Monetary Policy Transmission in the Balkans in the 21st Century: Empirical Evidence

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Abstract: *This study investigates monetary policy transmission in the Balkans in the 21st century. In order to analyse the reaction of output and prices to a shock in monetary policy (defined as an increase in the interest rate), this study employs structural vector auto regression approach. The obtained impulse responses suggest that monetary policy in the six Balkan countries under investigation is not effective in influencing output and prices, which points towards a very limited use of monetary policy in the overall conduct of economic policy.*

KEYWORDS:
Balkan countries, structural vector autoregression, transmission mechanism

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Introduction

The main aim of this paper is to explore the reaction of output and prices to an interest rate shock in a set of Balkan countries. The term Balkan geographically refers to Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Kosovo, Macedonia, Montenegro, Romania and Serbia. Occasionally Slovenia is added to this group of countries, and sometimes even Turkey because of the geographical proximity to the Balkans (as is the case in this special issue of the Journal of Economic and Social Studies). However, due to data limitations, the break-up of the Serbia-Montenegro association, and the fact that Greece is the country that introduced the euro already on January 1 2001, we limit our analysis to the following countries: Bulgaria, Croatia, Macedonia, Romania, Slovenia and Turkey. A common feature of these countries is their strong economic ties with the European Union. Bulgaria, Romania and Slovenia have (relatively) recently joined the EU, Croatia is expected to join in 2013 and Macedonia is a candidate country. Although Turkey was on its way to join the EU, the process at the moment seems stopped. Nevertheless, trade and economic links between Turkey and EU countries are very strong and increasing.

The capability of monetary policy to influence output and prices in the short-run can be considered mainstream economics nowadays, and vast empirical literature also supports this view. In spite of the fact that this is a commonly studied topic, there are still two important reasons to study the monetary transmission mechanism in a set of chosen Balkan countries. Firstly, given that an increasing number of countries are thinking about adopting inflation targeting, a thorough understanding of the way central bank influences inflation by changing the interest rate is crucial. Secondly, given the recent adoption of the euro in some countries in the sample (e.g. Slovenia) and expected future full euro area participation of other countries in the sample, it is of fundamental importance to evaluate whether monetary transmission operates differently in Balkan countries compared to the 'old' members. This is because a homogeneous approach to monetary policy for Balkan countries on the one side, and others on the other, could lead to significantly different effects on the economies in question.

The paper is structured as follows. Section 2 provides a brief review of previous studies. Data and research methodology are presented in Section 3. Section 4 reports the results for each country in our sample. Section 5 concludes.

Literature review

Up till date there has been no comprehensive analysis of monetary policy transmission mechanism that focuses on the group of Balkan countries. However, several countries from this group have been explored within a broader group of transition countries usually including the region of Central and Eastern Europe (CEE). Probably the two most cited studies for this group of countries are Ganev et al. (2002) and Elbourne and de Haan (2006) on which we will comment below.

The last few years have seen an increasing number of empirical studies on the transmission mechanism in transition and emerging economies. During the first half of 1990s and earlier, this type of study was typically limited to developed economies, but the literature has now been enriched with evidence from developing countries, including also the transition economies of Central and Eastern Europe. These studies provide interesting insights into the role of monetary policy in different environments and a common finding is that monetary policy transmission mechanisms differ between developed and developing countries. In general, the findings from developed economies show that monetary policy affects the real economy over a time horizon of two to three years and that monetary policy can, in principle, be used to counter shocks. For example, in the US Christiano et al. (1998) find that the changes in the interest rate controlled by the monetary authority affect output over two to three years, but the effect vanishes thereafter and in the long run it is only prices that are affected. Similar findings are provided by Peersman and Smets (2001) for the euro area. The findings from developing and transition economies, in contrast, show much more diversity and it becomes difficult to draw general conclusions regarding the impact of monetary policy on prices and output in these countries. This is to be expected given that these economies have been undergoing significant structural changes and that the data used for investigation are usually of a short duration and of questionable reliability and consistency.

As suggested above, several of the countries in our sample were investigated also by Ganev et al. (2002) and Elbourne and de Haan (2006). These countries are Bulgaria, Romania and Slovenia. As is often the case with the type of studies based on VAR methodology, different studies provide contradictory evidence. This is most easily seen by comparing the findings of these two studies for Bulgaria, Romania and Slovenia. For Bulgaria for example, Ganev et al. (2002) find that positive interest rate shock boosts inflation, while output is at first dampened, then boosted. On the other hand, in Elbourne and de Haan (2006) positive interest rate dampens both

prices and output. For Romania, the evidence is again contradicting, while for Slovenia the evidence from both studies suggests that output and prices are dampened by the interest rate shock. This example is used to illustrate the above discussed difficulty in finding a consistent set of results for individual countries between different studies and these calls for a very careful approach in applying the VAR methodology in our investigation of monetary policy transmission in the Balkans. When the whole list of CEE countries is considered the differences in the findings are even larger. The cause of these differences may be coming from several sources. The first one is that the time period covered by Ganev et al. (2002) is 1995 to 2000, while Elbourne and de Haan (2006) cover, depending on the country, periods starting in 1991 up to 2003. Secondly, although both studies report impulse response functions, a crucial distinction stems from the differences in the application of the underlying VAR model. Ganev et al. (2002) use a reduced form VAR in which the generalised impulse responses are calculated without imposing restrictions, restrictions which are necessary in the structural VAR used by Elbourne and de Haan (2006). The details concerning the order of VARs used in these studies are not reported, but it is possible this is an additional reason why their findings differ. The findings from other studies that are reviewed below only add to this diversity. Taken together literature review points towards the uncertainty about the conclusions that can be drawn from the findings of research on transmission mechanisms in transition economies.

Evidence on individual countries in our sample is still scarce and the present study therefore aims at filling at least a part of this gap in the empirical literature. In what follows we briefly comment on the studies investigating monetary policy transmission in individual countries in our sample. As we are interested in the interest rate channel, we principally report the findings on the importance of interest rate channel in the reviewed studies. For Bulgaria, Minea and Rault (2008) provide evidence that monetary policy cannot be used in a standard way, because of the currency board arrangement that has been in place since 1997. Their investigation points towards important and significant effects of foreign interest rates on developments in the Bulgarian economy. For Croatia, Vizek (2006) and Dolezal (2011) also find that the use of domestic interest rates does not have an important and significant effect on output and prices. For Macedonia, Besimi et al. (2006), using a co-integration framework, find that the exchange rate and money supply channel are more important than the interest rate channel (the interest rate does not have significant effects). For Romania, Antohi et al. (2003) find that monetary policy has some effect on the deposit interest rate, but no impact on the lending

interest rate. The exchange rate channel appears to be of more importance in this country. They also suggest that the establishment of the traditional transmission channels of the monetary impulses is still in its embryonic phase. For Slovenia we were not able to find individual studies. As additional evidence on Slovenia, we report the evidence from Jarocinski(2004) who estimates the impact of a monetary policy shock to be predominantly negative on output, but not statistically significant, while the impact on prices is firstly positive (not significant) and then negative (significant). For Turkey, Kara et al. (2007) and Basci et al. (2008) find that, unlike in the earlier periods, in the 21st century the interest rate channel has gained relevance and monetary policy may be considered to have become more effective in terms of the interest rate channel.

Data and research methodology

In our empirical analysis we estimate the response of output and prices to a monetary policy shock for each country in our sample of 6 Balkan countries. We apply a structural vector autoregression (SVAR) model, because it can capture complex dynamic interrelationships among macroeconomic variables quite well, and because it is the common model used in the literature for identifying the effects of a monetary policy shock.The previous section reviewed a number of studies which applied the VAR methodology in the analysis of the monetary policy transmission mechanism.The reviewed evidence has used different modelling strategies within the VAR methodology and found divergent results. Although the problem of the modelling strategy is an important one, in many studies it is only briefly addressed, with a few noticeable exceptions (e.g. Kim and Roubini, 2000; Elbourne and de Haan, 2006). Therefore, as our starting point we seta structural VAR model following Kim and Roubini (2000) and Elbourne and de Haan (2006). Following them, the variables we include in our model are output (Y), consumer price index (CPI), money (M), domestic interest rate (IR), exchange rate (ER), world price of oil (OIL) and the euro area interest rate (FIR). The first four are well-known variables in the monetary business cycle literature and therefore it is not required to elaborate on them specifically. The next variable, the exchange rate, is included in the model since it plays an important role in affecting the whole economy in a world of liberalized goods and capital markets. The world price of oil serves as a proxy for aggregate supply shocks, while the euro area interest rate approximates the foreign interest rate and, like the world price of oil, captures exogenous monetary policy changes. The model specified as explained above should be seen as a realistic representation of a structure of small open economies. The countries in our sample

fit this category quite well and through the use of external variables (shocks) we also capture strong relations of these countries with the rest of the world, especially reflecting strong ties with the European Union. According to economic theory we expect the reaction of output and prices to a contractionary monetary policy shock to be negative.

