MANAGED FLOATING AS A SECOND BEST OPTION; LESSONS FROM SLOVENIA

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Abstract

In the paper the exchange rate regime in Slovenia is analyzed. Product market structure differences and micro distortions on the labor market are identified as a crucial issues for choosing the managed floating exchange rate regime. The basic "philosophy", mechanism and instruments are described for three phases of the implementation of managed floating. A simple model is used to illustrate that the basic effects of managed floating were coherent throughout the analyzed period and could be empirically identified. The estimated model confirms that in Slovenia money (real interest rates) targeting was used to stabilize prices, while the exchange rate was managed to keep the expected rate of return difference at the appropriate level and to prevent the offsetting dynamics of loanable funds from abroad. The exchange rate has therefore become a basic instrument for battling capital inflows, although not through its unexpected volatility but through controlling the expected rate of return differences.

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1. INTRODUCTION

The choice of exchange rate regime depends on the structural and external conditions in which the economy works. Economies in transition went through a decade-long intensive real restructuring of the economy, a reshuffling of the institutional infrastructure and, at the same time, they faced a very volatile foreign capital flow environment. In different periods of transition there were not the same conditions, nor even the same number of them, acting as "tight" (constraints) in choosing an admissible (not to mention optimal) exchange rate regime. Therefore, if there are countries for which the assertion "no single currency regime is best for all time"[2] makes sense, the transition countries would have to be primary candidates.

If the IMF definition of managed floating is used, then Slovenia could be classified as a managed floater[3]. However, the implementation of the floating exchange rate regime has changed considerably in the period of transition[4]. In launching a currency almost without foreign reserves, the policy makers in Slovenia had no other option than a pure floating exchange rate regime. The increase in foreign reserves and fall in sovereign and currency risk premium increased capital inflows, so the exchange rate dynamics became managed and capital controls were introduced. After capital controls had to be lifted, micro distortions still present prevented a pegging of the exchange rate. Therefore, a tightly managed exchange rate was used afterwards, to make room for an autonomous money (interest rate) policy. Changes in the floating exchange rate regime implementation in Slovenia document that the very room for the choice of admissible exchange rate regime could depend on the structural and external conditions in which the transition economies operated.

This paper shows why and how the (managed floating) exchange rate regime was adjusted, in the period from 1993 to 2002. Market structure differences are described as a crucial condition for choosing the managed floating exchange rate regime. Different phases in the implementation of managed floating were determined by changes in constraining conditions. The basic "philosophy", mechanism and instruments are described for three phases of implementation of managed floating. A simple model is used to illustrate that the basic

[2] See, Frankel(1999).

[3] According to the IMF definition, managed floating is the exchange rate regime in which monetary authority influences the exchange rate dynamics through active intervention in the forex market without specifying or pre-committing to preannounced exchange rate path.

[4] How intensive were changes documents, for example, cluster based analysis of regimes, which classified Slovenia in that period in four different groups of regimes (see, Levy-Yeyati and Sturzenegger(2002))

effects of managed floating were coherent throughout the analyzed period and could be empirically identified.

The rest of the paper is structured as follows. In the second chapter, the consequences of the market structure differences for the choice of admissible (optimal) exchange rate regime are analyzed. The third chapter describes phases in the implementation of the managed floating. A model of the monetary policy is presented in the following, fourth, chapter. At the end of the paper there is a brief overview of results. Tables and figures are given in the statistical annex.

2. MICRO DISTORTIONS AND THE CHOICE OF EXCHANGE RATE REGIME

Transition-stylized facts. Considerable appreciation of the exchange rate and constant increases in the relative prices of services (all nontradables) characterized the first decade of restructuring in the more developed transition economies. The appearance of both phenomena was mostly independent of the exchange rate regime and monetary policy of the particular economy.[5]

Empirical evidence has been accumulated to explain both "stylized facts" in the context of sectoral differences in productivity gains.[6] The well-known Balassa-Samuelson arguments have been discussed a great deal. Since the tradables producing sectors are much more capital-intensive, with considerably faster productivity growth, increasing wages in the services or nontradables producing sectors (in catching up to wages in the tradables producing sectors), enhanced the pressure of unit labor costs on the prices of services (nontradables).[7] The crucial argument for the faster growth of the prices of services (and appreciation in the exchange rate) is, therefore, labor market equalization of wages in the services producing sectors to wages in the tradables sector as well as a rapid increase in productivity in the restructured (new) tradables goods producing sectors.

Such an explanation of real appreciation has straightforward implications for the possible ways the exchange rate channel of the monetary policy transmission mechanism is used in curbing inflation. In an economy facing considerable net foreign financial inflows, fixing or pure floating of the exchange rate (corner regimes) makes imported products relatively cheaper and the growth of wages in the export (tradable) segment of the economy slower, while both also make it possible to anchor the costs of intermediate inputs and wages in the nontradables (services) sector.

The argument could go even further, to support one of corner exchange rate regime options. As the exchange rate could be used efficiently in controlling prices of tradables and nontradables, and because money demand is unstable and the appropriate dynamics (and volume) of money is difficult to determine, money targeting is an inappropriate strategy for price stabilization in more developed transition economies; especially if such economies face

[5] See, for example, Halpern and Wyplosz(1997).

[6] See, for example, Begg et al.(1999).

[7] Tradables producing sectors will be referred as the tradable segment (of the economy); nontradable segment will similarly stand for nontradables producing sectors.

considerable net financial inflows from abroad.[8] The Balassa-Samuelson effect and a high exchange rate path through are therefore strong arguments for choosing a fixed exchange rate regime!

Market structure considerations. It is documented elsewhere that Slovenia is a significant empirical "outlier", not only for the transitional stylized fact of permanent (and considerable) real appreciation in the exchange rate but also for the Samuelson-Balassa explanation of the increase in relative prices of nontradables.[9] Arguments in favor of exchange rate price anchoring, and therefore for limiting the choice of exchange rate regime to corner options are therefore ungrounded.

Given the high exchange rate path through into prices of tradables, any real appreciation would have to be mainly caused by increasing relative prices of nontradables. However, empirical evidence does not confirm the differences in productivity-driven wage increases (and, because of less capital-intensive production, also increases in relative prices) in nontradable sectors, at least for the first decade of transition. In fact, empirical evidence documents that the sectoral differences in market structure evolution and segmented labor market with highly unionized workers were crucial for the relative increase in prices of nontradables.

Especially pronounced were differences in the market structure between tradables producing sectors and services producing sectors. There were two important reasons for these differences: the underdevelopment (the relative size in terms of the value added share) of the services segment before transition, and foreign competition on the market for tradables.

