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SOURCES OF INFLATION IN TRANSITION ECONOMY: THE CASE OF CROATIA

The aim of this paper is to study the inflation generation process in Croatia. Following the estimation strategies of Dibooglu and Kutan (2005.) we estimate a small open economy model, using SVAR estimation approach. The results of the estimated model imply that the inflation in Croatia is strongly related to the terms of trade and balance of payment shocks. We contrast these results to the re-estimated unrestricted VAR model, following the Payne (2002.) estimation strategy. The results of the latter also confirm that monetary shocks have relatively small influence on the inflation generation process in Croatia.

Key words: inflation, Croatia, SVAR.

1. Introduction

After experiencing hyperinflation, Croatia has enjoyed a prolonged period of stable inflation rates, and that period lasts for consecutive 12 years. The pattern is easily observed at Figure 1. The hyperinflation period in Croatia is relatively well documented in the literature[1]. As was the case in other transition economies,

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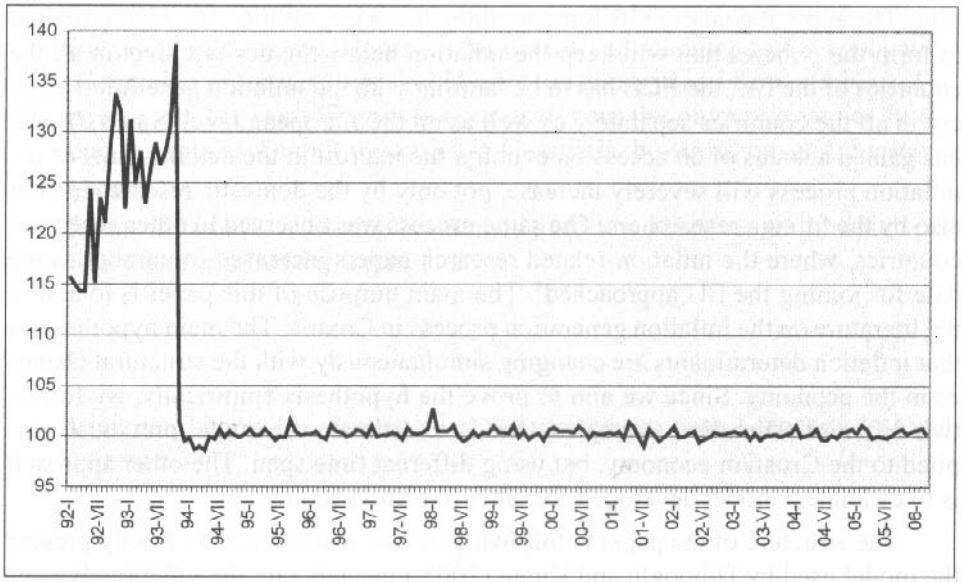
[1] For an overview of the inflation generation process during the hyperinflation period, as well as links to other segments of the Croatian macroeconomic system, see Anušić et al. (1995.) and Babić (1998.).

in the first phases of transition, monetization of fiscal deficits was the key factor behind the initial impulse of inflation. In addition to that, backward-looking wage indexation inherited from the socialist system was responsible for maintaining inflation at high levels. It can be concluded that inflation generation process in the hyperinflation period in Croatia was similar to those in other transition economies. Even the policies to curb inflation were similar across the countries, with exchange rate anchor frequently used as a crucial pillar of the stabilization program. Many small open developing economies seeking to reduce inflation have used a pre-announced time path of the exchange rate as the nominal anchor for monetary policy, often in the form of a crawling peg. The same is the case in Croatia, which has implemented its stabilization program in the year 1993. These so-called exchange rate-based stabilization (ERBS) plans have been associated with two empirical regularities (Celasun, 2006.). First, they generated a boom–recession cycle in economic activity in the countries they were implemented. The main characteristics of these cycles were that consumption and output usually expanded in the early stages of the program implementation, but recessions regularly occurred at the later stages of failed and successful stabilizations alike. Second, domestic inflation rates, especially in the segment of nontradables, converged to the rate of devaluation slowly, resulting in sustained real exchange rate appreciations. The similar pattern is also observed in the Croatian economy.

Figure 1.

MONTHLY CHANGES IN CROATIAN CONSUMER PRICE INDEX, 1992:I-2006:III



Sources: Croatian National Bank.

The importance of exchange rate anchor after the stabilization program implementation in Croatia is emphasized by Šonje and Škreb (1995.). In fact, Croatian economy is often characterized as being highly euroized[2]. Consequently, the association between the exchange rate movements and the inflation rate, in particular after the implementation of the stabilization program, have been generally perceived by the public as to follow the same direction. This has enabled the country to quickly import the inflation rate and lower it to a reasonable level. In fact, the Croatian economy did manage to decrease the inflation from very high rates in relatively short period, which was considered as a successful story in comparison to other countries that have applied similar stabilization programs. This has somewhat deferred the attention from the inflation, as one of the problems of Croatian economy. The relative lack of variation in inflation rate during the period

[2] See, for example, Vujčić (2003.).

after the implementation of the stabilization program has only been surpassed by the lack of empirical analysis of the inflation generation process in Croatia.