The variables used in our empirical analysis are as follows. For the output variable we use index of industrial production (based in 2005). As for CPI, we used consumer price index (based in 2005). M1 monetary aggregate was used for money. As for IR, we used money market interest rate as our first choice and deposit rate as the second one in cases where money market rate was unavailable (Macedonia). The nominal effective exchange rate index (based in 2005) was used for ER; if unavailable we used official US dollar exchange rate(Turkey and Slovenia). Finally, for OIL we used petroleum prices in US dollars per barrel (Petroleum: UK Brent). FIR variable is the euro area money market interest rate (alternatively we also used the European Central Bank (ECB)main refinancing rate). All the variables, apart from the interest rate, are transformed into logarithms.

This study follows the most common approach in empirical studies in that it uses the data in levels (this is the approach followed also by Kim and Roubini,2000;Mihov, 2001; and Elbourne and de Haan, 2006). As in other times series analysis, there might be a problem with the findings from a VAR model if the series are nonstationary. Applying the analysis to the data in levels while the data are nonstationary may result in spurious relationships. However, it is suggested in the literature that the data be used in their levels even if nonstationary. Sims et al. (1990) recommend against differencing even if the variables contain a unit root. They argue that the goal of a VAR analysis is to determine the interrelationships among the variables, not to determine the parameter estimates. Thus, the main argument against differencing is that it 'throws away' information concerning comovements in the data. If the data are used in levels, there is also a possibility that the series are cointegrated, so the problem of spurious relationships would not exist. Mojon and Peersman (2001) suggest that by doing the analysis in levels they allow for implicit cointegrating relationships in the data. In the present case there is the additional reason that the shortness of the sample period also renders testing for cointegration inappropriate.

Monthly data on all the variables is obtained from the IFS data base (International Monetary Fund, International Financial Statistics data base). However, in certain cases where the relevant data from the IFS data base was unavailable, we consulted other sources, principally the central banks' web pages (but only in cases one of the variables was missing). In addition, we used the ECB main refinancing rate from the ECB webpage. As suggested above, although this special issue of the journal aimed at focusing on a very broad list of the Balkan states including Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Macedonia, Montenegro, Romania, Serbia, Slovenia and Turkey the missing and very limited data allowed us to obtain the series for our empirical investigation for the following six countries: Bulgaria, Croatia, Macedonia, Romania, Slovenia and Turkey. Although not all the countries were included, we believe that a sample at hand is representative enough of the Balkan region, especially in terms of the links with the EU. With these countries in our sample we investigate the monetary policy transmission mechanism (the interest rate channel) in the Balkans in the 21st century. Table 1 reports the list of the countries under investigation, time periods and the available indicators for the chosen variable.

Table 1. Countries under investigation, time periods and the available indicators for the chosen variable

Country	**Period under investigation**	**Variables in the model**							
BULGARIA	2000M1–2011M12	MODEL	Y	CPI	M	IR	ER	Oil	Foreign interest rate
		Variable description	Index of industrial production (based in 2005)	Consumer price Index (based in 2005)	Monetary aggregate M1	Money market interest rate	Index of nominal effective exchange rate (based in 2005)	Petroleum: UK Brent (US $ per barrel)	Euro area money market interest rate or ECB refinancing rate
		Source	IFS	IFS	IFS	IFS	IFS	IFS	IFS or ECB
Country	**Period under investigation**	**Variables in the model**							
CROATIA	2000M1–2011M12	MODEL	Y	CPI	M	IR	ER	Oil	Foreign interest rate
		Variable description	Index of industrial production (based in 2005)	Consumer price Index (based in 2005)	Monetary aggregate M1	Money market interest rate	Index of nominal effective exchange rate (based in 2005)	Petroleum: UK Brent (US $ per barrel)	Euro area money market interest rate or ECB refinancing rate
		Source	IFS	IFS	IFS and Croatian National Bank	IFS	IFS	IFS	IFS or ECB

Tabele 1 (Continued)

Country	Period under investigation		Variables in the model						
MACEDONIA	2002M1–2011M12	MODEL	Y	CPI	M	IR	ER	Oil	Foreign interest rate
		Variable description	Index of industrial production (based in 2005)	Consumer price Index (based in 2005)	Monetary aggregate M1	Deposit interest rate	Index of nominal effective exchange rate (based in 2005)	Petroleum: UK Brent (US $ per barrel)	Euro area money market interest rate or ECB refinancing rate
		Source	IFS	IFS	IFS	IFS	IFS	IFS	IFS or ECB
Country	**Period under investigation**		**Variables in the model**						
ROMANIA	2000M1–2011M12	MODEL	Y	CPI	M	IR	ER	Oil	Foreign interest rate
		Variable description	Index of industrial production (based in 2005)	Consumer price Index (based in 2005)	Monetary aggregate M1	Money market interest rate	Index of nominal effective exchange rate (based in 2005)	Petroleum: UK Brent (US $ per barrel)	Euro area money market interest rate or ECB refinancing rate
		Source	IFS	IFS	IFS	IFS	IFS	IFS	IFS or ECB
Country	**Period under investigation**		**Variables in the model**						
SLOVENIA	2000M1–2006M12	MODEL	Y	CPI	M	IR	ER	Oil	Foreign interest rate
		Variable description	Index of industrial production (based in 2005)	Consumer price Index (based in 2005)	Monetary aggregate M1	Money market interest rate	US dollar exchange rate (national currency per US $)	Petroleum: UK Brent (US $ per barrel)	Euro area money market interest rate or ECB refinancing rate
		Source	IFS	IFS	IFS	IFS	IFS	IFS	IFS or ECB
Country	**Period under investigation**		**Variables in the model**						
TURKEY	2000M1–2011M11	MODEL	Y	CPI	M	IR	ER	Oil	Foreign interest rate
		Variable description	Index of industrial production (based in 2005)	Consumer price Index (based in 2005)	Monetary aggregate M1	Money market interest rate	US dollar exchange rate (national currency per US $)	Petroleum: UK Brent (US $ per barrel)	Euro area money market interest rate or ECB refinancing rate
		Source	IFS	IFS	IFS	IFS	IFS	IFS	IFS or ECB

In what follows we explain the model that is used in our empirical investigation of the effects of monetary policy on output and prices in the chosen Balkan states.

The *p*-th order SVAR model that we use is given as follows:

$$Ay_t = \Gamma_1 y_{t-1} + \Gamma_2 y_{t-2} + \cdots + \Gamma_p y_{t-p} + B\varepsilon_t \qquad (1)$$

where y_t is a $(m*1)$ vector of m endogenous variables; A represents a $(m*m)$ matrix of instantaneous relations between the left-hand-side variables; Γjs are structural form parameter $(m*m)$ matrices;ε_t is a $(m*1)$ structural form error that is a zero mean white noise process, and B is a $(m*m)$ matrix of contemporaneous relationships among the structural disturbances ε_t. A reduced form of our p-th order SVAR model, then, is:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + e_t \qquad (2)$$

wherey_t is a $(m*1)$ vector of m endogenous variables, A represents a $(m*m)$ matrix of reduced-form parameters and e_t is the reduced-form disturbance term. Since the error terms in the reduced SVAR (e_t) are a complicated mixture of the underlying structural shocks, they are not easy to interpret directly unless a direct link can be made to the structural shocks. The system should therefore be restricted so as to recover structural disturbances, ε_t, from observed values of e_t, as$Ae_t=B\varepsilon_t$. In order to identify the structural model it is therefore necessary to impose at least $m^2-m(m+1)/2$ restrictions on the structural model, m being the number of endogenous variables.