At the beginning of transition, considerable overemployment characterized the tradable sector, and minimal employment (underdeveloped) the service segment[10]. In the nineties, workers were also highly unionized in decentralized(!) trade unions. The labor market was therefore highly segmented, with powerful trade unions in (especially the non-market) service sectors and weak trade unions in the tradables producing sectors[11].

The less competitive structure of the market (relative to the tradable segment) enabled enterprises in the market services producing sectors to increase prices over marginal costs more than enterprises in the tradables producing sectors. Higher (expected) profits lowered employers' resistance to wage pressures in the services producing sectors. Moreover, services producing sectors were increasing employment while tradables producing sectors were cutting back, because of their different initial stage of development. Wages in the services (non tradables) producing sectors were, therefore, not chasing productivity-driven wages in the tradables producing sectors; in fact, the reverse process took place[12].

[8] Early in transition, the usual advice was to peg the exchange rate (if the fiscal fundamentals were in place). See, Begg et al. (1999a) or Sachs(1996).

[9] See, Bole(1997) and Bole(2001).

[10] Tradable segment and in particular export sector (to hard currency area) had been strong already before Slovenia declared its independence (see, for example, Bole(1997)).

[11] See Calmfors (1993) on the possible effects of strong but decentralized trade unions.

[12] See, Bole(1997) and Bole(2001).

Different flexibility of prices and the choice of exchange rate regime. The crucial question is, what does a difference in the mechanism of increasing prices of tradables versus nontradables mean for the specification of the stabilization policy, especially for the dilemma of money vis-a-vis exchange rate-based anchoring of inflation? In the theory, market structure differences have important implications for the specification of stabilization policy. Theoretical results corroborate the idea that optimal monetary policy would have to target nontradables ("sticky", "domestic") prices despite the impact of the resulting variability of the tradables ("flexible") prices[13]. In the paper by Clarida et al (2001) the theoretical message is given very succinctly: "To the extent that there is perfect exchange rate pass through, we find that the central bank should target domestic inflation and allow the exchange rate to float, despite the impact of the resulting exchange rate variability on the CPI".

Development of the market structure of the nontradables producing sectors could make the theoretical argument for Slovenia even stronger. Empirically it is therefore necessary to identify the choice of the monetary policy (exchange rate regime) in the (theoretical optimal) event that policy makers are targeting (predominantly) nontradables prices. To evaluate the possible choice of monetary policy, the role of the exchange rate and money in stabilizing prices are analyzed in the context of a simple VAR model.

The effects of the studied inflation anchors are analyzed on two desegregates of retail prices, for prices of goods and prices of services, and with two possible policy instruments, money and the exchange rate.

The VAR model is constructed separately for the goods and services producing sectors. In the first model, prices of goods, and in the second, prices of services are analyzed.

The model for every segment of sectors includes money, exchange rate, average wage and price index as endogenous variables, and the price of fuels as exogenous variables. For the whole of the nineties, prices of gasoline and some other oil products were controlled by the government or pegged to world (Platt´s) prices.[14] Therefore, the variable of fuel (and lubricants) is an exogenous variable in a model. A dummy variable for the introduction of VAT was also added in both models. The price index and average wage were different in every model. In the goods version of the model, the price variable refers to goods and the wage variable to the average wage in the tradable segment; in the services version of the model, price index for services stands for the price variable and the average wage in the non tradables producing sectors for the wage variable.

The money variable is defined as a ratio of M1 and real GDP. Exchange rate stands for the Bank of Slovenia's exchange rate for the German mark.[15] Both wage variables are constructed from monthly average wages for SIC sectors; figures on sectoral unemployment are used for weights.[16]

[13] See Aoki(2001) and Clarida et all(2001).

[14] From mid 2000 prices of gasoline were automatically pegged to the Platt´s prices on the world market.

[15] Data are from the Monthly Bulletin of the Bank of Slovenia.

[16] Data are from monthly Rapid Reports - Labour Market, Statistical Office of the Republic of Slovenia.

Both models, for goods as well as the services segment, are estimated for the period from 1993/1 to 2002/2. Models are estimated using quarterly data[17]. Results are given in Table 1 and 2.

The effects of money, exchange rate and wages on prices are illustrated by the impulse response functions simulated by the estimated models. Policy variables are at the end of the assumed order of variables. Given the way impulses are generated, estimated responses may depend considerably on the order of variables. Relative size of (goods vis-a-vis services) responses are, however, almost independent of the assumed order of variables (in both simulations).

In Figure 1, responses of inflation on impulses to wages are given for the prices of goods and services. In the graphs, responses to the one standard deviation impulses are presented, together with 1 standard error confidence intervals. Impulses to wages have significant effects on the prices of services but not on the prices of goods (tradables). Effects on prices of services are much stronger and last longer (effects are significant at 5%, in three quarters) relative to the effects on the prices of goods, which are not significant (at 5%) in any quarter. The less competitive market structure for services and the segmented labor market, analyzed in previous chapters, offers an explanation for the difference. The strong and decentralized trade unions (targeting predominantly rises in wages and not employment) were more efficient in increasing wages in the services sector, because the less competitive market structure enabled employers in that sector to pass on higher costs in higher prices (reduced the employers' resistance to wage increase).

The effects of impulses to money are illustrated in Figure 2. Obviously effects are similar for goods and services price desegregates. For both, money effects attain peak value in the period of the first three quarters, and last over one year. In both cases, the cumulative effect in the three highest quarters (second, third and fourth) is around 30% of the standard deviation of the corresponding price variable.

Responses to exchange rate impulses are illustrated in Figure 3. While effects of money on the goods sector are pretty close to those on the services sector, the effects of the exchange rate differ a great deal. Differences in the responses of prices to exchange rate impulses are large. The commutative response in three highest quarters attains almost 50% of standard deviation for prices of goods and less than 10% of standard deviation for prices of services. Empirical evidence therefore corroborates the fact that exchange rate policy is much more efficient at curbing prices in the goods sector than in the services sector. Exchange rate-based price stabilization would be distortionary, therefore the sustainability of such price stabilization would be questionable – especially because relative prices of services in Slovenia are already very high in comparison with the "normal", that is development-determined, relative prices of services.

In Table 3, relative prices of services for Slovenia, in comparison with Hungary, Poland, Croatia, Austria and Italy, are presented. Obviously, in Slovenia relative prices of services are much higher than in the compared transition economies. They are high also in comparison

[17] Estimated models are presented in the same specification as models in Bole(2001), although broader price desegregates are analyzed.

with both developed economies; around 80% of the relative price of services in Italy or in Austria is considerably higher than the differences in development (between Slovenia and those countries) could explain.[18] If relative prices of services are already "very high", a fixed or pure floating exchange rate regime would seriously jeopardize the dynamics of long-term real convergence even more than sustainability of price stabilization.

