short term loans | 2,448 | 2,332 | 116 | 10.88 | 8.51 | 0.46 |
| Long term loans | 2,204 | 1,873 | 331 | 9.80 | 6.83 | 1.33 |
| Loans from abroad | 4,593 | 3,166 | 1,427 | 20.41 | 11.55 | 5.73 |
| Short term | 259 | 271 | -11 | 1.15 | 0.99 | -0.05 |
| Long term | 4,334 | 2,895 | 1,439 | 19.26 | 10.56 | 5.78 |
| in % of total liabilities of enterprises | | | | | | |
| Banking loans in total liabilities of enterprises | 23.83 | 24.74 | 20.82 | | | |
| Loans from domestic banking sector | 6.98 | 8.74 | 1.16 | | | |
| Loans from abroad | 16.85 | 16.00 | 19.66 | | | |

Source: Statement about Actual Operating Results of Business Companies and Cooperatives in the Republic of Serbia, data from financial reports for 2006, the NBS; the NBS Statistical Bulletin.

1) Aggregated for 76,638 companies that submitted balance sheets for 2006, accounting for 86% of total registered business companies and cooperatives in 2006.

2.2. The Exchange Rate Channel

Although a central bank conducts monetary policy in the IT regime by relying on the reference interest rate as the main instrument – the effect of the exchange rate on prices is still possible, under the conditions of a flexible exchange rate, which is an integral part of IT. This, so-called exchange rate channel, is important in the transmission of monetary policy in open economies (Svensson 2000). It is even more important in those economies in which there is a high level of „dollarization“ (Leiderman et al, 2006), i.e., „euroization“ in the case of Serbia, when a large number of transactions, prices, claims and liabilities are calculated and denominated in a foreign currency.

Graph L3-5 Nominal, Real Repo Rate and Yield in Euros (the right axis) and an Increase in Repo Investments (the right axis)


Source: the NBS, author's calculations.

1) The retail price index was used for the calculation of the real rate, quarterly annualized.

The National Bank of Serbia can exert influence on the exchange rate by means of direct interventions on the foreign exchange market, which are rare in the IT concept and reduced to the cases of excessive volatility of the exchange rate and which can threaten the stability of the financial system. Moreover, the NBS can also indirectly influence the exchange rate by means of the interest rate. If the repo interest rate in Serbia is higher than the interest rate in some other country, that attracts foreign investors who later on – in order to invest in domestic securities with a higher interest rate, create additional demand for the domestic currency, which in the short run causes appreciation of the domestic currency. It is the so-called uncovered interest parity (equation (3) in Box 1.), and this type of transaction is known as „carry trade“.

Although the shortness of the observation period does not permit the establishment of a clear connection, there still are clear indications that over the last year in which inflation was targeted, the reference interest rate of the NBS exerted influence on the exchange rate. That phenomenon was recorded in the experiences of other open economies as well, where inflation is targeted by

using the nominal interest rate as the main instrument. Specifically, we can notice that over the past year the episodes of accelerated inflows of investment into the NBS (repo) securities coincided with the high nominal repo interest rate and concurrent nominal appreciation of the dinar which was increasing the yield on investments for investors who come from a foreign currency (the curve „yield on the euro-Aug“) and invest dinars through the repo market (Graph L3-5). The foregoing is particularly evident in Q4 2006 and Q3 2007.

Changes in the nominal exchange rate – both those caused by the activity of the NBS, and those spontaneous, which result only from supply and demand on the foreign exchange market – can have an effect on prices. This is a transmission channel which, if it exists in an economy, unlike the interest rate channel, operates in a very short period of time. It operates primarily in that import prices and the prices of domestic products which are competing with imported goods – are adjusted in a specific proportion, in line with the changes in the nominal exchange rate. Then headline inflation – the price index – also changes, to the extent to which it includes these products. Thus, with the dinar depreciation (appreciation), the prices go up (down), since then for the same price of an imported good in euros one needs to pay a higher (lower) amount in dinars.

The importance of the exchange rate channel and the speed of its response to prices is, as one can conclude, very much conditional upon: (a) the operation of competition on the market for imported goods and their competing domestic counterpart products, if there are any, (b) the method of price fixing used by sellers – in euros or in dinars and (c) the direction in which the exchange rate is changing – the operation of this channel, namely, probably is not of the same intensity in depreciation as in appreciation of the domestic currency, because prices can exhibit higher inertia when it comes to the adjustment in one direction compared to the opposite one.

