The effects of macroeconomic policies under fixed exchange rates: A Bayesian VAR analysis

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Abstract

We analyse the effects of fiscal and monetary policies in Croatia and Macedonia based on the Bayesian Vector Autoregressions. The main results of the study are as follows: Fiscal tightening leads to economic expansion in Macedonia and a decline in economic activity in Croatia. In both countries fiscal tightening leads to a decline in inflation and money market rates. Monetary tightening leads to output contraction and a decline in inflation in both countries. We find opposite reaction of fiscal authorities to a monetary shock: monetary contraction is accompanied by fiscal tightening in Croatia and by loose fiscal policy in Macedonia.

Keywords: Fiscal Policy, Monetary Policy, Bayesian VAR

JEL Classification: C32, E52, E58, E62, E63

I Introduction

Since the seminal work of Mundell (1963) and Fleming (1962) a large body of literature has analysed the effectiveness of monetary and fiscal policies under the fixed exchange rate regime (For instance, see Bahmani-Oskooee and Pourheydarian 1990; Gali and Monacelli 2005; Lane and Perotti 2003; Niehans 1968; Shambaugh 2004). Recently, the Global financial crisis have revived the emphasis on the fiscal policy as the effectiveness of monetary policy had been constrained by the lower-zero bound of interest rates (Blanchard et al. 2010). Hence, at the outset of the economic recession in 2009, these economies were faced with pressures on the foreign exchange market. Accordingly, despite the decline in economic activity, the monetary policy makers were forced to tighten in order to restore the balance on the foreign exchange market by reducing the liquidity of the banking system. Thus, examining the interaction between monetary and fiscal policies during the recent economic downturn may provide additional useful policy implications for these economies.

Most of the empirical research on the effects of monetary and/or fiscal policy has been conducted within the VAR methodology. We employ the recently developed Bayesian VARs in order to investigate the macroeconomic policies in two South East European countries with fixed exchange rate regime (Croatia and Macedonia). The primary focus of our study is twofold: first, what are the effects of monetary and fiscal policies and second, how these policies react to each other as well as to other macroeconomic shocks. Since we deal with small open economies, our VARs explicitly incorporate the effects of foreign macroeconomic shocks on these economies.

We provide evidence for countercyclical response of fiscal policy and procyclical reaction of the central banks during the business cycle. As for the effects of macroeconomic policies, the main results are as follows: Fiscal tightening leads to economic expansion in Macedonia and a decline in economic activity in Croatia. At the same time, in both countries fiscal tightening leads to a short-lived decline in both inflation and money market rates. Monetary tightening leads to output contraction and a decline in inflation in both countries. Yet, we find an opposite reaction of the fiscal authorities to a monetary shock: in Croatia, monetary contraction is accompanied by fiscal tightening in Croatia and by loose fiscal policy in Macedonia.

The rest of the paper is organized as follows: Section 2 reviews the empirical literature on the effects of monetary and fiscal policy. The data description and the estimation methods are presented in Section 3. The findings of the empirical study are presented in Section 4, which is followed by the main conclusions.

II Review of the empirical literature

Following the seminal paper by Sims (1980), a large body of empirical literature has investigated the effects of monetary policy based on the VAR methodology. For a non-exclusive list, see Bagliano and Favero (1998), Bernanke and Blinder (1992), Bernanke and Mihov (1998), Christiano et al. (1996), Gordon and Leeper (1994), Hoover and Jordá (2001), Leeper et al. (1996), Rudebusch (1998), Sims (1992), and Uhlig (2005).