In theory, an optimal monetary policy would have to target nontradables prices because of differences in flexibility (market structure differences)[19]. The presented empirical evidence for Slovenia shows that the central bank must stabilize the economy by controlling money if nontradables prices are targeted. But targeting nontradables prices is not only the admissible stabilization policy. Relative prices of services in Slovenia are, in fact, already much higher than could be explained by the relative development of the economy. Stabilizing prices of nontradables conditional on the prices of tradables is, therefore, also a necessary pillar of an admissible policy of real convergence. In a free capital flow environment, therefore, neither pegging nor pure floating of the exchange rate regime could be an admissible option for the currency regime in Slovenia.

3. MANAGED FLOATING - IMPLEMENTATION OVERVIEW

Exchange rate interventions-descriptive evidence. It was documented that market structure differences and micro distortions on the labor market did not favor corner exchange rate regime options in Slovenia. While it is, at least *de jure*, not questionable that in transition money was targeted, interventions in the exchange rate dynamics were made without specifying any commitment or even preannounced path. It is, therefore, a question how the actual choice of interventions in the exchange rate dynamics was made?

To gain at least a heuristical impression of the exchange rate intervention "reaction function" it is worth looking at the intensity of the central bank interventions pinpointed at foreign financial flows.

In Figure 4 monetization on the retail forex market [20] is given as an appropriate indicator of the timing and size of the foreign financial flows monetary effects. In comparison with components of the balance of payments, monetization on the retail forex market enables much better insights into the (revealed preference) reaction function of a monetary policy facing considerable swings in foreign financial flows. There are several reasons why these insights are especially valuable in studying the reactions of monetary policy.

In the analyzed period, the scale of currency substitution was still substantial in Slovenia[21]. Therefore the size and dynamics of (net) monetization had more direct effects on the volume of broad money and the bank credit supply (than components of the balance of payments), as

[18] See, for example, Kravis and Lipsey (1983), where empirical evidence on interrelation between relative prices of services and development of the economy is presented..

[19] See Clarida et all(2001) and Aoki(2001).

[20] Net forex bought by the banking sector from the non-banking sector.

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

they directly affected the "tolar" part of bank balance sheets. Because of the “non-fixed” exchange rate regime and significant currency substitution, monetization on the retail forex market shows explicitly an imbalance in the forex market and, therefore, the scale and timing of the pressure on the exchange rate dynamics. If microeconomic variables are important for exchange rate dynamics, monetization on the forex market must directly incorporate their effects[22]. So, monetization on the retail forex market could actually figure in the (revealed preference) reaction function of the monetary authority.

In Figure 4, monetization on the retail forex market is given in percentages of quarterly GDP. Dates of launching new instruments for containing and neutralizing foreign financial inflows are marked by a star. Star therefore denotes periods when disequilibrium on the retail forex market became dangerous in perception of the policy makers. All new instruments were, obviously, launched in periods when monetization on the retail forex market attained peak values[23], that is, in the periods when the central bank faced big problems with money control and appreciation of the exchange rate. In years of high monetization, net forex bought from the non-banking sector exceeded considerably even 10% of broad money.

Heuristically speaking, we can say that policy makers target money and dump the volatility of an otherwise floating exchange rate, especially in peaks. This kind of basic “philosophy” of the exchange rate regime has not been changed up to 2002. The implementation of the exchange rate regime was, however, changed several times. Starting conditions, external factors (capital flows) and performance of the economy on other sectors (especially the fiscal stance) largely determined the policy instruments through which the currency regime was implemented. Volatility of these determinants caused vigorous changes in the dynamics of some basic variables (exchange rate or net foreign assets of the central bank), which are usually used as criteria for the exchange rate regime classification. This is why more detailed technical classification of the *de fact* exchange rate regime used in Slovenia revealed several possible classification changes in the analyzed period[24]. Just a descriptive analysis could distinguish at least three significantly different phases in implementation of the managed floating regime in Slovenia.

Three phases of managed floating implementation. Shortly after launching the new currency, pure floating of the exchange rate and exogenous money was the only possible choice for the central bank, as it faced high inflation and had negligible foreign exchange reserves, while the economy had no access to foreign credit[25]. Neglecting this starting period, phases of the managed floating exchange rate regime implementation could be illustrated by graphs of the central bank net forex assets and expected rate of return difference (for short term credits) presented in Figure 5.

Figure 5 shows the central bank net foreign assets given in percentages of base money. Expected rate of return difference is calculated for short-term credits of domestic banks (in

[22] On possible importance of microeconomic variables for dynamics of exchange rate, see Rose(1994).

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

[24] See, for example, Levy-Yeyati and Sturzenegger(2002).

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

domestic currency) vis-a-vis short-term credits of banks in Germany. Expected growth rate of the exchange rate is approximated by the actual growth rate of the exchange rate in the following quarter (on the yearly level). Using estimated expected exchange rate dynamics instead of actual future dynamics (for example, applying the same methodology Mishkin used for interest rates[26]) does not bring any relevant change to the analyzed graph. In the Figure the period of capital controls (1995/3 – 1999/2) is shadowed.

Graphs in Figure 5 reveal three phases in the implementation of the floating exchange rate regime in Slovenia. In every phase, money was controlled and volatility of the exchange rate dumped in peaks, but explicit intermediate targets and the structure of instruments were different.

The first phase coincides with the period in which net foreign assets of the central bank were smaller than base money; that phase lasted until the middle of 1995. In that period the central bank targeted base money. Because net foreign assets were less than base money, it was able to influence base money very effectively by changing even just the supply of its lending instruments. So possible runaways of expected rate of return difference were large and long-term, as the graph in Figure 5 documents. Potentially damaging offset effects (of controlling money) through capital flows could be neutralized efficiently through a simple additional shrinking of the supply of lending instruments to banks. As currency and sovereign risk premium were still high, in that phase, the room for maneuver of the central bank was even larger. In that phase, forex bills of the central bank, credits collateralized by central bank forex bills and the repurchase operation of central bank forex bills were the basic instruments through which monetary policy was facilitated [27].

The second phase of the managed floating regime coincides with the period of direct capital controls; it lasted from the second half of 1995 until the middle of 1999. In that phase the level of the central bank net foreign assets was systematically higher than corresponding figure for the base money. In the second phase, the central bank still targeted base money. Controlling money in that period became, however, considerably more difficult and costly. Because net foreign assets of the central bank significantly exceeded base money, the central bank had to neutralize harmful capital flow effects chiefly by borrowing (sterilization) instruments. In that phase controlling money was made additionally difficult because the currency and sovereign risk premium dropped considerably at the beginning of that period [28]. The graph in Figure 6 shows, that the pressure of foreign loanable funds increased considerably, in that phase. However, capital controls (enacted in that phase) enabled the central bank to tolerate at least short-term independence of the exchange rate path and interest rates path. As the graph in Figure 5 illustrates, amplitudes of expected rate of return difference swings were still high, but the period of swings was much shorter (on average, only around two quarters) and the average level was lower, because the danger of interest-elastic capital inflows were much higher than in the first phase. In addition to the instruments used already in the first phase, the central bank offered (on a permanent basis) its bills in

[26] See Mishkin(1984).