Likewise, in addition to the above described direct impact on prices, in an open economy, the exchange rate also exerts an indirect influence, by affecting exports and imports (if the Marshall-Lerner Condition operates) – thus also net exports ($X-M$) which constitute one component of total demand ($C+I+G+X-M$).

And last but not least, in a highly euroized economy such as ours, it is possible that the changes in the dinar rate affect the creditworthiness of clients and thus affect the volume of new loans and total aggregate demand (Leiderman et al, 2006). Specifically, the dinar depreciation in the circumstances where about of 80% of total credit is indexed to a foreign currency increases the liabilities of companies and households and reduces their ability to borrow further.

Empirical studies into the existence and intensity of the operation of this channel – which is measured by the so-called *exchange rate pass-through to prices* – in transition countries, have shown that it is higher to producer prices than to consumer prices. An important finding of those studies is that over time, from the mid-1990s onwards, the intensity of the transmission of changes in the exchange rate to prices has been diminishing in those countries. The above is associated with stabilization, i.e., the curbing of inflation in those countries, which contributed to a decline in the exchange rate pass-through (Frankel et al, 2005 and Bitans, 2004).

The exchange rate pass-through to the index of core prices (the prices set freely by the market and the NBS uses them as a target rate) in Serbia is relatively high and amounts to around 50% (Table L3-6).

At least some 30% of all prices in the basket of products, which are included in the core inflation index – are of an imported origin and on the assumption of a competitive market, depreciation (appreciation) of the domestic currency automatically produces higher (lower) costs to importers, hence an increase (decrease) in the prices of products they import and sell on the domestic market. The pass-through was empirically established in that it was calculated on the basis of the data in the period when prices were going up and the dinar depreciated in nominal terms. Now when the dinar often appreciates in nominal terms, the pass-through certainly exists, but the question remains of whether there is any asymmetry in the response, since in appreciation, which creates room for price cuts, the degree of competition on the market also comes to the

fore, because the room is also created for the operation of monopolistic forces. In other words, if there is no competition on the market there will be less interest in reducing dinar prices due to lower purchase prices of imported goods denominated in dinars, caused by appreciation.

Table L3-6. Overview of the Exchange Rate Pass-Through to Prices in Transition Countries

| Country | Import prices | Manufacturing prices | Consumer prices |
|--|---------------|----------------------|----------------------|
| average of results from all available studies for each specific country, in % | | | |
| <i>Average for the sample of 12 transition countries</i> | 70 | 52 | 33 |
| Czech Republic | 65 | 41 | 23 |
| Hungary | 87 | 57 | 30 |
| Poland | 84 | 60 | 31 |
| Slovakia | 101 | 73 | 35 |
| Slovenia | 40 | 78 | 53 |
| Croatia | ... | 17 | 22 |
| Russia | ... | 23 | 40 |
| Serbia | | | 40-52* ¹⁾ |

Source: Coricelli F, E.Balazs and R. MacDonald, 2006; * Petrović, Mladenović, 2005.

1) The core price index was used, not the CPI. Period 2001-2005.

2.3. Credit Channel

Unlike the interest rate channel, where the interest rate changes demand and thus affects the volume of new bank credit, there is another channel which changes the price of raising funds for banks through the interest rate of the central bank, resulting in a change in supply of credit. That other channel is called the *credit channel⁹ in the narrow sense* or the *bank lending channel*. The previous mechanism operates in the circumstances where there are companies which depend on banks for financing (they cannot substitute bank financing by issuance of bonds on the capital market), as well as provided that banks cannot perfectly substitute loans by some other type of investment in their balance sheets. Likewise, there is the *credit channel in the broad sense* or the *balance sheet channel*. It is reflected in the phenomenon that a rise in real interest rates caused by an increase in the reference interest rate can result in reduced profitability of companies and a lower net value of their assets. For that reason to banks – companies become less attractive for lending and they reduce the total volume of new credit.

It is believed that banks which have a higher asset/equity ratio, then banks with higher total assets and those with better liquidity are less susceptible to the operation of the credit channel since they have room for maneuver to avoid a rise in the price of fund raising for new investment being reflected to the same degree in the volume of credit they extend.