Inflation is one of the key variables for the EU joined economic policy – stable inflation rate in line with those in other EU economies is one of the preconditions for joining the monetary union. Therefore, it is not a surprise that the European central bank (ECB) puts a special emphasis on the inflation rate in the EU countries. The explicit goal of ECB is maintaining the price stability. In order to be able to form the policies that will keep the inflation below the desired level in all the countries of the EU, the ECB has to be familiar with the inflation generation process in all the countries separately as well as on the European level. Since Croatia has gained a status of an accession country, the interest in the determinants of the inflation process will severely increase, not only by the domestic researchers, but also by the foreign researchers. The same process was observed in other accession countries, where the inflation-related research papers increased in number as the date for joining the EU approached[3]. The main purpose of this paper is to add to the literature on the inflation generation process in Croatia. The main hypothesis is that inflation determinants are changing simultaneously with the structural changes in the economy. Since we aim to prove the hypothesis empirically, we follow two different estimation strategies. One is to estimate the model previously applied to the Croatian economy, but using different time span. The other approach is to estimate a model developed for other transition economies.

The structure of the paper is following. In the next section we briefly present the model used by Dibooglu and Kutan (2005.) in analyzing the inflation dynamics in other two transition economies – Poland and Hungary. In the third section we present the data and discuss the estimation method applied. Fourth section presents results of the estimation procedure following the Dibooglu and Kutan (2005.) methodology and estimated SVAR model, as well as procedure used by Payne (2002.) which suggests estimating a VAR model. The last section concludes.

2. Inflation dynamics modelling

The inflation dynamics of a transition economy does not readily follow established theoretical models[4]. In transition economies, there are many structural

[3] See, for example, Fabiani and Morgan (2003.), McAdam and Willman (2003.), Łyziak (2003.), Trigari (2004.), Coenen and Levin (2004.).

[4] Even though Sahay and Vegh (1995.) argue that inflationary processes in transition economies are similar to those in market economies.

and institutional changes, which also influence the inflation generation process. Furthermore, due to the profound changes simultaneously occurring in a relatively short period of time, it is rather difficult to empirically distinguish between the effects different segments of the economy exert on specific macroeconomic variable. Recently, Dibooglu and Kutan (2005.) have proposed an open economy aggregate supply-aggregate demand model, which is suitable for analyzing inflation dynamics. The brief outline of the model is presented here, since we are using it for the estimation purposes. However, for details and roadmap to the application of the estimation procedure, one should refer to Dibooglu and Kutan (2005.). The authors also use the same framework for analyzing the output dynamics in the mentioned countries. Output dynamics in Croatia is, however, beyond the scope of this paper.

Terms of trade (h) evolution is assumed to follow a random walk, which can be shown with the following expression:

$$h_t = h_{t-1} + \varepsilon_t^h \tag{1}$$

Aggregate supply (y – domestic output) depends on output capacity ($\hat{y}$) and terms of trade:

$$y_t^s = \hat{y}_t + \theta h_t \tag{2}$$

Output capacity can be modelled as a function of the productive capacity of the economy, and in that case we would need more structure relating the output to the capital stock and employment. However, since our aim is to be able to empirically asses the influence of shocks to the inflation dynamics, and we have to deal with limited data sources in Croatia, at this stage we have used the assumption that output capacity simply follows a random walk process. This assumption is, as it will be shown later, also used for other variables in the model.

$$\hat{y}_t = \hat{y}_{t-1} + \varepsilon_t^s \tag{3}$$

The model allows for non-instantaneous balance of payment adjustments. Capital inflows are modelled as a function of the net domestic rate of return including interest rate effect (the difference between the domestic nominal interest rate i and the foreign interest rate i^*) and exchange rate effect (s – representing the exchange rate as the domestic currency price of foreign currency), adjusted for a risk premium (ρ), with additional correction of the overall capital inflows impact for the degree of capital mobility (k). The model we are estimating implies

perfect capital mobility. Although it is possible to analyze a model with a certain degree of capital mobility, we believe that restrictions to the capital account are sufficiently removed in the Croatian case to support our assumption. Furthermore, Dibooglu and Kutan (2005.) have shown that both in the case of Hungary and in the case of Poland, estimations with and without assumption of perfect capital mobility yield approximately the same result.