The issue of recovering the structural form parameters from their reduced form counterparts (and the corresponding impulse responses) is far too often ignored or dealt with inappropriately by applying the so-called recursive or the Cholesky identification scheme. This causes the problem because the identified shocks vary depending on the ordering of variables in the underlying VAR model and usually no theory is used to justify this recursive identification. In consequence, although the results are obtained, we cannot actually be sure what they are measuring.

Following Elbourne and de Haan (2006), who adapt the model applied to industrial countries by Kim and Roubini (2000), the identification scheme we use in SVAR is given below, where $Ae_t = B\varepsilon_t$ is given as:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & a_{16} & 0 \\ a_{21} & 1 & 0 & 0 & 0 & a_{26} & 0 \\ a_{31} & a_{32} & 1 & a_{34} & 0 & 0 & 0 \\ 0 & 0 & a_{43} & 1 & a_{45} & a_{46} & a_{47} \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & a_{56} & a_{57} \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & a_{76} & 1 \end{bmatrix} \begin{bmatrix} e_Y \\ e_{CPI} \\ e_M \\ e_{IR} \\ e_{ER} \\ e_{OIL} \\ e_{FIR} \end{bmatrix} =$$

$$\begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & b_{77} \end{bmatrix} \begin{bmatrix} \varepsilon_Y \\ \varepsilon_{CPI} \\ \varepsilon_M \\ \varepsilon_{IR} \\ \varepsilon_{ER} \\ \varepsilon_{OIL} \\ \varepsilon_{FIR} \end{bmatrix} \quad (3)$$

In specification (3), $e_Y$is an output shock,$e_{CPI}$is a price level shock, $e_M$is a money demand shock, $e_i$is a domestic interest rate shock, $e_{ER}$is an exchange rate shock, $e_{OIL}$is an oil price shock and e_{FIR} is the foreign interest rate (euro area interest rate) shock.

Justification for this identification scheme is the following. Given that the oil is a crucial input for most economic sectors, the price of oil is assumed to affect prices and the real sector contemporaneously (therefore we leave the coefficients a_{16} and $_{26}$unrestricted). Prices are, additionally, affected by the current value of output (a_{21}). A usual money demand function is assumed; the demand for real money balances depends on real income (nominal income and prices) and the nominal interest rate (a_{31},a_{32} and a_{34}). The interest rate is assumed to be set after the monetary authority observes the current value of money, the exchange rate, the world price of oil and foreign interest rate, but not the current values of output and the price level (therefore a_{41}=0 and a_{42}=0). These two variables are assumed not to be available to monetary authorities within the current time period (this is a realistic assumption given that we use monthly data). As for the exchange rate, since it is a forward-looking asset price, we assume that all the variables have a contemporaneous effect on the exchange rate. Finally, the world price of oil is assumed to be contemporaneously exogenous to any variable in the domestic economy, while the foreign interest rate is assumed to be contemporaneously exogenous to any variable apart from the oil price (this assumption is realistic given that the countries in our sample are small economies and as such are not expected to exert any significant impact on the foreign interest rate).

In choosing the order of SVAR model (the number of lags to be included) we consider the information criteria (the Schwarz information criterion – SC, Hannan-Quinn information criterion – HQ and the Akaike information criterion -AIC) and the presence of autocorrelation in our system. Unexpectedly (given that we deal with monthly data) most of the information criteria point to the use of very low number of lags. The SC and HQ criterion in most cases suggest the use of one or two lags for most countries, while the AIC information criterion points to a higher number of lags which varies among the countries. Since the literature often suggests that information criteria should not be seen as too convincinggiven that the results vary too often depending on the chosen criterion (which is also the case in our analysis), we believe that in the time series analysis it is much important to base our estimations on the system which is free of the problem of autocorrelation. Therefore, we are principally lead by this criterion when deciding about the order of our underlying VAR models. Given that we deal with monthly data we initially use a minimum of 4 lags for each country and employ the autocorrelation Lagrange multiplier (LM) test to check whether with this number of lags the system is free of autocorrelation. In cases where the LM statistics suggests that the null of no correlation can be rejected at 4 lags, we increase(change) the number of lags until the problem is solved. As a robustness check we also run our estimations with 8 lags.

Results

After presenting the data and research methodology in Section 3, in this section we report the results of our empirical investigation for each of the 6 Balkan countries in our sample. We first estimate the structural VAR model and then shock the system to obtain the impulse response functions. We check for each country how an increase in the interest rate (contraction in monetary policy) affects output and prices which allows us to assess the effectiveness of monetary policy in the analysed countries.

Bulgaria

The impact of monetary policy on output and prices in Bulgaria is reported in Figure 1. Using our structural VAR model (explained in Section 3) we impose a shock on the interest rate (a one standard deviation increase in the interest rate) and investigate how the system reacts to this innovation. We are principally interested in the impact of a contractionary monetary policy on output and prices and therefore we report the impulse response function for only these two variables.

Figure 1. Monetary policy effects on output and prices in Bulgaria

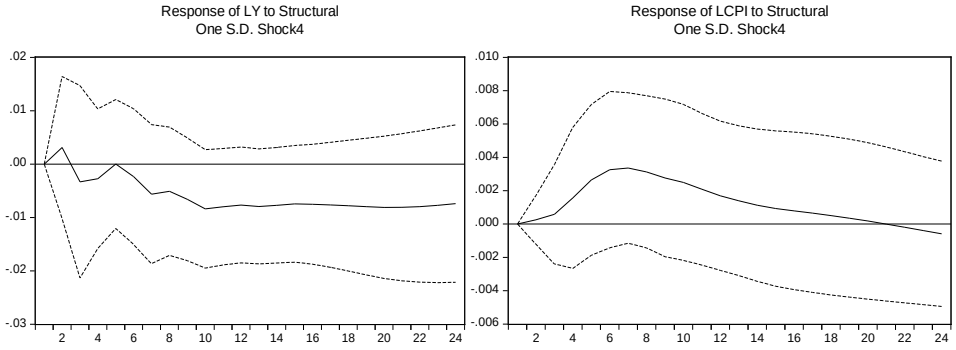


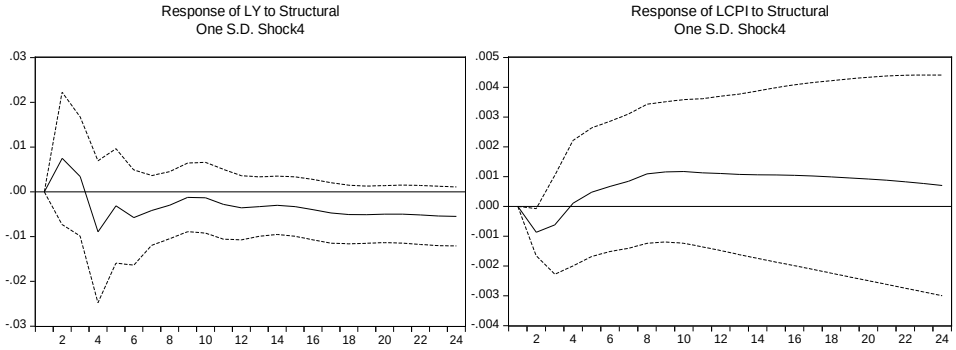
Figure 1 suggests that in Bulgaria the impact of monetary policy on output is negative, as theoretically expected. At the same time, the impact of monetary policy on prices appears to be positive,which is contrary to our expectations. The estimated effects, however, are not statistically significant. Therefore, we should treat these estimates (the impact of monetary policy shock) as practically nonexistent. This suggests that monetary policy in Bulgaria cannot be used as a leverage to affect output and prices, which is for the most part expected given that Bulgaria is a small open economy with strong links to the euro area. This is particularly important in view of the fact that Bulgaria has a currency board which significantly limits the conduct of independent monetary policy. This exchange rate arrangement could be seen as an important objection whether at all Bulgaria should be part of our sample, because theoretically it is expected that the effects of monetary policy will be nonexistent. However, as our sample of countries is limited and we managed to obtain the data also for Bulgaria we decided to estimate the monetary policy transmission also for this country. It should be noted that we experimented with different modifications in the underlying structural VAR model to check the

robustness of our findings.These modifications included: different number of lags in the underlying structural VAR model (we estimated the model with 8 lags, instead of 4), as well as estimating the model including the ECB refinancing rate instead the euro area money market rate (the results of these modifications are reported in Appendix 1A). We also introduced a dummy for the recent global financial crisis starting in August 2007 (this will be reported later on in Appendix 2). The results remained practically the same concerning the sign and statistical significance of the estimated impacts of monetary policy shock on output, while for prices we observed a change in the sign of the estimated impact (now predominantly negative) when our model was run with 8 lags. However, as our results are still statistically insignificant we can say they are consistent with those reported in Figure 1 and in our opinion it is warranted to conclude that monetary policy in Bulgaria has very little, if any, impact on output and prices.