Blanchard and Perotti (2002) introduced the Structural VAR (SVAR) in the identification of fiscal policy shocks while Ramey and Shapiro (1998) and Romer and Romer (2010) implemented the alternative narrative approach. Burnside et al (2004), Edelberg et al. (1999), and Ramey (2011) are examples of VAR studies with shocks identified by the approach of Ramey and Shapiro (1998). Perotti (2007) modifies the event-study approach and compares it with the Blanchard-Perotti approach. Favero and Giavazzi (2012) argue that the structural shocks in the VARs can be identified by the narrative approach, which are orthogonal to the information set included within the VAR. Along these lines, Mertens and Ravn (2012) employ the narrative approach of Romer and Romer (2010) within the SVAR. Recently, a number of studies employ different combinations of the main policy shocks identification approaches. For example, Dungey and Fry (2007) deal with the identification of fiscal and monetary shocks by using the sign restrictions and permanent and temporary shock methodology of Pagan and Pesaran (2007). Caldara and Kamps (2008) employ the recursive approach, the Blanchard-Perotti approach, the sign restrictions approach and the event-study approach.

The empirical research has provided divergent results with respect to both the direction and the magnitude of the effects of fiscal policy shocks on macroeconomic variables. Specifically, some of the studies find that fiscal policy shocks have clear positive effects on output, consumption and/or employment in line with the traditional Keynesian view (Fatás and Mihov 2001; Galí et al. 2007; Giordano et al. 2008; Romer and Romer 2010). In addition, some studies confirm that, typically, fiscal policy has had a stabilising role in the business cycles by

running countercyclical primary deficits (Fatas and Mihov 2001; Melitz 1997; Taylor 2000; Galí and Perotti 2003). On the other hand, some papers provide mixed evidence regarding the debate on the Keynesian vs. non-Keynesian effects of fiscal policy, revealing that expansionary fiscal policy may produce adverse effects on some macroeconomic variables as suggested by neo-classical theoretical predictions (Ramey and Shapiro 1998; Edelberg et al. 1999; Blanchard and Perotti 2002; van Aarle et al. 2003; Burnside et al. 2004; Mountford and Uhlig 2005; Perotti 2004 and 2007; Caldara and Camps 2008; Afonso and Sousa 2009; Cogan et al. 2010; Barro and Redlick 2011; Ramey 2011).

The Global crisis has provoked a growing interest in the effects of fiscal policy and the interactions with monetary policy in the former transition economies, too. As shown below, even the empirical studies supporting the traditional Keynesian effects of fiscal policy fail to produce quantitatively important fiscal multipliers. Moreover, some papers indicate that expansionary fiscal policy may have adverse effects on output, investment and employment in line with the neoclassical models. Overall, one may conclude that the potential of fiscal policy to stimulate economic activity in CEE countries is very limited, which is in line with the findings in Ilzetzki et al. (2013). In the following paragraphs we briefly review the empirical evidence for this area.

Crespo-Cuaresma et al. (2011) find that monetary policy in CEE economies usually offsets domestic fiscal expansion, while on the other hand fiscal authorities usually accommodate the interest rate shocks. Baxa (2010) and Franta (2012) provide evidence that fiscal policy in the Czech Republic produces the traditional Keynesian effects. The latter also shows that the expansionary fiscal policy leads to a higher inflation, while the central bank reacts as a substitute by increasing short-term interest rates. In Caraiani (2010), too, both output and inflation rise following an expansionary fiscal policy, while monetary policy behaves in a counteracting manner. Similarly, Jemec et al. (2011) show that fiscal policy shocks in Slovenia produce the Keynesian effects, but they are short-lived and of small magnitude.

Baksa et al. (2010) show that the effectiveness of fiscal policy in Hungary is very limited, i.e. fiscal multipliers are low and short-lived. As for the interactions between fiscal and monetary policies, they conclude that the effects of fiscal policy are not dependent on the stance of monetary policy (accommodative or aggressive). Lendvai (2007) provides mixed evidence on the effectiveness of fiscal policy in Hungary, i.e. the increase in government expenditure has positive effects on household consumption and negative effects on the corporate

sector. Due to this strong crowding-out effect, total output and employment decline. Mirdala (2009) analyzes the effects of fiscal policy shocks in several CEE and SEE economies during 2000-2008 and finds mixed results about the output effects of government expenditure shocks in different countries. Benčík (2009) provides evidence in favour of neoclassical predictions about fiscal policy effects. Specifically, he finds that fiscal consolidation (a cut in the budget deficit-to-GDP ratio) leads to an increase in output, though the effects are short-term. Similarly, Rzonca and Cizkowicz (2005) provide evidence that fiscal consolidation has strong favourable effects on output growth. Serbanoiu (2012) shows that in Romania positive government expenditure shocks lead to an increase in output, decline in private consumption and investment (crowding-out effect), initial rise in inflation and temporary decline in interest rates. Bobaşu (2015) and Boiciuc (2015), too, shows that the effects of fiscal policy are rather limited.