The trade balance is a function of the real exchange rate (p denoting the domestic price level). We also allow for exogenous shifts in exports due to changes in competitiveness (b). This yields following expression for the balance of payment adjustment:

$$k\left[i_t - i_t^* - \left(E_t s_{t+1} - s_t\right) - \rho_t\right] + \eta_1\left(s_t - p_t\right) - \eta_2 y_t + b_t = 0 \qquad (4)$$

Based on the previous expression, exogenous elements in the balance of payments (z), comprise of the following:

$$z_t = \left[i_t^* + \rho_t - \left(1/k\right)b_t\right] \qquad (5)$$

We assume that these shocks follow a random walk.

$$z_t = z_{t-1} + \varepsilon_t^z \qquad (6)$$

The demand side of the economy comprises of autonomous aggregate demand (d), expected real interest rate and net exports.

$$y_t^d = d_t - \gamma\left[i_t - E_t\left(p_{t+1} - p_t\right)\right] + \eta_1\left(s_t - p_t\right) - \eta_2 y_t \qquad (7)$$

The assumption is that aggregate demand shock also follows a random walk.

$$d_t = d_{t-1} + \varepsilon_t^d \qquad (8)$$

In money demand equation we assume the unitary income elasticity, but also that money demand depends on exogenous balance of payment shocks. Consequently, money demand is specified by the following expression:

$$m_t^d = p_t + y_t - \lambda i_t - \mu z_t \tag{9}$$

Money supply is assumed to follow a random walk.

$$m_t^s = m_{t-1}^s + \varepsilon_t^m \tag{10}$$

Finally, we close the model by imposing the goods market and money market equilibrium.

$$y_t^s = y_t^d = y_t \tag{11}$$

$$m_t^s = m_t^d = m_t \tag{12}$$

In all previous equations all of the variables except interest rates are expressed in logarithms, t denotes time, E is the expectations operator, and ε denotes stochastic disturbances in respective equations.

As shown in detail by Dibooglu and Kutan (2005.), this model enables SVAR analysis of the 5 specified shocks in the economy: terms of trade, aggregate supply, balance of payment, aggregate demand and monetary shock. The long run effects of the shocks on the endogenous variables are given by following expression:

$$\begin{vmatrix} \Delta h_t \\ \Delta y_t \\ \Delta(s_t - p_t) \\ \Delta(m_t - p_t) \\ \Delta p_t \end{vmatrix} = \begin{vmatrix} a_{11}(1) & 0 & 0 & 0 & 0 \\ a_{21}(1) & a_{22}(1) & 0 & 0 & 0 \\ a_{31}(1) & a_{32}(1) & a_{33}(1) & 0 & 0 \\ a_{41}(1) & a_{42}(1) & a_{43}(1) & a_{44}(1) & 0 \\ a_{51}(1) & a_{52}(1) & a_{53}(1) & a_{54}(1) & a_{55}(1) \end{vmatrix} \begin{vmatrix} \varepsilon_t^h \\ \varepsilon_t^s \\ \varepsilon_t^z \\ \varepsilon_t^d \\ \varepsilon_t^m \end{vmatrix} \tag{13}$$

After brief discussion of the data and estimation issues in the next section, we present the results of the SVAR model estimation and contrast those with VAR estimation results following Payne (2002.) estimation strategy. That estimation procedure is used as an additional tool to gain the insight into the relationship between the variables of interest. In addition, our assumption is that the inflation generation process has changed in the last few years in Croatia. Therefore, analyzing the different data period should reveal different relationships between the analyzed variables.

3. Data and estimation strategy

In order to estimate the model for the Croatian economy, we have to deal with specific data issues. First of all, the data availability is rather limited in Croatia. Therefore, some of the variables in our case had to be constructed. This has also somewhat influenced the choice of the analyzed period, since for some variables it was not plausible to extend the data period further in the past. Due to the shortness of the period, we analyze monthly data for the period 1998:1 to 2006:3. Most of the data used in the analysis are available on the Croatian National Bank (www.hnb.hr) and Croatian Bureau of Statistics (www.dzs.hr) Internet pages. For the construction of the unavailable variables, available variables on the same Internet pages were used.

The main reason that the analyzed period in this paper is restricted is the fact that the inflation measure according to the same methodology is available only since the year 1998. Specifically, Croatian Bureau of Statistics is publishing consumer price indices (CPI) for the period since 1998 onwards and prior to that year inflation in Croatia was measured by two alternative indices – retail price index and cost of living index. Even though comparisons between those indices reveal that in the period of low inflation all of the alternative measures indicate the same changes in inflation, there are certain differences in levels of the indices. Since the variations in inflation rate are low during the analyzed period, we have decided to apply only the data based on same methodology, to minimise possible biases stemming from the data issues themselves.