Croatia

The estimated impact of monetary policy on output and prices in Croatia is reported in Figure.

Figure 2. Monetary policy effects on output and prices in Croatia



Impulse responses in Figure 2 indicate that an unexpected monetary policy shock (an increase in the interest rate) has a positive impact on output in the few first months following the shock, but afterwards the impact is negative as expected. However, note that these effects are not statistically significant. The negative effect comes close to being significant in the later period (months 17 to 24 after the shock). As for the prices, in the first few months the impact of a monetary policy shock is negative as

expected, but afterwards the effect turns to be positive. With the exception of the short immediate impact, the effects are not statistically significant. Experimentation with different number of lags (8 lags instead of 4), the use of the ECB refinancing rate instead of the euro area money market rate in the underlying model (these results are reported in Appendix 1B) reveals qualitatively similar results for output. The estimated effect on output is mixed, predominantly negative, but without being statistically significant. As for the prices, the results are now, unexpectedly, predominantly positive, and when the ECB refinancing rate is used in the model statistically significant (the model with 4 lags). However, with 8 lags the effect on prices again turns insignificant. Taken together, these results suggest that monetary policy in Croatia has a very limited impact in effecting output and possibly some effect on prices (but this effect is for the most part statistically insignificant). These results could be treated as expected given that Croatian monetary authorities have pursued the exchange rate targeting, which, similar to the case of Bulgaria, results in a very few degrees of freedom in conducting individual monetary policy.

Macedonia

The impact of monetary policy on output and prices in Macedonia is reported in Figure 3.

Figure 3. Monetary policy effects on output and prices in Macedonia

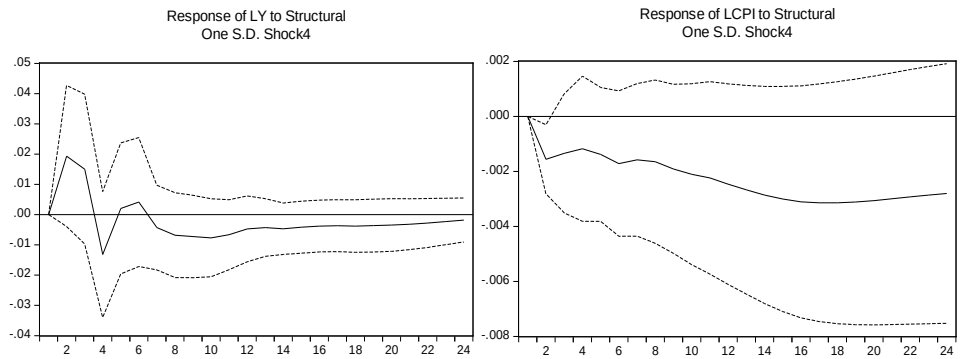


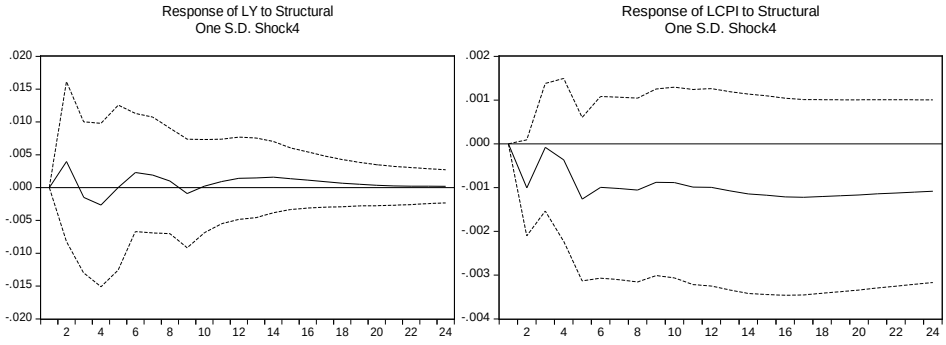
Figure 3 indicates that the impact of an interest rate shock on output is firstly positive, and then turns negative. However, note that neither the positive nor negative impacts are statistically significant. As for the prices, the impact of a monetary policy shock is negative, as expected, but it is statistically significant only

in the first few months. We further check these findings through experimenting with a higher number of lags (8 lags instead of 4). The results for output are very similar (mixed – positive and negative, still being statistically insignificant), while for the prices the impact is again negative, but the statistically significant impact lasts longer in this case (for the first 8 months). These results suggest that monetary policy in Macedonia may be considered as being able to affect prices for a while. When we experiment with the ECB refinancing rate (using both 4 and 8 lags) the results are very similar (for output mixed and insignificant, while for the prices again negative but losing statistical significance). The results of the introduced modifications are reported in Appendix 1C. Taken together, the results for Macedonia suggest that monetary policy is not effective at influencing output, while there is some indication of it being able to affect prices.

Romania

The impact of monetary policy on output and prices in Romania is reported in Figure 4.

Figure 4. Monetary policy effects on output and prices in Romania



Impulse responses in Figure 4 suggest that the impact of monetary policy shock (an increase in the interest rate) on output is mixed, firstly positive, then negative, and then again positive, but overall predominantly positive, contrary to theoretical expectations. Note, however, that the estimated effects are not statistically significant. As for the prices, the effects of monetary policy shock are negative as expected, but they are not statistically significant. These results suggest that monetary policy in Romania is not able to affect output or prices. When we

experiment with the modifications introduced in the underlying model, the estimation of the model with 8 lags instead of 4, the results for output are similar as in the underlying model (the impact of monetary policy shock on output is mixed, both positive and negative, but the effects are again not significant). As for the prices, unlike in the estimation with 4 lags, the impact of a monetary policy shock on prices is this time positive, but again this effect is not statistically significant. Experimentation with the ECB refinancing rate (tested both with 4 and 8 lags) produces similar results for the effects on output. As for the prices, the effects are always negative but statistically insignificant, with the exception of the estimated impact on prices with the model employing 4 lags, but only in a few first months. The results of the introduced modifications are reported in Appendix 1D. Taken together, it seems warranted to conclude that monetary policy in Romania is not effective at influencing output, while the impact on prices probably deserves the same qualification. Caution should be exerted as only in one case (out of the 4 tested) the impact on prices is partly significant, but this is probably not enough to consider monetary policy as being effective at influencing prices in Romania.

Slovenia

The impact of monetary policy on output and prices in Slovenia is reported in Figure 5.

Figure 5. Monetary policy effects on output and prices in Slovenia

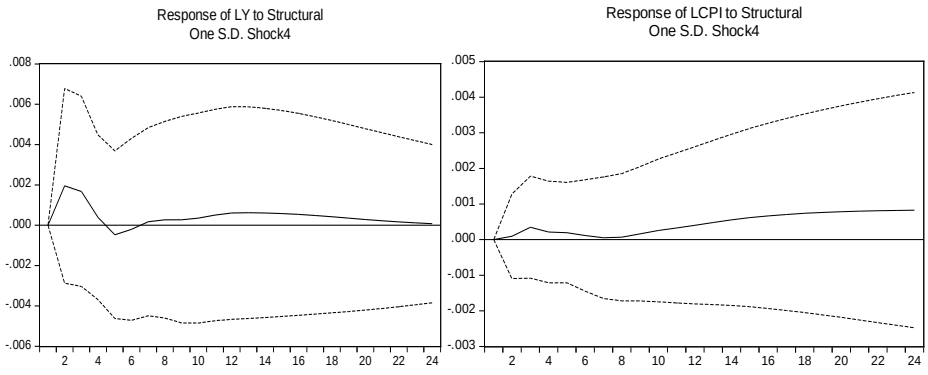


Figure 5 suggests that monetary policy in Slovenia is not able to affect output and prices. The estimated effect of a monetary policy shock on both output and prices is, contrary to expectations, positive. Note, however, that these effects are not statistically significant. As these positive responses are somewhat surprising, we introduced the usual modifications as in the case with other countries in our sample (the results are reported in Appendix 1E). Unlike the above reported results, when we experiment with 8 lags instead of 4, the impact of a monetary policy shock on both output and prices is in accordance with theoretical expectations, i.e. negative. However, as before, these negative responses are still statistically insignificant. Experimentation with the ECB refinancing rate instead of the euro area market interest rate (using both 4 and 8 lags) produces mixed effects (positive and negative) for both output and prices, but again these effects are not significant. Overall, the results reported for Slovenia suggest that monetary policy is not effective at influencing output and prices. The reasons for these nonexistent effects should be searched for in Slovenia's preparations for the euro area membership and alignment with the ECB monetary policy (Slovenia introduced the euro on January 1 2007).