[27] See, Bole(1999),

[28] In 1996, several changes made Slovenia much more investors friendly. Restructuring of old debt from previous Yugoslavia was successfully finished; in the same year Slovenia successfully launched its first bond issue on euro market and got a single investment grade -A.

domestic currency, and they became a crucial new instrument in that phase of managed floating regime implementation. Costs of sterilized intervention increased significantly; but even in peaks costs did not exceeded 0.5% of GDP[29].

The final phase of the managed floating regime started after capital controls were removed , in the middle of 1999. In that phase, controlling money through short-term targeting of base money in periods shorter than a year became almost impossible. Because capital controls were absent, any significant even short-term change in the expected rate of return difference could trigger an offsetting inflow of capital, especially an increase in the forex credits supplied by domestic banks. The lifting of capital controls, namely, made the dynamics and the level of lending rates for short term forex credits of domestic banks almost equal to that for short-term credits in Germany (see, Figure 6). Net foreign assets of the central bank were already much higher than base money, and the central bank therefore could not appropriately increase the intensity of sterilization intervention (to contain and neutralize harmful effects of financial flows) to match the money target also in shorter periods (of two to three quarters) [30]. Matching the short-term money target was made especially difficult by the considerable increase in long-term (interest rate less elastic) capital inflows; this accelerated not only because of the lifting of capital controls but also because uncertainty about the successful end of the accession process diminished almost completely. In the third phase, the central bank therefore launched two changes in its intervening. In the short run, it has started to effectively target real interest rates, and is sticking to the base money volume target only on the longer horizon[31]. To make effective real interest targeting possible (to mitigate financial flows offsetting), the central bank has started to tightly manage (intervene in) exchange rate dynamics to prevent swings in the expected rate of return difference. The exchange rate has therefore become a crucial instrument for battling capital inflows, although not through its unexpected volatility but through minimizing volatility and size of the expected rate of return differences.

The central bank makes its commitment to interest parity condition credible through a contract with business banks. Through this contract, the central bank offers forex swap (on a permanent basis) as a crucial instrument for managing exchange rate dynamics. The change in the implementation of monetary policy targeting is illustrated by graphs of expected rate of return differences, ex post real interest rates and increment in narrow money per unit of GDP. These graphs are given in Figures 5 and 7. Obviously, a change in the formulation of controlling money and exchange rate floating, after capital controls were lifted, resulted in a stabilization of real interest rate, a lower and less volatile ratio of narrow money over GDP and almost constant expected rate of return differences [32].

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[29] See Bole(1999).

[30] At the end of 2001, for example, when Euro currency was launched, capital inflow through the households sector only in one month attained around 4% of yearly GDP. It took central bank over three quarters to neutralize corresponding increase in the base money.

[31] Practical problems with instrumentalization of the short term money volume targeting push central bank to make the same step Romer makes in theory (see, Romer(2000)).

[32] Introduction of VAT in 1999, strong increase in excises (excises on oil products more than doubled), additional increase in VAT tax rate and increase in several prices controlled by the government considerably increased variance in relative prices and accelerate prices of nontradables and oil products after 1999. Keeping real interest rates high and correspondingly adjusting exchange rate central bank has been squeezing domestic private demand to curb price

4. MANAGED FLOATING - MODEL OF THE MECHANISM

Description of the model. In the analyzed period, the economy faced wholescale restructuring and a very volatile external environment. Using only descriptive evidence, it is difficult to evaluate even the consistency of the policy–makers' measures, not to mention the (heuristical) commitment (to fighting nontradables inflation and dumping exchange rate appreciation at peaks) or even to assess the efficiency of such a policy. Using a simple reduced form model, consistency of the exchange rate regime is tested and basic feedback of the exchange rate regime mechanism identified.

A quarterly model is specified and estimated for the period 1993/3 to 2002/2. Because of the shortness of the analyzed period, and therefore small amount of information, the model incorporates only three endogenous variables and two exogenous variables.

The model deals with the interplay of real interest rate, real exchange rate and prices. Such reduction and linear transformation of variables is not used only because of scarce data, but also because a long-run relationship between those variables is a priori expected, knowing the descriptive evidence of the previous section and corresponding (heuristical) commitment of the monetary policy[33]. As already mentioned, the primary goal of the model analysis would have to be testing monetary policy consistency, and estimating (potential) long-run "monetary rule" used in managing exchange rate floating.

To enable the model to track the actual dynamics, the volatile environment has to be explicitly specified in the model. Two exogenous sources of volatility are, therefore, incorporated into the model. Push factors of abundant and volatile financial flows from abroad are encompassed in the model with a foreign interest rate variable. Introduction of VAT and increased fiscal repression are specified by the dummy variable for introduction of VAT and the price of gasoline.

The average quarter exchange rate for the euro (in domestic currency) features as an exchange rate variable. The average quarter retail price index and average price of gasoline index are price variables used in the model. Quarter averages of lending rates for short-term credits to the business sector are taken for domestic and foreign interest rate variables. Except interest rates and dummy variables, all other variables are in logs[34].

Data are, however, available only for nominal interest rates. Since in the model the real domestic interest rate figures as an endogenous variable, it is estimated using the method suggested by Mishkin[35]. The real interest rate for the current quarter is estimated as an

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increases. In the three years period, high real interest rates significantly cut domestic private demand share in GDP (household spending by 3.5 and investment by 4.2 percentages of GDP), but kept export performance unchanged.

[33] On homogenity restrictions, see Pesaran and Smith (1998).

[34] Data for price variables are from Monthly Statistical Review, Statistical Office of the Republic of Slovenia; data for domestic interest rate and exchange rate are from Monthly Bulletin of the Bank of Slovenia and foreign interest rate data are from Monthly Report of the Deutsche Bundesbank.

[35] See, Mishkin(1984).

expected value of ex post real interest rate (for the same quarter), conditional on the information set available at the end of the previous quarter. The linear regression function used for estimating the real interest rate is presented in Table 4. In the function, all variables, except interest rates, are in the growth rates; interest rates are in the first differences[36].