The existence of the balance sheet channel was empirically confirmed in developed countries. Two major studies are the best known,¹⁰ based on data with balance sheets of individual banks in the USA, which indirectly determined the existence of this channel. Specifically, on a sample that comprised some 13,000 banks the research has shown that, in addition to the fact that changes in monetary policy, i.e., the reference interest rate, affect credit growth in all banks – monetary policy acts differently on credit growth depending on certain characteristics of banks: the amount of their equity, size and liquidity. Thus it was concluded that banks which have better coverage by capital, larger banks and banks with better liquidity contain their credit growth as a consequence of the tightening of monetary conditions to a lower extent, because they can better neutralize a drop in liquidity owing to the position which implies a lower degree of dependency on the money market. Numerous studies into the existence of the balance sheet channel in other

⁹ The credit channel was first introduced in the theoretical debate about the transmission of monetary policy in the papers by Bernanke and Blinder (1988) when it was established that just the interest rate channel is not sufficient to explain the changes in aggregate demand, because its response to changes in long-term interest rates (costs of financing new investment) is not strong enough. According to them, the credit channel is the channel which intensifies the operation of the interest rate channel.

¹⁰ Kashian A. and J.C.Stein (2000) and Kishan R.P. and Opiela Th.P. (2000).

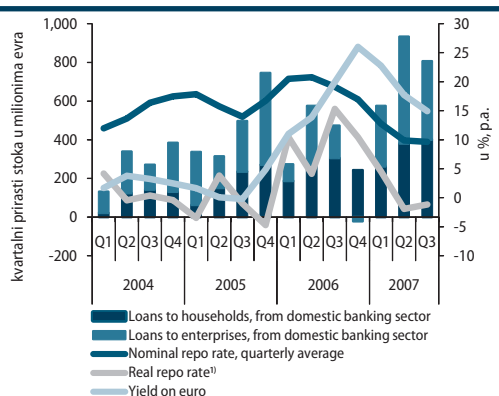
developed countries followed, which used a similar methodology. Recent studies in the euro area countries, have shown that the reference rate of the central bank has a general influence on credit growth (the interest rate channel) – but that only liquidity of banks brings about different distribution of the effects of monetary policy among banks, which would point to the possible existence of the credit channel. Research in transition countries often shows contradictory results and scarcely evidences the existence of the credit channel. Specifically, some research into that channel shows that larger banks and foreign banks respond more through a change in credit supply after a change in the reference interest rate in the country.¹¹ Such finding of the research often remains inconclusively corroborated.

2.4. Expectations Channel

Expectations regarding inflation in the coming period are an important factor in the setting of wages and prices in enterprises. Specifically, in addition to inflation in the current period, it has been established that economic agents, in the setting of wages and prices, take into account, *inter alia*, all currently available information on the price movements in the coming period. In other words, if economic agents in Serbia are convinced that the central bank will take all available measures in the coming period to maintain price stability, despite some current threats to increase prices, they will not calculate into their decisions on prices and wages in the coming period a complete materialization of these threats. If the expectations, however, go above the target announced by the central bank in its policy, it is a positive sign for the central bank that it has to respond even more through its monetary policy to the existing threats to price stability in order for inflation over the upcoming period to be in line with the target. This is the origin of the importance of inflationary expectations, i.e., the importance of their stabilization. This is where an important role is played by an integral part of the IT concept, which refers to constant communication of the NBS with the public, the publication of the targeted inflation rate and the commitment of the NBS to meet it, as well as the strengthening of the transparency in the work of the central bank.

Thus in the model for projection and monetary policy analysis (Box 1), the price fixing equation (2), inflation in the current period depends, *inter alia*, on inflation in the previous period (the coefficient α_{nld} to which the value of 0.4 was assigned) and the expected inflation in the coming period (the coefficient $1-\alpha_{nld}$ which in this case amounts to 0.6). Characteristics of *expectations* vary from country to country, and within one and the same country they evolve in time. It is believed that if the coefficient α_{nld} is close to 1 the economy in question is very inert and inadequately

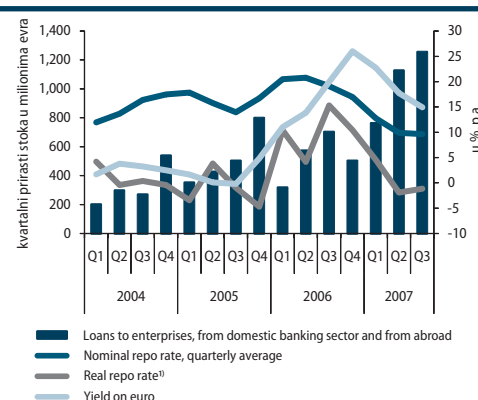
Graph L3-7. Total New Loans from the Domestic Banking System to Enterprises and Households and the Reference Interest Rate: 2004–2007



Source: The NBS, author's calculations.