Turkey

The impact of monetary policy on output and prices in Turkey is reported in Figure 6.

Figure 6. Monetary policy effects on output and prices in Turkey

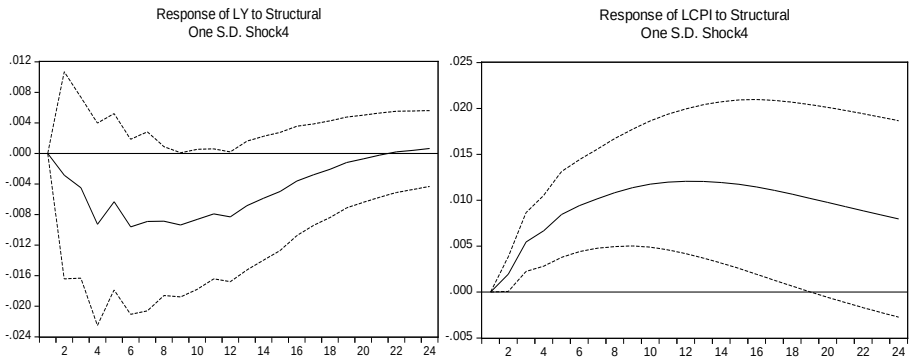


Figure 6 suggests that in the case of Turkey a monetary policy shock (an increase in the interest rate) has a negative effect on output, as expected, and this effect shows signs of being statistically significant (months 9 – 13). The impact on prices is surprisingly positive and statistically significant. These results suggest that monetary policy in Turkey is effective at influencing output (with the expected sign) and prices (positively, contrary to expectations). These significant impacts in the case of Turkey, unlike other countries, may be explained by the fact that Turkey is a larger economy in comparison to other countries in our sample, and larger economies should be more effective, according to theory, when using monetary policy (external effects and global forces are less powerful in the case of large economies). Another reason may be that in comparison with other countries in our sample Turkey's links with the EU may be weaker. Although these arguments may sound convincing in explaining why the impact of monetary policy in the case of Turkey is stronger, our usual modifications introduced in the underlying model (the results are reported in Appendix 1F) suggest that these results should be interpreted with caution. Namely, when we experiment with 8 lags instead of 4 the impact of a monetary policy shock turns positive and this time it is not statistically significant. As for the prices, unlike the previous case, the impact of a monetary policy shock on prices is this time negative, and statistically significant only for a few first months after the shock. This evidently points towards different conclusions regarding the ability of monetary policy in Turkey to affect output and prices. Experimentation with the ECB refinancing rate suggests that the impact of a monetary policy shock on output is predominantly negative, as expected, but the effect is not significant. As for the prices, the effect is again negative, but losing statistical significance. Taken together, the results for Turkey also suggest (as was the case with other countries in our sample) that monetary policy does not have the ability to influence output and prices.

In reporting the evidence on the monetary policy transmission in the 6 Balkan states this study has focused on the 21st century. As the last couple of years have seen the world facing a major financial and economic crisis, it can be argued that the role of monetary policy has been changing, as well as the underlying economic environment, which could possibly lead to different outcomes in terms of the effects of monetary policy on output and prices. Therefore, we decide to introduce another modification in our underlying SVAR model by allowing for a dummy variable starting in August 2007 which is officially considered to the start of the recent global crisis. The results of this exercise are reported in Appendix 2 for all the countries but Slovenia. The reason for not including Slovenia is that the period available for

estimation so far covered the period only until December 2006. This is due to the official introduction of the euro in Slovenia when this country officially surrendered its monetary policy to the ECB. The results reportedin Appendix 2 are consistent with the results reported earlier, with two exceptions (Bulgaria and Turkey). Thus, for the reasons of space we do not comment on Croatia, Macedonia and Romania, but instead we only provide a general comment that the introduction of the dummy variable representing the recent financial crisis in our underlying model does not seem to affect our conclusions concerning the effects of a monetary policy shock on output and prices in these countries (in terms of the sign of the estimated effects the impulse responses are very similar as in the underlying model and again they are not statistically significant). For Bulgaria and Turkey, the mentioned modification in the underlying model results in the following changes. For Bulgaria, the estimated impact of a monetary policy shock on output was earlier predominantly negative (Figure 1) and now it is mixed, but being predominantly positive. Note, however, that this effect does not appear to be statistically significant. The effect on prices, on the other hand, which was found to be positive before now turns negative, but again not statistically significant. For Turkey, negative effect on output found earlier now becomes positive, but insignificant, while the reaction of prices turns from positive to negative. The effect on prices is statistically significant only for a very short period of the first two months. This exercise once again shows the the results based on VAR methodology may be sensitive to even the slightest changes in the model. However, as most of our countries' findings were not affected, especially in terms of statistical significance of the estimated effects, and given the earlier findings and checks of robustness, it may still be concluded that in the countries under investigation monetary policy shocks rarely have any effect on output and prices. All together our results suggest that in the Balkans monetary policy cannot be used as a very strong instrument of economic policy.

Conclusion

This study has investigated monetary policy transmission (interest rate channel) in six Balkan countries in the 21st century. As the empirical literature dealing with the analysis of monetary policy in the Balkan region is still scarce, the attempt of the present study to investigate it in a comprehensive way represents a valuable contribution.

The study employs a structural VAR approach to isolate and investigate the impact of an unexpected monetary policy shock (an increase in the interest rate) on output and prices. Through imposing a model with a more realistic structure, which represents small open economies, and a set of restrictions that strictly rely on economic theory, our approach represents the best practice in applying the VAR methodology. This careful approach, together with different checks of robustness allows us to be confident about our findings. Evidence in this study points towards a very small, if any, impact of monetary policy on output in a set of Balkan countries. In terms of the estimated direction of the impact of monetary policy on output we observe very mixed evidence, both negative and positive. However, in no country is the impact statistically significant. As for the prices, the evidence is mixed again, but the impact is again predominantly insignificant. A number of introduced robustness checks do not change this general finding. Thus, taken together, the evidence in this study does not suggest a consistent (clearly positive or negative and statistically significant) impact of monetary policy. Even though one might argue that the insignificance of our results renders no conclusion, we believe this finding is actually in accordance with expectations. Namely, we read this evidence as pointing towards a very weak, if any, ability of monetary policy to affect output and prices in the Balkans. Although these findings may be in contrast to the evidence from developed countries, it is very likely that because of the strong links with the euro area and possibly a very significant convergence already achieved, monetary policy in Balkan countries is not effective. These findings further suggest that the fear of losing independent monetary policy, commonly put forward as a reason against adopting the euro, may be overstated and unwarranted, as the countries in our sample appear to be very limited in using it anyway.