Variables in the managed floating model are stationary in differences[37], but the test of cointegration rejected no cointegration hypothesis at 10% significance[38]. The model is therefore estimated in a vector error correction form. Although testing of cointegration would have to be done conditionally on the order of the model[39], a lack of data made any parsimonious testing unsafe. The lowest order (p=1) is used, and cointegration is tested only for such specification. Test of higher rank of cointegration seems meaningless, because there is not enough of data to estimate larger model. Nevertheless, test of hypothesis of no more than one cointegrating vector was formally made, and was not significant at 10% [40].

Model results. The estimated model is presented in Tables 5 and 6. In the first Table, parameters of a long-run relationship (coefficients of cointegrating vector) and feedback parameters (error correction coefficients) are given. Coefficients of short-run relationships are presented in Table 6. In both tables t-statistics are given in brackets.

To illustrate quality of the model specification, significances of testing residual autocorrelations and heteroscedasticity are also given in the second table. Possible structural change was tested for the period immediately after lifting the capital controls (2000/I-2000/IV). The simplest (one forecast period) test for the structural change was used. In two quarters (2000/I and 2000/III) test was significant at 0.1 significance. Cumulative test for the structural change in 2000[41] was on the verge of significance (0.12). At testing, however, it was impossible to avoid lack of data problem, especially at using F approximation in small samples.

The long-run relationship between the real interest rate, real exchange rate and prices has a simple interpretation. It captures the idea that in the transition period, in Slovenia, the process of restructuring of the real and financial sector (falling of real interest rates and real appreciation of the exchange rate) went simultaneously, and that phase of the process of restructuring is marked by aggregate achievements in the stabilization of the economy (price stabilization). Any enforced acceleration on one segment of the restructuring was offset by a lagging in the other. The long-run relationship, for example, indicates that artificial acceleration in real restructuring neglecting the aforementioned differences in the market structure of tradable vis-a-vis nontradable sectors would be, on the long run, offset by increased financial repression! The shortness of the analyzed period prevents the introduction of the government into the model . The point is, in transition, intensive restructuring of the

[36] Data on interest rate, exchange rate and money variables are from the Monthly Bulletin of the Bank of Slovenia, data on other variables are from Monthly Statistical Review, Statistical Office of the Republic of Slovenia. All variables used in the regression for real interest rate passed the unit root test at 10% significance.

[37] Variables of the model passed unit root test in differences at 10% significance.

[38] Likelihood ratio was 30.4.

[39] See, for example, Pesaran and Smith(1998).

[40] Corresponding likelihood ratio was 12.6.

[41] See, for example, Lütkepohl(1993).

government sector was the third process determining progress of the transition (development) process, therefore the model's long-run relationship would also have to incorporate corresponding trade-offs.

Coefficients of the short-run part of the model are given in Table 6.

Deviations from the long-run relationship feed back significantly through the short-run dynamics of interest rate and exchange rate; both error correction coefficients are significant. High real interest rates in comparison with the phase of the long-run process of financial and real restructuring would cause, in the next period, real appreciation of the exchange rate and a fall in the real interest rate. Insignificance of the inflation feedback (error correction) parameter makes sense in the context of the aforementioned interpretation of the price variable role in the long-run relationship.

The mechanism of the exchange rate regime workings is illustrated by the impulse response graphs in Figure 8. This presents graphs of real interest rate responses to impulses in prices, price and real exchange rate responses to real interest rate impulses and responses of prices to real exchange rate impulses.

The price impulse gives a strong push to the real interest rate in the second quarter, when almost 40% of the variance in real interest rate is due to price impulse. The long-run increase in real interest rate is smaller. The strong effect of prices on real interest rates already in the two quarters period is probably caused not only by the policy–makers' activity but also by the system of interest rates indexation. An unexpected change in prices affects nominal interest rates immediately, while expected inflation probably changes (because of one additional piece of information) much less.

Crucial for the analysis of the managed floating regime in Slovenia is the graph in which the exchange rate effects of the impulses to the real interest rate are presented. An increase in the real interest rate pushes the real exchange rate up in the first two quarters. Long run responses are lower. Nevertheless the share of the real exchange rate variance due to the real interest rate (around 30%) does not fall significantly in the long run. Such a strong response of the exchange rate on impulse to interest rate could reconcile trend and volatility of the expected rate of return difference (in Figure 6), especially after 1999, and the dynamics of the ex post real interest rate presented in Figure 7. Such an empirical fact also corroborates the already sketched mechanism of managed floating, according to which money (interest rates) control is used to stabilize prices, while the exchange rate is adjusted to keep the expected rate of return difference at the same level and so prevent the offsetting dynamics of loanable funds from abroad.

The short-run inflation effect of the change in the real exchange rate is high and significant, while that of the change in the real interest rate insignificant (see Table 6). Nevertheless, responses of prices to impulses in the real exchange rate are smaller than those of real interest rates, especially over longer horizons. The responses to exchange rate impulses are concentrated in the first three quarters, while responses to interest rates impulses are higher over longer horizons.

Exogenous variables describing the introduction of VAT and fiscal repression significantly affect the short-run dynamics of interest rate, exchange rate and inflation. For the analysis of

the exchange rate mechanism (managed floating), most revealing is the short-run effect of the foreign interest rate on the real exchange rate. Although the coefficient is not significant (t-statistics is equal to 1.4), its negative sign corroborates additionally the described mechanism of managing the exchange rate. An increase in the foreign interest rate enables, ceteris paribus, faster appreciation (slower depreciation) of the exchange rate; because slower depreciation is necessary to keep the expected rate of return difference on the same level, with unchanged (expected) inflation and, therefore, with the same stance of monetary policy (real interest rates).

The model results confirm that in Slovenia stabilization has been facilitated through money control (through targeting base money or real interest rates). Results also corroborate the fact that exchange rate interventions were coherently used to support effectiveness of money control. The main difference between the lessons from the estimated model of managed floating in Slovenia and those from the theoretical models is probably the connectedness of both instruments. Changing only one of the instruments, interest rate or (dynamics of) exchange rate, in the estimated model context, does not automatically also cause a change in the monetary stance, as it does in the context of the optimal rule of theoretical models[42].

5. CONCLUSIONS

In this paper the exchange rate regime in Slovenia is analyzed.

It is shown that, because of the sectoral differences in the product market structure and micro distortions on the labor market, the potential effects of exchange rate anchoring of the prices of services (and nontradables) are small. The exchange rate anchoring of prices would be distortionary, that is, prices of tradables are curbed, while the prices of services (nontradables) are not. Money anchoring has strong and much more uniform effects across sectors.

Since the theoretical results show that optimal monetary policy would have to target nontradables prices despite the impact of the resulting variability of tradables prices, the presented empirical results corroborate the idea that the central bank should target nontradables prices, using money control and not exchange rate anchoring. In a free capital flow environment, therefore, neither pegging nor pure floating of the exchange rate regime could be an admissible option for the exchange rate regime in Slovenia.