There is additional reason we start our analysis with the year 1998. That is the fact that the introduction of the VAT in the Croatian tax system coincided with the beginning of our period of the analysis. If we were to analyze longer time period, the beginning of the year 1998 would have to be a priori considered as a structural break. Namely, introduction of VAT caused short-run shock to the price level, which was reflected as a one-time increase in the price index. Since this has coincided with the change in the methodology, we would not be able to appropriately distinguish between those two effects.

The dynamics of the analyzed data is also being determined by the data availability. Since the analyzed period is not that long, we have decided to use the monthly data dynamics, although comparative studies in other countries usually deal with longer time spans, and annual data. Since we are using monthly data, we have excluded GDP as a relevant output indicator in the model, as we have not tried to interpolate the quarterly GDP estimates to the monthly level. Instead, we have used data on industrial production as a proxy for our output variable (output). Even though in the changing structure of the Croatian economy it could be argued that industrial production can, through the passing of the time, serve less as an appropriate indicator of overall economic growth (due to the increasing share of the

service sector), we still believe that, when dealing with high frequency data, it is the most appropriate indicator. The statistical coverage of the growing service sector is still relatively underdeveloped even on the quarterly level, and consequently we would not have the appropriate alternative indicators to capture the changing structure of the economy in a high-frequency data. If we were trying to interpolate the GDP from quarterly to monthly level, we would probably use the industrial production indices as an auxiliary variable.

We have used two different measures of exchange rate changes, to be able to use the same variables as Payne (2002.) and Dibooglu and Kutan (2005.) have used in their estimations. We have included nominal effective exchange rate index (NEX) in the VAR estimation, and real effective exchange rate index (REX) in the SVAR estimation. The latter was obtained by deflating the former with the producer price index.

As a measure of money growth variable, we have used the broadest available measure - M4. There have been some methodological changes in the monetary aggregates coverage through time. However, since M4 is the broadest available indicator, the changes should have the least impact on its direction. The only break in the series is in May 1999, when the data from banks that went bankrupt were excluded from the monetary statistics. Consequently, there is a severe one-time decline in the monthly monetary aggregate M4 in that month.

In the VAR estimation, the nominal wage (NW) variable was also used. Throughout the analyzed period, there have been changes in the tax system, which resulted in the changes in the gross wage/net wage ratio. The changes might result in favourable leaps in net wages for employees, but might be also reflected in a lower total labour costs for employers. In our analysis, we have used net wages, since it serves as a proxy of pressures that stem from the labour market and can be actually realized on the goods market in terms of increasing the price level. They are also somewhat related to the movements in the labour costs, but that relationship is not as straightforward due to the mentioned tax scheme changes.

The terms of trade variable had to be constructed. This variable is not readily available in Croatia, since import and export price indices have only recently started being published by the Croatian Bureau of Statistics. These indices are based on the unit value index methodology, and consequently can also serve as an approximation of the changes in imports and exports prices. According to that methodology, changes in unit values include both changes in prices as well as changes in the volume of exports and imports. Furthermore, even during the time for which the indices are available, there have been changes in methodology and only quarterly indices have been published based only on goods data, with no attempt to provide a longer data series according to the same methodology. In order to construct a plausible indicator for the whole period, we have used the national accounts data on nominal and real exports and imports, which include both goods and services data. Since the service sector (such as tourism) plays a significant role

in the Croatian balance of payment, we believe that the terms of trade indicator should include both changes in goods and services prices. These data also include volume and price changes, but since the pure price change is not available even in the alternative methodology, we considered that our approach will result in appropriate measure of the changes in the terms of trade. However, GDP estimates are also available on quarterly basis, and consequently terms of trade indicator had to be interpolated to monthly frequency. We have used a 3-moving average in order to obtain the higher frequency series.

We are dealing with indices of all the previously mentioned variables. Those are all based to the average of the year 2001. All of the variables used have been seasonally adjusted. For the estimation purposes, the natural logarithm of all the variables was used. Before the appropriate estimation method was chosen, the variables were tested for stationarity. Here, we only briefly summarise the results, while the results of the applied augmented Dickey-Fuller tests can be found in the Table A1 in the Appendix. Based on performed tests, it can be concluded that for inflation (CPI), money growth (M4), nominal effective exchange rate index (NEX), real effective exchange rate index (REX), and terms of trade index (Term) a hypothesis of unit root cannot be rejected, while industrial production index (output) and nominal wages (NW) index are stationary.

4. Estimation results

Our estimation strategy was to estimate the SVAR model for Croatia, and to compare the results with those for Hungary and Poland. These results would enable us to determine whether there are similarities in inflation generation process in transition countries. The next step is to estimate the VAR model for Croatia, and to compare the results with the same model estimated for the period that includes hyperinflation period. These results would then enable us to determine whether changes in the inflation generation process have occurred during the transition period in Croatia.