1) In calculating the real rate the RPI was used, quarterly annualized.

Graph L3-8. Total Inflows of Credit to Enterprises from the Domestic Banking System and from Abroad: 2004–2007



Source: The NBS, author's calculations.

1) In calculating the real rate the RPI was used, quarterly annualized.

¹¹ Schmitz (2004) for the countries of Central and East Europe accessing the European Union, or Pruteanu (2007) for the Czech Republic.

adjusts its *expectations* regarding the inflation rate in the coming period to the impulses created by the information on the changes in the economic sphere related to the upcoming period, but rather relies on the experience from the past period. And vice versa, if the coefficient is closer to 0, the economy in question is such that prices change quickly on just a weak impulse, i.e., information which can affect expectations vis-à-vis inflation in the coming period, because past experiences are much less important.

II. Achievements of Monetary Policy Concerning the Impact on the Volume of Credit in the First Year of IT in Serbia, Empirical Estimate

As described in the first section of this paper, the volume of newly approved loans can change under the influence of the reference interest rate. In theory, changes occur in that, on the one hand, credit demand changes due to a change in other rates (the interest rate channel) and in that credit supply by banks changes due to an increase in the price of banks' sources for new investment (the credit channel), on the other hand. The question is, however, whether these theoretical principles operate in the initial period of the use of the repo rate of the NBS within the new monetary policy framework in Serbia in its first year. Aggregated data for the entire banking sector on investment in retail and corporate loans, Graph L3-7, suggests that the total increase in loans from the domestic banking system to enterprises and households exhibited high volatility in the past two years, with corporate loans being particularly volatile - in some quarters negative, while in others extremely high. At the same time, an impression that can be gained visually is that the inflow of loans is in no way correlated to the changes in the nominal, real repo rate and the rate calculated as yield on euros invested in repo papers in the dinar equivalent.

The data on total inflows of credit to enterprises – both from the domestic banking system and from abroad (Graph L3-8) – nevertheless indicate that the inflow of loans to enterprises has an upward trend with slight seasonal changes (if Q2 2007 is adjusted by the big loan to Telekom). Although it is difficult to make definite conclusions on the basis of the graph on the mutual relationship between these two series, at first glance one gets an impression that the inflow of new loans is not strongly linked to the interest rate of the NBS as the main instrument of monetary policy.

We have empirically tested the impact of the reference interest rate as the main instrument monetary policy in Serbia on the volume of loans extended through the domestic banking system during the first year of IT. For estimating this phenomenon we used panel data¹² which is quarterly and which originates from balance sheets of 38 different banks for the period Q1 2004–Q2 2007, making a total of 387 individual observations. We tested the existence of the general impact of interest rates on loans (both on credit demand through the interest rate channel, and on credit supply through the credit channel) – by means of the equation (1) on the data which refers to the period of four quarters, from Q2 2006 to Q2 2007, and we checked the same relationship on a three-year period, since the reference rate existed in the past as well, but – although nominally high – the real rate and yield on the euro were too low in order for this market to be active and attractive for banks.

In the literature, to test for the existence of the interest rate channel a model is used like the model presented in the equation (1), which will be used here.

$$\Delta \ln K_{it} = \alpha \Delta \ln K_{i(t-1)} + \beta \Delta MP_t + \gamma \pi_t + \delta \Delta \ln BDP_t + \lambda D_{q406} + \mu_i + \varepsilon_{it} \quad (1)$$

Where $\Delta \ln K_{it}$ represents the y-o-y growth rate of total bank credit i in quarter t ; $\Delta \ln K_{i(t-1)}$ stands for the value of the same variable over the period $t-1$, ΔMP_t represents a change in the instrument of monetary policy in quarter t relative to the previous quarter; π_t is the y-o-y inflation rate in quarter t ; $\Delta \ln BDP_t$ is the y-o-y GDP growth in quarter t ; D_{q406} is a dummy which equals 1 in

¹² The *panel data* is a set of time series for the same phenomenon in t points in time observed on n different individuals. The problem of the short observation period is mitigated and the number of observations ($t \times n$) increased by methods of econometric estimates on the panel data.

the pre-election quarter Q4 2006, while in other periods it equals 0; μ_i is related to the individual effect specific for each bank; ε_{it} stands for error.