The estimated model confirms that in Slovenia money (real interest rates) targeting was used to stabilize prices, while the exchange rate was managed to keep the expected rate of return difference at the same level and so prevent the offsetting dynamics of loanable funds from abroad. The exchange rate has therefore become a crucial instrument for battling capital inflows, although not through its unexpected volatility but through controlling the expected rate of return differences.

Although the implementation of managed floating has changed several times, depending on the possible controllability of harmful effects of foreign financial flows, the model results corroborate the fact that exchange rate interventions were coherently used to support effectiveness of money control.

[42] See Bofinger and Wollmershaeuser(2001) or Ball(1998).

STATISTICAL ANNEX

Table 1
VAR model for goods producing sectors

	Prices	Wages	Exchange rate	Money
Prices [a]	0.2010	0.7228	-0.0521	1.1208
	(1.2)	(1.6)	(-0.2)	(1.9)
Wages [b]	0.0436	-0.4682	0.1831	0.3319
	(0.6)	(-2.5)	(1.5)	(1.4)
Exchange rate	0.2255	0.4676	2838	-0.0879
	(2.5)	(1.9)	(1.7)	(-0.3)
Money [c]	0.0695	0.2035	0.0486	-0.1738
	(1.8)	(2.0)	(0.7)	(-1.3)
VAT dummy	0.0124	0.0209	0.0029	0.0663
	(1.2)	(0.7)	(0.1)	(1.8)
Gasoline prices	0.0999	-0.2894	0.1486	-0.3417
	(1.7)	(-1.9)	(1.4)	(-1.7)
R^2 adj	0.47	0.27	0.15	0.35

Note: All variables are in the differences of logarithms.
[a] Retail prices of goods.
[b] Average wage in tradable segment.
[c] Narrow money per unit of real GDP.

Source: Monthly Bulletin of the Bank of Slovenia; Rapid Reports – Labor market, Statistical Office of the Republic of Slovenia.

Table 2

VAR model for services producing sectors

	Prices	Wages	Exchange rate	Money
Prices [a]	0.3725	0.1125	0.4489	0.7998
	(2.9)	(0.3)	(2.0)	(1.9)
Wages [b]	0.2348	-0.4245	0.0555	0.6249
	(4.0)	(-2.7)	(0.6)	(3.3)
Exchange rate	0.0725	0.5086	0.0855	-0.1171
	(0.7)	(1.8)	(0.5)	(-0.3)
Money [c]	0.1050	0.2407	-0.0123	-0.1849
	(2.6)	(2.2)	(-0.2)	(-1.4)
VAT dummy	0.0169	0.0040	0.0110	0.0599
	(1.5)	(0.1)	(0.6)	(1.7)
Gasoline prices	0.1336	-0.2721	0.0746	-0.2014
	(2.3)	(-1.7)	(0.7)	(-1.0)
R^2 adj	0.71	0.23	0.21	0.43

Note: All variables are in the differences of logarithms.

[a] Prices of services.

[b] Average wage in nontradable segment.

[c] Narrow money per unit of real GDP.

Source: Monthly Bulletin of the Bank of Slovenia; Rapid Reports – Labor market, Statistical Office of the Republic of Slovenia.

Table 3
Relative prices of services in Slovenia

Italy	1998/10	82.7
Austria	1998/10	75.0
Poland	1996/10	150.3
Croatia	1996/10	163.7
Hungary	1996/3	159.1

Note: Relative prices of services are calculated per unit of prices of goods; relative prices of services in Slovenia are presented in the percentages of relative prices in other economies.

Source: Working papers EDP, 1999/10, 1996/9, 1997/5, 1999/3, Institute for economic diagnosis and prognosis, University of Maribor, Slovenia.

Table 4
Model of real interest rate

	Lag	Coefficient	t-stat
Nominal index[a]	1	-0.4846	-2.1209
VAT dummy	0	-7.3041	-2.3471
Base money[b]	1	5.5718	1.0434
Prices	1	3.6445	4.5615
Prices	2	-1.7664	-2.3078
Exchange rate	1	75.876	1.7311
Real interest rate	2	-0.2828	-1.7408
R^2 adj	0.46		
DW	2.17		

Source: Monthly Statistical Review, Statistical Office of the Republic of Slovenia; Monthly Bulletin of the Bank of Slovenia; Statistical Bulletin, Agency for Payments Settlement; own calculations.

Note: Interest rates are in the differences, other variables, except dummy variable, are in the growth rates.
[a] Moving average of monthly price indexes used in indexation of interest rates.
[b] Money in percentages of gross domestic payments.

Table 5
Model of monetary policy - I

	Long run parameters	Feed back parameters [a]
Real interest rate	1.0000	-0.2599 (-3.6)
Prices	84.892 (1.8)	-0.0001 (-0.6)
Real exchange rate	167.88 (1.4)	-0.0011 (-2.1)
Constant	-54.438	

Source: Monthly Statistical Review, Statistical Office of the Republic of Slovenia; Monthly Bulletin of the Bank of Slovenia; own estimates.

Note: Prices and real exchange rate are in logarithms.
[a] Feed back parameters for the increments in variables.

Table 6

Model of monetary policy - II

Short-run parameters and specification tests

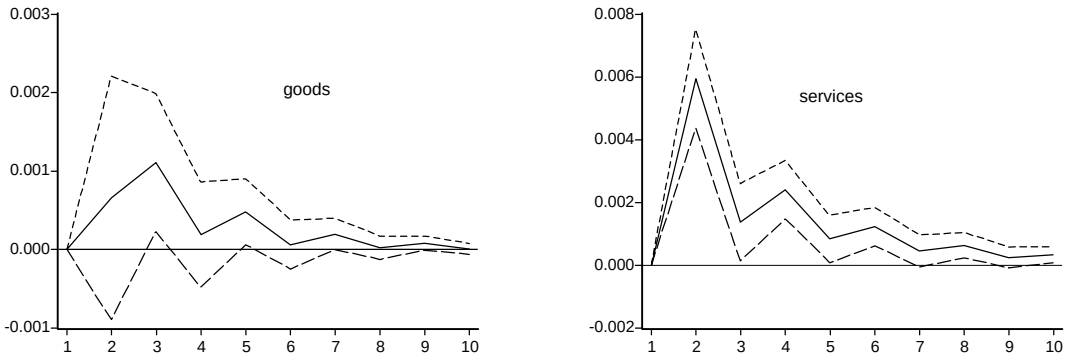
	Real interest rate	Prices	Real exchange rate
Real interest rate	- 0.1673 (-1.5)	0.0001 (0.3)	0.0010 (1.3)
Prices	240.839 (6.2)	0.2433 (2.1)	-0.2494 (-0.9)
Real exchange rate	28.034 (1.1)	0.1945 (2.6)	0.2870 (1.6)
VAT dummy	-5.6078 (-3.0)	0.0081 (1.4)	-0.0129 (-1.0)
Gasoline prices	7.6331 (0.8)	0.1588 (5.3)	-0.1612 (-2.3)
Foreign interest rate	-2.1687 (-1.1)	-0.0003 (-0.0)	-0.0193 (-1.4)
AR (2) [a]	0.3	0.7	0.2
ARCH (2) [a]	0.6	0.7	0.6

Source: Monthly Statistical Review, Statistical Office of the Republic of Slovenia; Monthly Bulletin of the Bank of Slovenia; own estimates.