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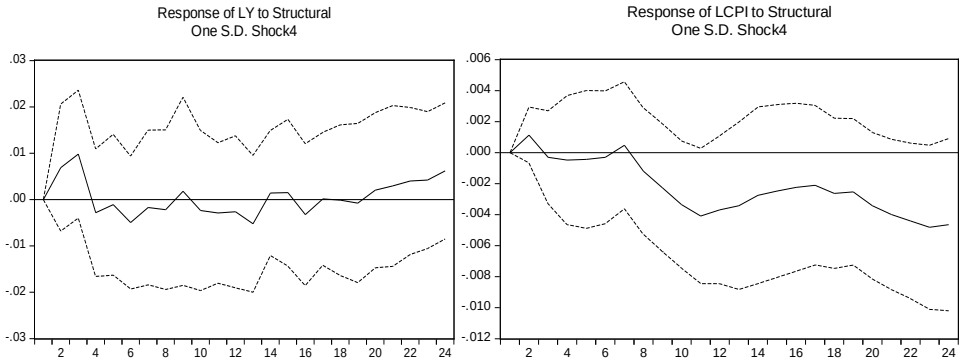
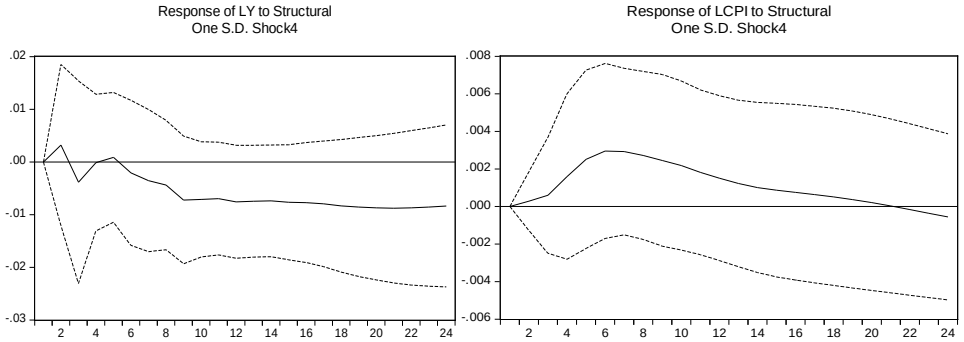
Appendix 1A - Modifications for Bulgaria

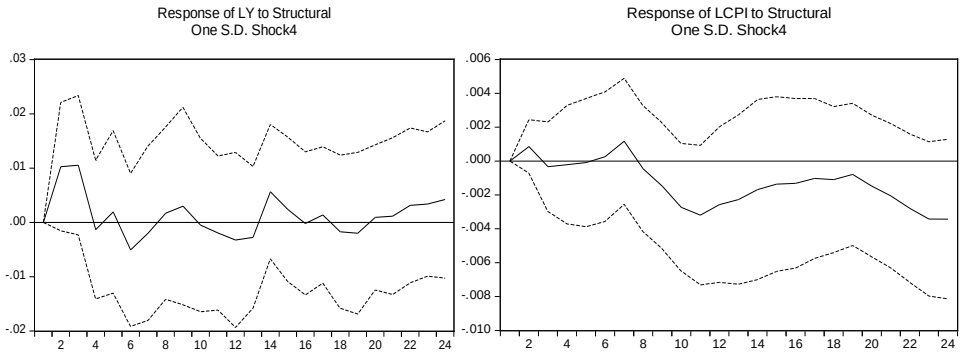
SVAR model – 8 lags (euro area money market interest rate)



SVAR model – 4 lags (ECB refinancing rate)

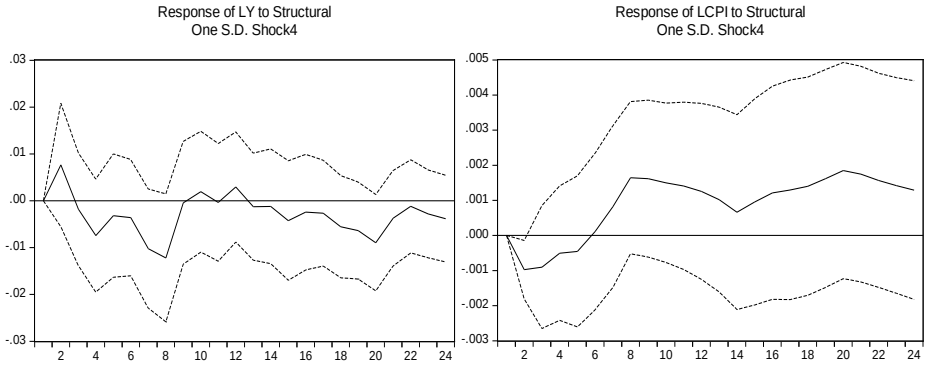


SVAR model – 8 lags (ECB refinancing rate)

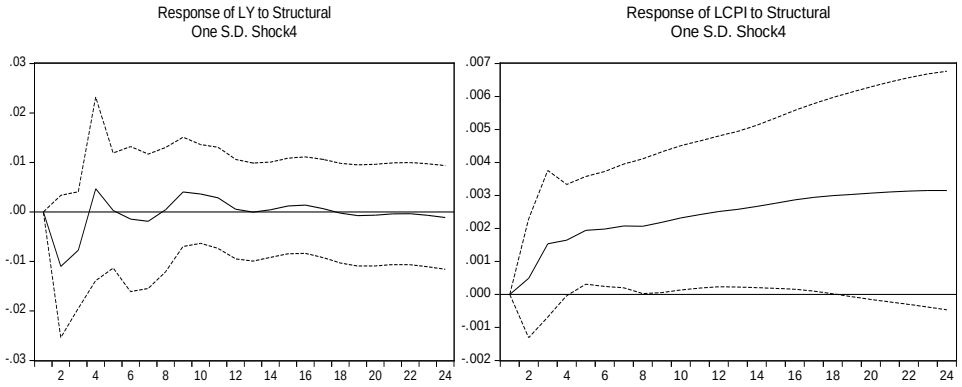


Appendix 1B - Modifications for Croatia

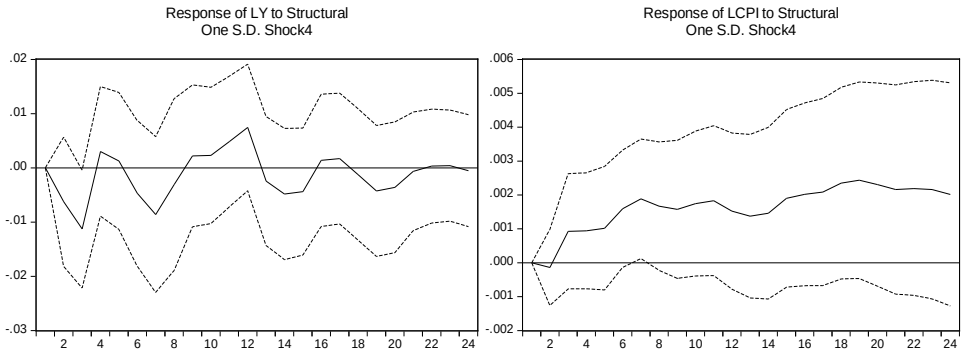
SVAR model – 8 lags (euro area money market interest rate)



SVAR model – 4 lags (ECB refinancing rate)

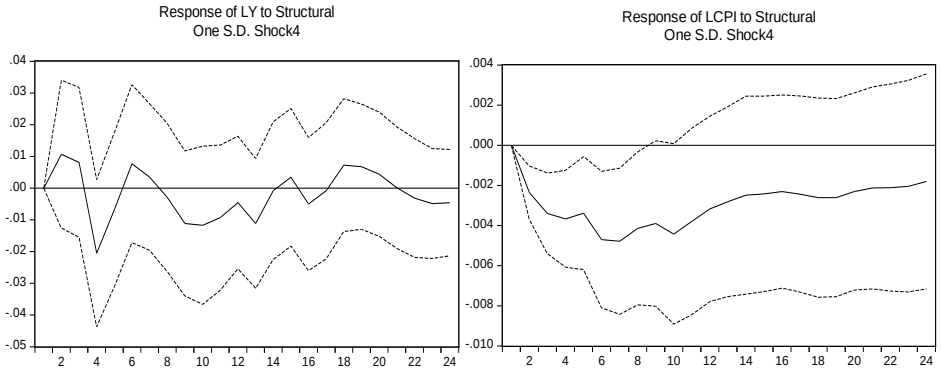


SVAR model – 8 lags (ECB refinancing rate)