The SVAR methodology enables identification of specific shocks to the selected variables. The difference between unrestricted VAR and here applied SVAR is that in the latter relationships between the variables in the model can be imposed. In this paper we analyze five different shocks (terms of trade, aggregate supply, balance of payments, aggregate demand and monetary shock) to inflation. The long-run effects between the variables used in the estimation procedure are specified by expression (13).

The details of the estimated SVAR model were decided upon the usual tests. The 6 lags were included based on the results of two tests – sequential modified LR test statistic and final prediction error. The Schwarz criterion indicated shorter

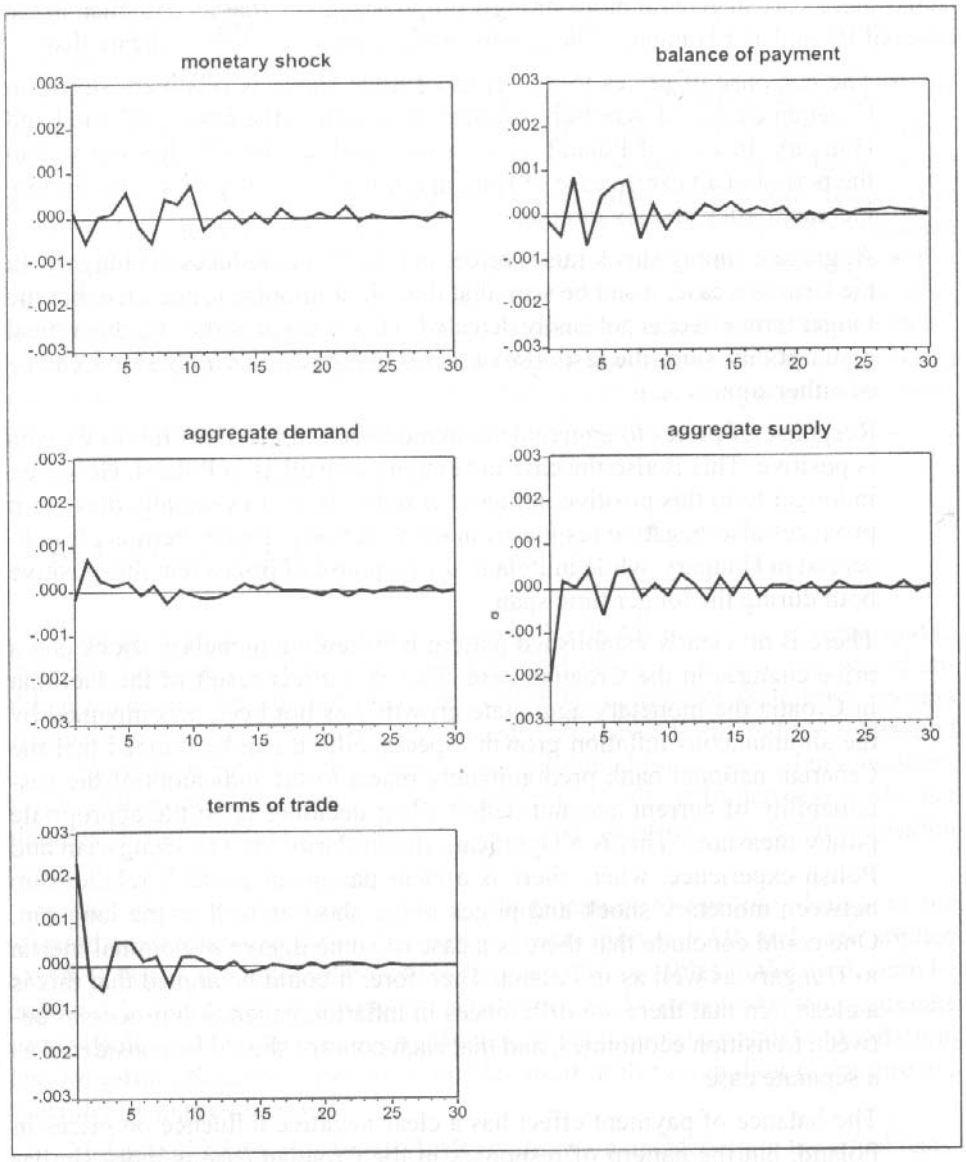
number of lags – only 2. However, since we are dealing with monthly data, we did not consider plausible to include only 2 lags in our shocks analysis.