Note: Prices and real exchange rate are in the increments of logarithms; interest rate is in the increments.

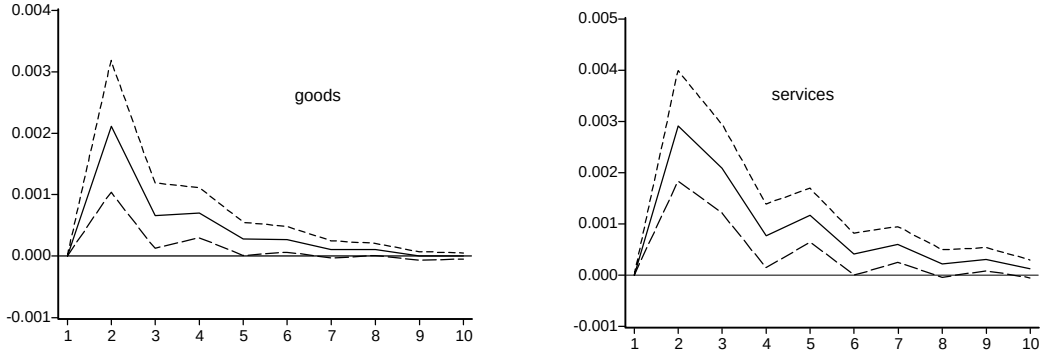
[a] Significance.

Figure 1
Price responses to wage impulses



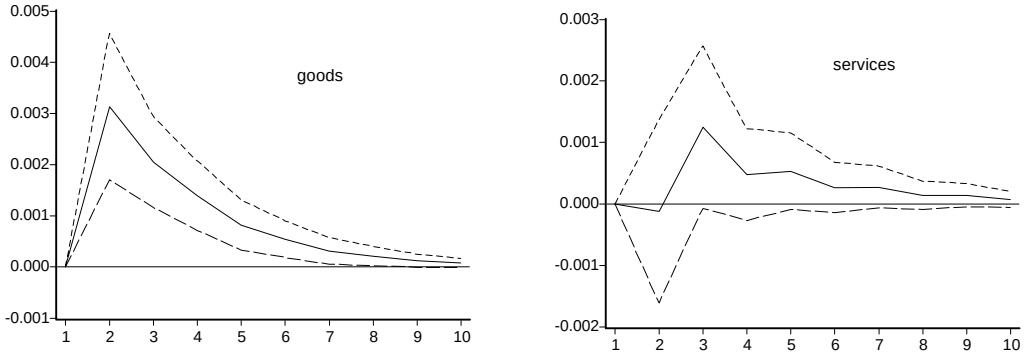
Source: Model estimates.

Figure 2
Price responses to money impulses



Source: Model estimates.

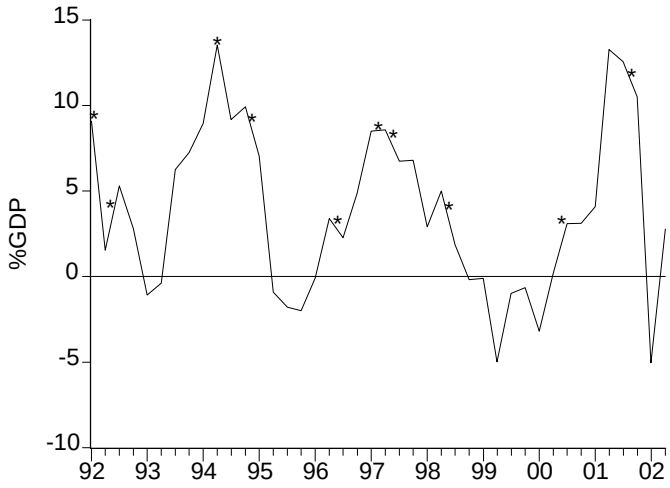
Figure 3
Price responses to exchange rate impulses



Source: Model estimates.

Figure 4

Monetization[a] on the retail forex market



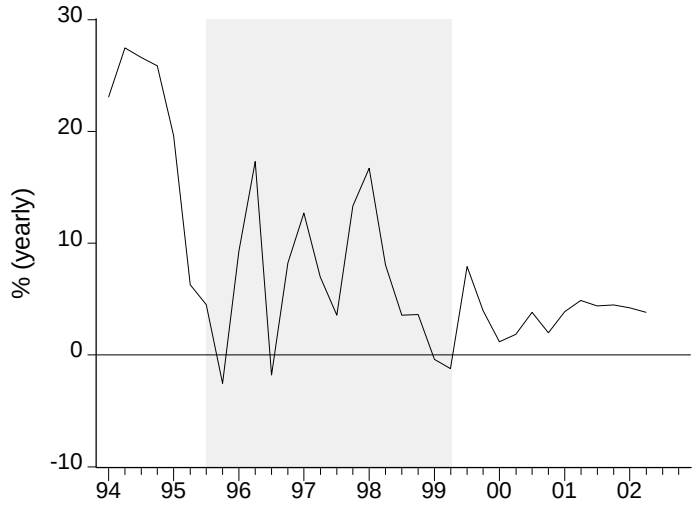
Source: Monthly Bulletin of the Bank of Slovenia; own calculations.

Note: Star indicates launching of new measure (instrument).

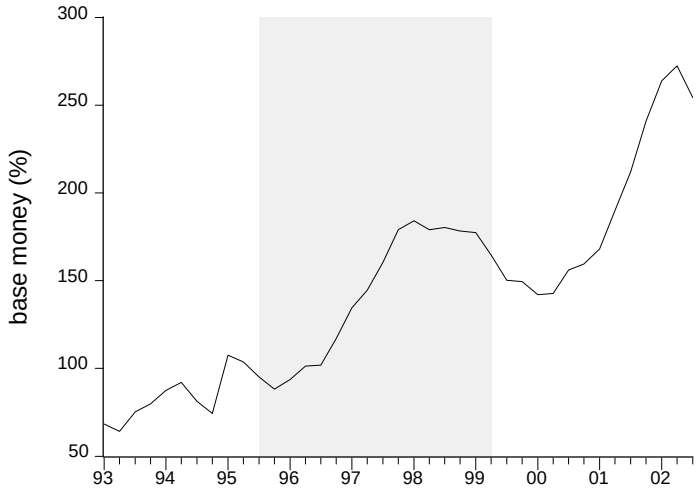
[a] Net forex bought from the non-banking sector.