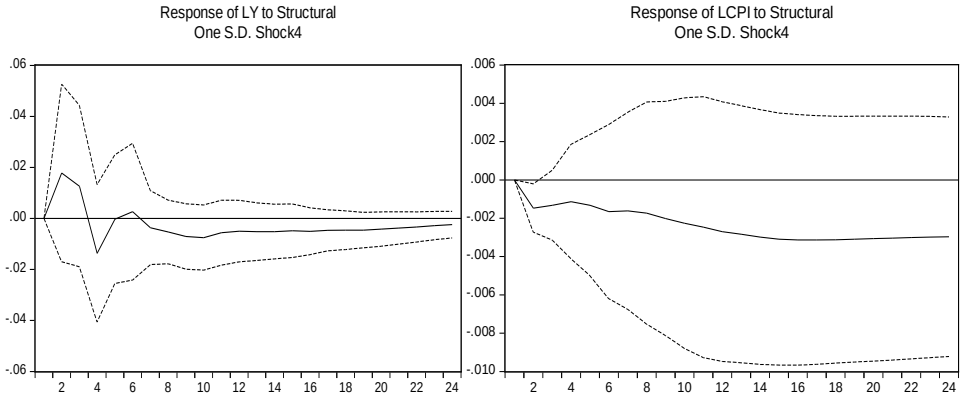


Appendix 1C - Modifications for Macedonia

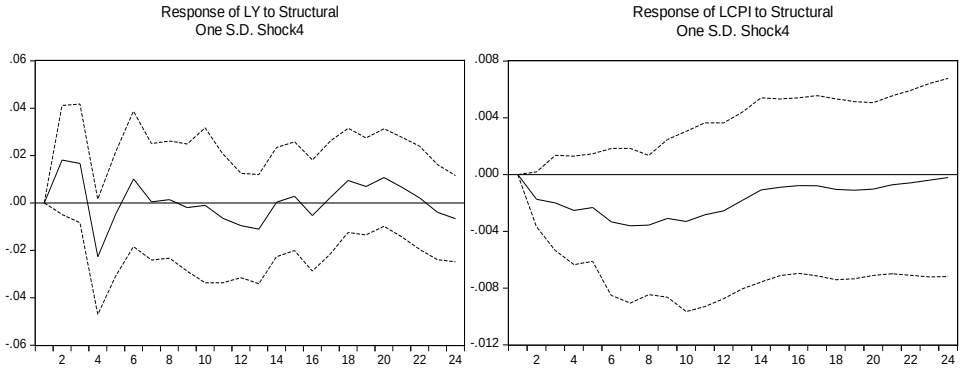
SVAR model – 8 lags (euro area money market interest rate)



SVAR model – 4 lags (ECB refinancing rate)

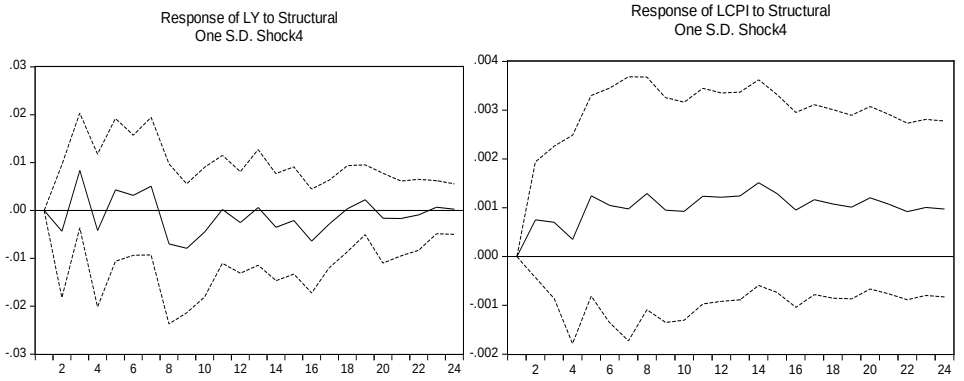


SVAR model – 8 lags (ECB refinancing rate)

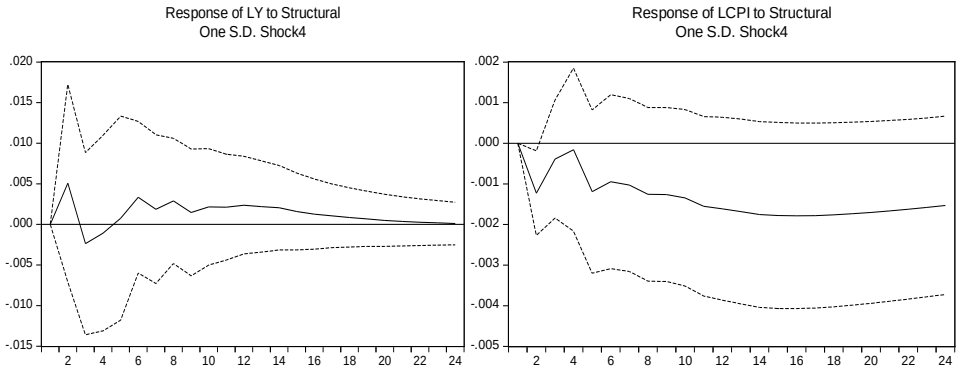


Appendix 1D - Modifications for Romania

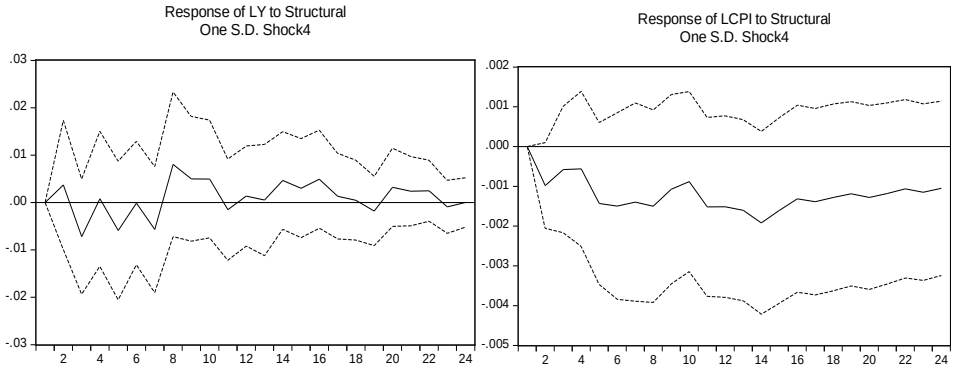
SVAR model – 8 lags (euro area money market interest rate)



SVAR model – 4 lags (ECB refinancing rate)

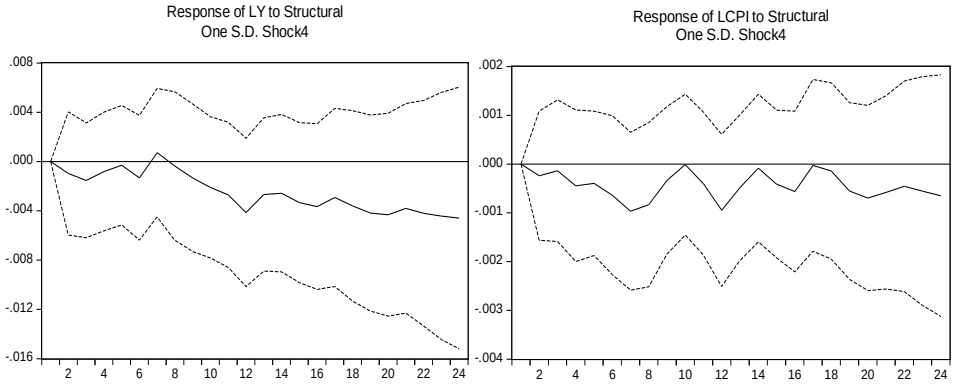


SVAR model – 8 lags (ECB refinancing rate)

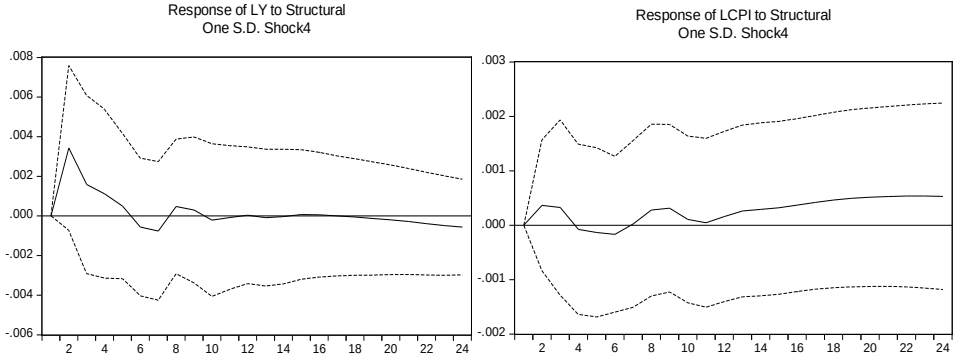


Appendix 1E - Modifications for Slovenia

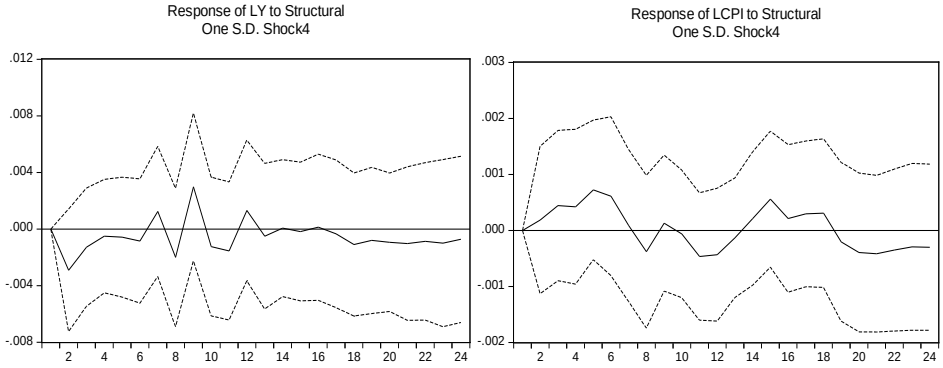
SVAR model – 8 lags (euro area money market interest rate)