Figure 2 presents responses of each of the identified shocks to the price level within the 30 periods (months). When compared to the results presented in Dibooglu and Kutan (2005.), it can be noticed that the responses of prices to the selected shocks are in general more strongly emphasized in Croatian case than in the cases of Poland and Hungary. The results of the estimated SVAR indicate that:

- The response of prices to the terms of trade shock is relatively strong in Croatian case, and definitely stronger than both in the cases of Poland and Hungary. In case of Poland, it is positive and completely dies out within the period of a year. In case of Hungary, initially it is negative, and slightly increases after first six months.
- Aggregate supply shock raises prices in Poland and reduces in Hungary. In the Croatian case, it can be seen that the initial impulse is negative, but the longer term effect is not easily detected. This is not at odds with theoretical assumptions, since the response of prices to aggregate supply shock can be of either sign.
- Response of prices to aggregate demand shock in the short run in Croatia is positive. This is also the case in Hungary as well as in Poland. However, in longer term this positive influence is reduced, as it eventually dies out it produces also negative responses in some periods. This pattern is also observed in Hungary, while in Poland the response of prices remains positive both during the longer time span.
- There is no clearly established pattern between the monetary shock and a price changes in the Croatian case. This is a direct result of the fact that in Croatia the monetary aggregate growth, has not been accompanied by the simultaneous inflation growth. Specifically, it can be noticed that the Croatian national bank predominately reacts to the indicators of the sustainability of current account deficit when deciding upon the appropriate policy measures. This is a significant dissimilarity both to Hungarian and Polish experience, where there is a clear pattern of positive relationship between monetary shock and prices in the short as well as the long run. One could conclude that there is a case of some degree of nominal inertia in Hungary as well as in Poland. Therefore, it could be argued that this is a clear sign that there are differences in inflation generation processes between transition economies, and that each country should be considered as a separate case.
- The balance of payment effect has a clear negative influence on prices in Poland, but the pattern of responses in the Croatian case is more similar to the Hungarian, where after the initial negative influence, there are interchanging effects which gradually die out in the longer run.

Figure 2.

RESPONSE OF PRICES TO IDENTIFIED SHOCKS



Sources: authors' calculations.

We proceed with the discussion of the inflation generation process in Croatia. Previously mentioned effects can even better be substantiated when comparing the variance decompositions. The results of variance decompositions can be found in Table 1.

Table 1

VARIANCE DECOMPOSITION OF THE PRICES

	Type of shock				
Period	**Monetary**	**Balance of payment**	**Aggregate demand**	**Aggregate supply**	**Terms of trade**
1	0,2	0,2	0,4	44,1	55,1
6	4,8	13,6	4,4	33,9	43,2
12	10,6	17,3	4,4	30,0	37,6
18	10,8	17,6	4,6	30,4	36,5
24	11,1	17,8	4,7	30,3	36,1
30	11,1	17,9	4,7	30,3	35,9

Sources: authors' calculations.

According to the results presented in Table 1, the dominant shocks for the inflation dynamics in Croatia are terms of trade and aggregate supply. However, even though monetary and balance of payment shocks are not that relevant in the short run, their influence is increasing in the longer run. The strong influence of the aggregate supply shock is also noticed in case of Hungary and Poland, although there are significant differences between those countries. In Poland, the strongest influence on the price dynamics comes from monetary shocks, while in Hungary, the balance of payment shock predominates in the longer run, while the supply shock loses its grip.

The fact that terms of trade and balance of payment shocks play a significant role in inflation generation process in Croatia is not a surprising result. Croatian economy is a small open economy, with external imbalances and high import dependency. Over the course of the years, Croatian goods export has only been able to cover approximately half of the total goods imports. The revenues from international tourism, although substantial in last few years, have not been sufficient enough to close the current account. In fact, the current account deficit is increasing during the last few years, thereby implying the growing external sector imbalances. The fact that terms of trade have such a strong influence on the inflation generation process, further stress the inability of the Croatian economy to develop

a competitive economic structure which would be able to efficiently compete on the international goods market. This lack of competitiveness has been frequently analyzed in the literature[5]. Specifically, several factors have been blamed for the inability to revive the goods export after the breakdown of ties with former Yugoslavian republics. Some of them are included in the analysis we perform next. Namely, the growth of wages, which was in particularly in the public sector often surpassing even the potential (let alone real) productivity growth during the analyzed period, was considered as one of the factors behind the relative lack of competitiveness in Croatia in comparison to other transition economies in the broader region. Comparisons of the relative unit labour costs between Croatia and other countries in the region usually prove that Croatian labour force is not inexpensive to foreign investors or to domestic firms[6]. This competitiveness dimension can be related to the inflation generation process, through the wage-price spiral analysis. Specifically this segment will be included in our next estimation method.