Figure 5
Exchange rate regime effects

Expected rate of return differences [a]



Net foreign assets of the Bank of Slovenia

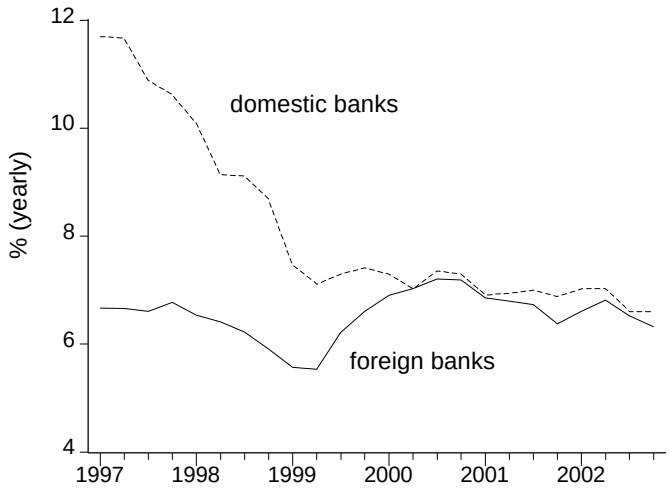


Source: Monthly Bulletin of the Bank of Slovenia; Monthly Report of the Deutsche Bundesbank; own calculations.

Note: Periods of capital controls are shadowed.

[a] Short term (tolar) credits in Slovenia vis-à-vis short term credits in Germany.

Figure 6
Lending rates

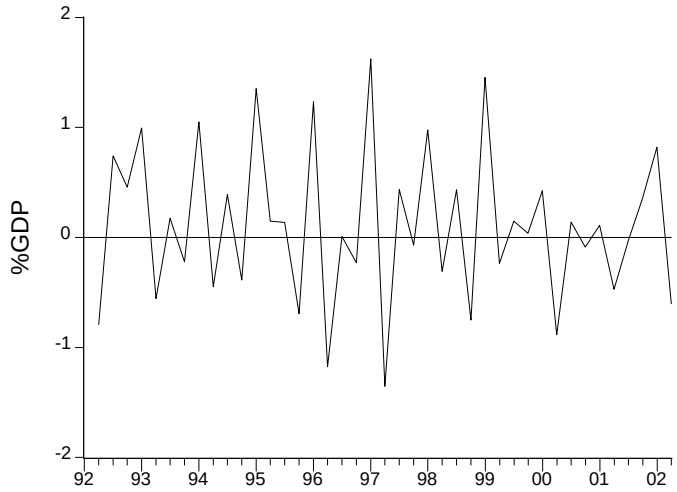


Source: Monthly Bulletin of the Bank of Slovenia; Monthly Report of the Deutsche Bundesbank.

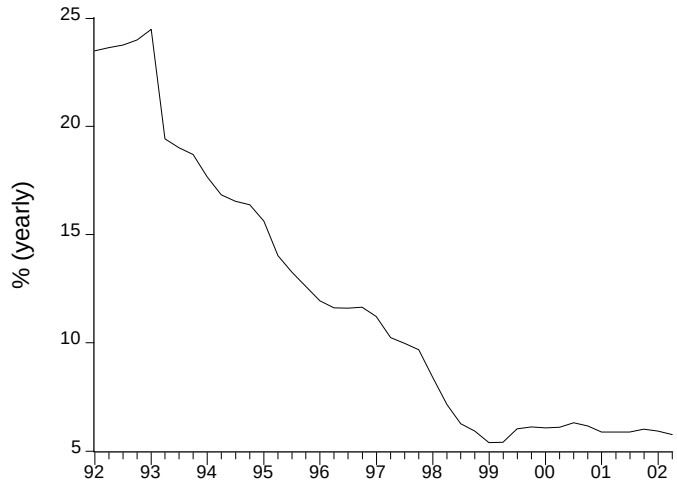
Note: Lending rates for short term credits in forex (in DEM) in comparison with lending rates for short term credits in Germany.

Figure 7
Money and interest rates

Money [a]



Ex post real interest rates [b]

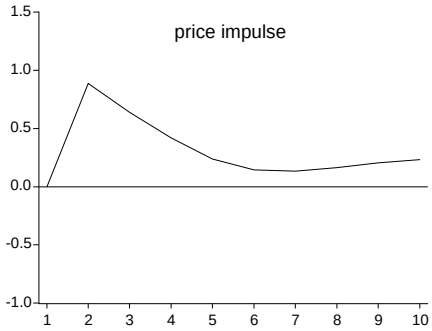


Source: Monthly Bulletin of the Bank of Slovenia; own calculations.

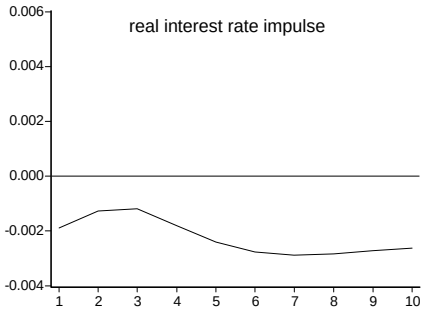
Note: [a] Narrow money in percentages of GDP (increment).
[b] Lending rates for short term credits.

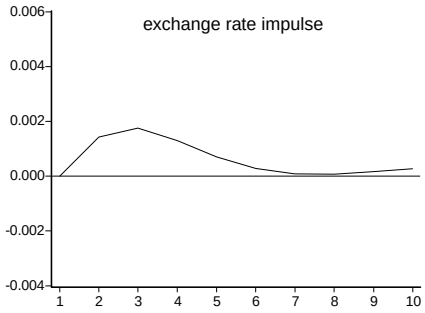
Figure 8
Managed floating mechanism; model estimates

Responses of interest rates

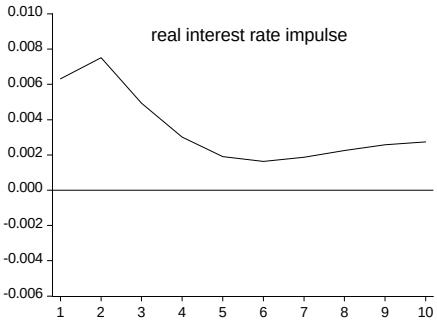


Responses of prices





Responses of exchange rate



Source: Model estimates.

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