We used as an indicator of monetary policy: the change in the nominal repo rate relative to the previous quarter; we shall try to use instead of it a change in the real interest rate from quarter to quarter and the change in the *index of monetary policy restrictiveness*. We calculate this index as a weighted sum of the change in the nominal repo rate and the change in the nominal dinar rate relative to the previous quarter, where the weight assigned to the interest rate is 0.3 and that assigned to the exchange rate 0.7. The weights have been assigned based on a free estimate of the author on relative importance of changes in the interest rate and the exchange rate for monetary policy stance¹³.

In estimating coefficients of the model we have used the Generalized Method of Moments (GMM, according to Arellano-Bond 2002), which enables the application of the dynamic model – with the shift of the dependent variable on the right hand side (the credit growth rate in the previous period in the estimated model) on the panel data, and the avoidance of the problems of endogeneity and the omitted variable in the model.

The results of the estimate of the model (Table L3-9) show that, when observed on both periods, bank credit did not exhibit any response to all three monetary policy indicators – the nominal reference interest rate, the real reference interest rate and the monetary policy restrictiveness index. Although the period from the introduction of IT is short, the results of the estimate on a one-year period suggest that at the beginning of IT the interest rate channel is not particularly important, which is consistent with experiences of other countries. Still, one could expect that in the course of time this channel will begin to gain importance.

Table TL3-9. Results of the Estimate of Monetary Policy Impact on Credit Growth (the Generalized Method of Moments GMM)

| | Dependent variable: year-on-year growth of credit to private sector | | | | | |
|--|---|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Period | Q2 2004 - Q2 2007 | Q2 2006 - Q2 2007 | Q2 2004 - Q2 2007 | Q2 2006 - Q2 2007 | Q2 2004 - Q2 2007 | Q2 2006 - Q2 2007 |
| Laged year-on-year credit growth | 0,8420*** <i>0,0737</i> | 0,9309*** <i>0,0809</i> | 0,8786*** <i>0,0732</i> | 0,9297*** <i>0,0916</i> | 0,8418*** <i>0,0737</i> | 0,9304*** <i>0,0812</i> |
| Inflation | 0,0035 <i>0,0034</i> | -0,0016 <i>0,0060</i> | | | 0,0035 <i>0,0033</i> | -0,0014 <i>0,0061</i> |
| GDP growth, y-o-y | -0,9572 <i>0,6338</i> | 0,7078 <i>0,9330</i> | 0,4432 <i>0,3677</i> | 0,5102 <i>0,4440</i> | -0,1022 <i>0,6335</i> | 0,6701 <i>0,9461</i> |
| Dummy variable for Q4 2006 | -0,7899** <i>0,3665</i> | -0,9799** <i>0,0425</i> | -0,0740* <i>0,0324</i> | -0,0764** <i>0,0386</i> | -0,0785** <i>0,0367</i> | -0,0977** <i>0,0428</i> |
| Change in reference interest rate (repo) | -0,0068 <i>0,0078</i> | -0,0009 <i>0,0104</i> | | | | |
| Change in real reference rate | | | -0,0070* <i>0,0042</i> | -0,0054 <i>0,0044</i> | | |
| Change in monetary policy stance index | | | | | -0,0174 <i>0,0195</i> | -0,0036 <i>0,0265</i> |
| Number of observations | 387 | 185 | 387 | 185 | 387 | 185 |
| p-value, Sargan test | 0,448 | 0,731 | 0,292 | 0,444 | 0,451 | 0,707 |
| p-value, AR1/AR2 | 0,005/0,042 | 0,008/0,179 | 0,004/0,048 | 0,007/0,181 | 0,005/0,042 | 0,008/0,179 |

Notes: *, **, *** denotes the level of importance of 10%, 5% and 1%. Values below written in italics apply to the standard error.