As a contrast to the SVAR results, we present the re-estimated unrestricted VAR model using the approach applied by Payne (2002.). The inflation process generation has been described using four variables. In addition to inflation, one of the variables is the same as in previously specified model – money growth variable (M4). The other two are nominal effective exchange rate (NEX) and nominal wage growth (NW). The rational behind this specification is that inflation generation process in transition countries usually stems from the demand-pull factors. Specifically, monetization of fiscal deficits generates excessive growth rates of the money supply. In addition to that, inflation is also generated from the cost-push side, here represented by the labour cost. Import dependency of the economy is in this specification included only through the exchange-rate movements, which feed into the domestic prices. As already mentioned before, all of the variables have been seasonally adjusted, and logarithm transformation was applied to all the variables prior to estimation.

The selection of the dynamics in the model was based on the usual tests. The appropriate lag length has been chosen based on 3 different selection criteria – LR test statistics, final prediction error and Akaike information criterion, which all indicated inclusion of 3 lags. This is the same lag number as applied by Payne (2002.). Even though the tests imply the inclusion of 3 lags, we believe that this is relatively short time span, in particularly since we are dealing with monthly data. Nevertheless, we have decided to apply the statistically justifiable estimation procedure, in order to be able to rely more firmly on the results.

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[5] Based on the results of various research studies, Croatian government has announced recommendations for raising the Croatia's competitiveness. These can be found on the following Internet page http://www.vlada.hr/Download/2004/04/13/NCC_55_Recommendations-19-51.pdf

[6] See, for example, Institute for International Relations (2002.).

Since we believe that the differences in analyzed periods produce differences in estimated sources of inflation dynamics, we proceed with summarising the main results of previous research. Payne (2002.) finds that in Croatian case following can be concluded from the estimated coefficients of the specified VAR:

- inflation is positively influenced by wage growth and currency depreciation
- wage growth is influenced by past wage growth and currency depreciation
- currency depreciation is positively related to money growth and past values of currency depreciation
- money growth is influenced by wage growth and currency depreciation, with a strong persistence in the money growth itself.

Revising the analyzed period, produces somewhat different implications for the inflation generation process in Croatia. It seems that even during the short period, some of the links between the analyzed variables have been broken, resulting in the following relationships:

- significant variables for inflation are still exchange rate and wage growth, but also monetary growth turns to have positive influence on inflation
- for monetary growth, there is still a high degree of persistence, and influence from exchange rate, while the influence from wage growth has disappeared,
- exchange rate is associated with money growth, although the link is relatively weaker than in other direction,
- wage growth is predominately dependent on past wage growth.

The relationships between the variables can be more thoroughly observed within the variance decomposition in the estimated VAR model. We discuss one standard deviation shock to inflation and the percent of forecast error variance that can be attributed to each variable in the model. The results are presented in the following table.

Table 2

VARIANCE DECOMPOSITIONS BASED ON VAR MODEL

Period	Inflation	Monetary	Exchange rate	Nominal wages
1	100,0			
6	77,6	7,0	6,0	9,4
12	76,7	7,0	6,4	9,9
18	76,7	7,0	6,4	9,9
24	76,7	7,0	6,4	9,9
30	76,7	7,0	6,4	9,9

Source: authors' calculations.

Percentage of forecast error variance attributed to each variable.

Since the underlying shocks were orthogonalized using the Choleski decomposition, the striking feature of the previously presented short run effect is straightforwardly explained by the ordering of the variables in the decomposition process. However, another element of the previous results also catches attention. It seems that in the longer run, the system exhibits some degree of the inflation persistence. This is somewhat in contradiction with previous results presented in Payne (2002.), who for the analyzed period 1992:1 to 1999:12 finds lack of persistence in Croatian inflation generation process. This lack of persistence is attributed to the successful implementation of the anti-inflationary stabilization program. However, it seems that those effects have worn-off during the first years past the stabilization program implementation. This is related to the fact that previous period of analysis compounded a hyperinflation period, while our analysis focuses on the low-inflation period. The inflation generation process has obviously changed, and the wage growth has lost its strength in explaining the rates of growth.

One of the key factors is that the wage growth has, through the tri-partite negotiations including unions, government and the employers' representatives, been moderated. Specifically, through the series of negotiations processes, the idea that the wage growth should be below the productivity growth (whatever this term in reality comprises of) was widely accepted in the public. This has driven away the attention from the wage growth as the main factor of inflation growth in Croatia. This perception is strongly different from the one prevailing at the beginning of the 90ies, when the indexation of wages to the inflation rate was often explicitly stated in the collective bargaining.

Both estimation approaches imply that inflation in Croatia is not strictly related to the monetary aggregates growth. When taking into account the objectives

and instruments of the monetary policy in Croatia, these results are expected. However, based on the presented results it cannot be concluded that the inflation generation process has been completely revealed by the estimated models. The first reason is that none of the presented results can decidedly be considered to represent the appropriate model for the inflation generation process in Croatia. The second reason is that each emphasizes a different segment of the inflation generation process, and consequently cannot be taken as providing a definitive answer as to how to model and forecast inflation in Croatian case.