SVAR model – 4 lags (ECB refinancing rate)

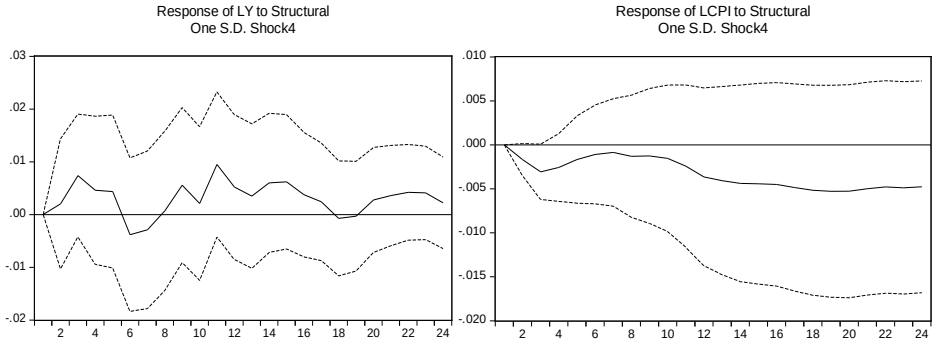


SVAR model – 8 lags (ECB refinancing rate)

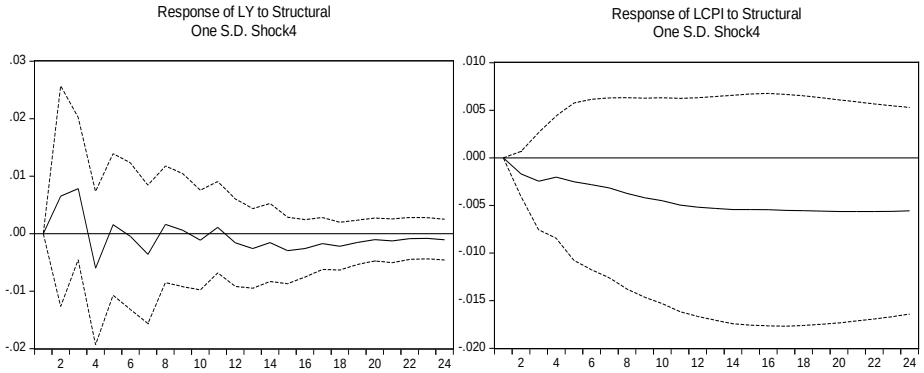


Appendix 1F - Modifications for Turkey

SVAR model – 8 lags (euro area money market interest rate)



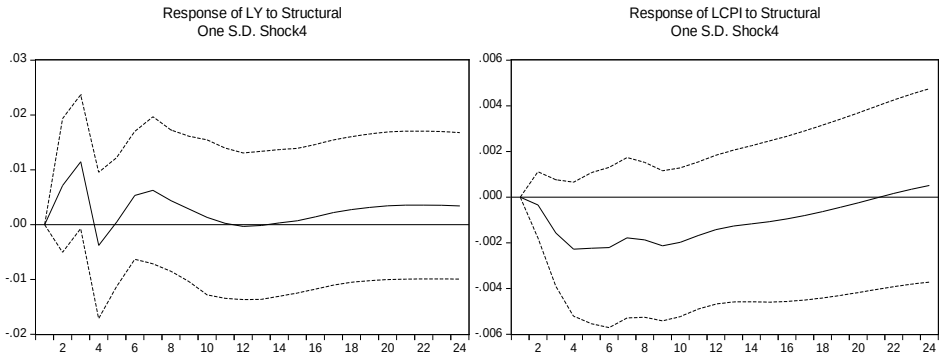
SVAR model – 4 lags (ECB refinancing rate)



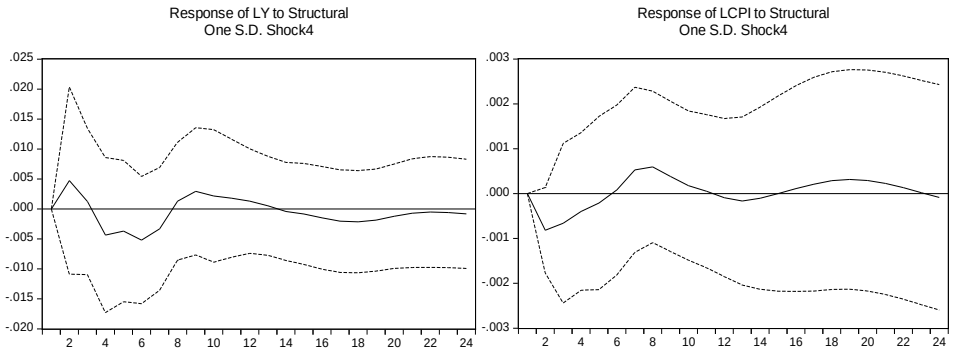
SVAR model – 8 lags (ECB refinancing rate)
It was not possible to estimate the structural VAR model with 8 lags. (Hessian matrix problem)

Appendix 2

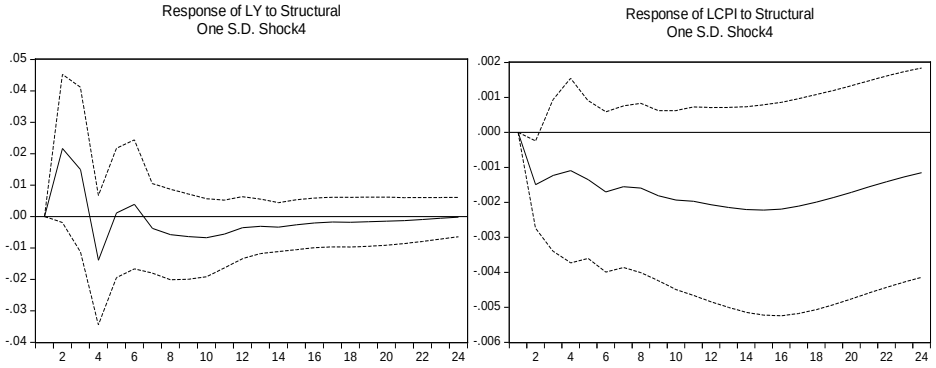
Bulgaria (estimation with the financial crisis dummy)



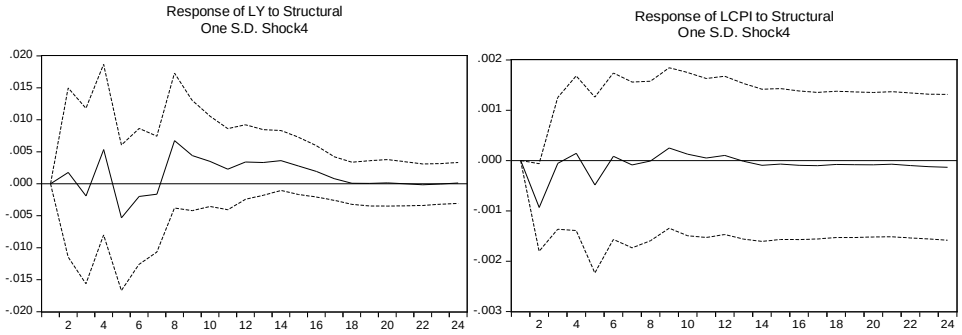
Croatia (estimation with the financial crisis dummy)



Macedonia (estimation with the financial crisis dummy)



Romania (estimation with the financial crisis dummy)



Turkey (estimation with the financial crisis dummy)