III. Conclusion

Although the main monetary policy instrument in the IT regime, which has been in force in Serbia for a year now – the repo interest rate, the exchange rate has played an important role in that initial period of IT as a monetary policy anchor. The exchange rate can be influenced in a very short run by the repo rate, in that banks invest capital they have imported from abroad in the repo market, when yields (which depend on the repo rate, as well as on the change of the exchange rate in the period of investment) become attractive. Changes in the exchange rate are then transmitted further, through the exchange rate channel, to prices. Experiences from other transition countries, which have been using the IT concept for more than a decade now, also show that *the exchange rate channel* is important in small open economies, but that one could expect its impact to grow weaker in time. The interest rate through the *interest rate channel* is transmitted

13 The NBS in the Report on Inflation for Q2 2007 introduces the monetary restrictiveness index. It constructs it as a sum of deviations of the real exchange rate index and the real repo rate index from the trend, with the exchange rate having a weight of 0.8, and the interest rate of 0.2.

to prices in not such a short period of time as the exchange rate. The interest rate channel can be observed, *inter alia*, on bank loans for which demand slackens due to changes in other rates as well, under the influence of the reference rate. That channel is stronger in developed countries, and in other transition countries it was growing stronger over time, although at the beginning of IT it was relatively weak. Empirical data for Serbia has confirmed that in the initial period of one year, during which IT has been used, and in a somewhat longer period of the previous three years, since the introduction of the repo rate – it has not had a more significant impact on growth of credit to enterprises and households extended by banks from the domestic system. In other words, credit is, relative to the interest rate of the central bank, an exogenous category most probably determined by demand. It is probably possible to exert influence on the volume of credit from the domestic banking system in the short run by some more direct measure of monetary policy (the reserve requirement ratio or a change in macroprudential norms, which are occasionally used in the achievement of monetary objectives as well). In the long run, however, it is even more certain that the total volume of credit received by the domestic private sector – both through the domestic banking system, and through direct foreign borrowing, is determined – by demand for credit, which seems to be able to always find an avenue to be met, despite monetary policy measures. The reason for that is probably a relatively low level of indebtedness of the entire private sector. In time, one can expect the strengthening of the interest rate channel, i.e., ever higher dependency of the price of credit on the reference rate of the central bank and ever higher sensitivity of clients to changes in interest rates of banks. Experiences from other transition countries substantiate that assumption. When it comes to the *expectations channel*, one could say that expectations had every reason to be more firmly tied to the targeted inflation rate over the past year, since the NBS intensively informs the public about its work and its commitment to the achievement of the set objective.

We have confirmed by empirical results that in the past three and a half years the interest rate of the central bank did not have a strong effect on bank credit growth, when the entire banking system in Serbia is observed. This applies both to the whole period from Q2 2004 to Q2 2007, and for the period from Q2 2006 to Q2 2007 – when the repo rate had more importance and the NBS used it more intensively.

The IT concept has proven itself to be a good framework in many countries where it is applied, because it had successful policies as a result (although often expensive in the initial years), which managed to bring down inflation and keep it at a low level, although deviations from the target always occurred in certain periods of application. Still, it is important to know that for the degree of successfulness of its implementation, according to reputable authors who study IT in the world, several prerequisites need to be met. We shall mention the following four¹⁴: (1) independence of the central bank, (2) elasticity of the economy to changes in the interest rate and in the exchange rate, (3) the existence of an econometric model and of good understanding of transmission mechanisms of monetary policy and (4) tight and **responsible fiscal policy**. Only the third condition, and to a certain extent the first one, are under the control of the central bank which is, clearly, if it is trying to fight for stable inflation by itself, in the absence of a tight fiscal policy, doomed to pay a far higher price for that, while the IT concept only helps it to efficiently attain the set target on inflation in the upcoming period.

If fiscal policy, through its expansiveness, makes the job of monetary policy in endeavoring to keep prices under control more difficult, that in the described circumstances, where the exchange rate continues to be a significant anchor of monetary policy, results not only in more expensive monetary policy reflected in high paid interest on repo operations of the NBS, but also in a higher required degree of appreciation of the domestic currency so that prices can be rapidly brought down, with a view to consistently meeting the set target of the NBS regarding annual inflation. Obviously, this strong appreciation, which diverges from its fundamental determinants, in time becomes an enemy of the competitiveness of the Serbian economy, exports and the current account balance in the balance of payments.

¹⁴ Amato and Gerlach (2001)

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