Part of the explanation on the differences in estimation results clearly can be drawn from the estimation strategy. While the first used approach exploits more structure, and thereby underlying hypothesis on the relationship between the variables in the economy, the second approach presents the results of an unrestricted VAR estimates. Whether the second approach could benefit from the imposed structure of the economy is beyond the scope of this paper.

Even though these two approaches cannot be directly compared, they provide some insight into the changing pattern of the inflation generation process in Croatia. Due to different specifications, these approaches put more emphasis on selected indicators of the Croatian economy. However, they do not give contradictory results, but rather complement the gained insights.

We find that the more structural approach confirms the importance of the vulnerable external position of the Croatian economy in the inflation generation process. These results are generally also perceived by the public, but rarely quantified. The relative importance of monetary aggregates growth is not that significant, when compared with external imbalances indicators. The relationship with the external factors can be also revealed just when comparing the changes of oil prices on the international market and monthly figures of consumer price index in Croatia.

5. Conclusions

We have shown that inflation generation processes in transition economies differ, and a specific country situation has to be taken into account when analyzing inflation and forming recommendation on specific policy actions. Even though the overall dynamics of the inflation in specific phases of transition process in different countries has resulted in similar patterns, underlying structure of the economy must be taken in account when analyzing the inflation generation process in each country.

In Croatia, the inflation generation process has also changed through time. From initial impulse which came from the monetization of the fiscal deficits,

through wage growth impact and effects of exchange rate anchoring as a part of the stabilization program. In recent period, low performance indicators of the Croatian competitiveness add to the list of the factors behind of the inflation generation process. In this segment, Croatian economy is specific in comparison to other transition economies in the neighbourhood. And consequently, further research on the determination of the inflationary dynamics should be expected in the near future.

In this paper we have used two estimation methods in order to explain the inflation generation process in Croatia. One approach follows the unrestricted VAR estimation including three variables in addition to inflation – wage growth, nominal effective exchange rate and monetary aggregate M4. The results of this model imply relatively high persistence of the inflation. The second approach adds more structure to the economy, and emphasizes the external sector as a key segment of a small open economy such as Croatia is. Results of the SVAR estimation confirm that the terms of trade and balance of payment shocks should be considered as most important for inflation generation process.

Keeping the inflation below a certain threshold has proven not to be too a difficult task for the Croatian national bank in the last few years. However, in order to be able to pin down the appropriate factors behind the inflation growth, more structural factors in the estimation process should be included. For this task to be completed, several data issues should be resolved. The more elaborate model should enable us to gain more insight into the key variables of the Croatian economy.

Appendix

Table A1.

ADF UNIT ROOT TESTS

Series	Intercept and trend	Intercept	Nor intercept nor trend
		Level	
CPI	-1,93***	-	-
Output	-6,98	-	-
M4 (1)	-1,16***	-0,78***	3,52***
NEX	-2,45***	-	-
REX	-2,46***	-	-
NW (2)	-4,44	-	-
Term (1)	-3,19**	-	-
		First differences	
CPI	-11,18	-	-
Output	-	-	-
M4 (1)	-	-	-4,72
NEX	-9,53	-	-
REX	-9,70	-	-
NW (2)	-	-	-
Term (1)	-8,23	-	-

Not being able to reject the unit root hypothesis *** 1% significance; ** 5% and * 10% significance.

Automatic lag length selection was applied for the correction of autocorrelation issues, and the chosen lag is specified in the parenthesis following each series name.

The test was performed starting from the assumption that the appropriate form includes intercept and trend. If those were proven significant, then this form of equation is considered appropriate. Consequently, the results presented in the Table should be read from left to the right, meaning that the most rightward presented form of testing equation should be considered appropriate for each of the series.

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IZVORI INFLACIJE U TRANZICIJSKOJ EKONOMIJI: SLUČAJ HRVATSKE

Sažetak

Cilj ovog rada je istražiti process generiranja inflacije u Hrvatskoj. Slijedeći metodologiju koju su predložili Dibooglu and Kutan (2005.), autori ocjenjuju model malog otvorenog gospodarstva, primjenjujući SVAR metodu. Rezultati upućuju na zaključak kako je inflacija u Hrvatskoj povezana sa šokovima uvjeta razmjene i platne bilance. Ti rezultati se zatim uspoređuju s rezultatima ponovno ocijenjenog neograničenog VAR modela, primjenjujući metodologiju koju je predložio Payne (2002.). Rezultati drugog pristupa također potvrđuju kako monetarni šokovi imaju relativno manji utjecaj na proces generiranja inflacije u Hrvatskoj.

Ključne riječi: inflacija, Hrvatska, SVAR metoda