There are a few studies on the effects of fiscal and monetary policies and their interactions in the SEE economies. Muir and Weber (2013) investigate the effects of fiscal policy in Bulgaria during 2003-2011 and provide the following main results: fiscal multipliers are very low, especially for government expenditure; recently, fiscal multipliers have increased, suggesting that the impact of fiscal policy on economic activity is larger in recessions; and the size of fiscal multipliers depends on the compositon of expenditure and revenues. Mirdala (2009) shows that in Bulgaria fiscal expansion has strong positive effects on output, (which dies out very quickly), but it leads to increased inflation and higher short-term interest rates. For Albania, Mançellari (2011) shows that fiscal multipliers are very low, and positive government spending shocks lead to a slightly higher inflation.

Rukelj (2009) investigates the interactions of fiscal policy, monetary policy and economic activity in Croatia. His study shows that fiscal and monetary policy move in the opposite direction, i.e. they have been used as substitutes: fiscal shocks have a predominantly negative impact on narrow money, while monetary shocks produce negative effects on government expenditure. Ravnik and Žilić (2011) find that both government expenditure and tax revenues shocks have negative effects on output in Croatia. Also, they show that the interest rates show the strongest response to fiscal shocks, while fiscal shocks have minor and short-lived effects on inflation. Hinić and Miletić (2013) analyze the effects of fiscal and monetary policies in Serbia and show that both government expenditure and tax revenues shocks produce positive on output in Serbia, but the fiscal

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multipliers are much smaller than one in the short run. As for the interactions between the two policies, they find that monetary policy accommodates fiscal policy shocks and vice versa, i.e. they act as complements. Deskar et al. (2015) show that the fiscal multipliers in Croatia are larger as compared with Serbia and Slovenia.

III Data and Methodology

We work with quarterly data from 2000 to 2011, providing 48 observations for Macedonia and 47 observations for Croatia. Specifically, for Macedonia, the sample starts from the first quarter of 2000, when following a comprehensive reform of monetary policy instruments the central bank bills were introduced. Similarly, for Croatia, the sample starts from the second quarter of 2000 for two reasons: first, money market rate data are available only from this quarter onward, and second, we want to avoid the effects of the banking crisis from 1998-1999.

The VARs include four domestic macroeconomic variables, which are chosen as indicators of fiscal policy, monetary policy, inflation and economic activity in each country, respectively. Specifically, we work with the primary cyclically-adjusted government balance/GDP ratio (F_d), the money market interest rates (i_d), the CPI-based inflation rate (π_d), and the output gap (y_d). All the data for these countries were collected from their central banks' and ministries of finance's websites. For consistency, the data related to fiscal revenues and expenditures, throughout the whole sample period are adjusted according the Governmental Financial Statistics (GFS) 2001 methodology set by the International Monetary Fund (IMF). Though we are primarily interested in domestic policies our empirical model also comprises a set of foreign variables, such as: the euro-zone output gap (y_f), the 3-month Euribor (i_f), and the euro-zone inflation (π_f).

Domestic money market interest rates are used as indicators of monetary policy in Croatia and Macedonia. In spite of the fixed exchange rate regime, we believe that there is a room for autonomous monetary policy in these two countries due to the following reasons: *First*, the interest rate parity holds only if there is perfect capital mobility where domestic and foreign assets are perfect substitutes. Obviously, these assumptions are too strong for Croatia and Macedonia; *Second*, both the Macedonian and Croatian central banks have relied on a series of

non-interest rate policy tools, thus, being able to affect domestic money market rates (See Lang and Krznar 2004).

As for the primary government balance, we use central government due to data availability. The output gap is calculated as a percentage difference between the actual and potential GDP. In estimating potential GDP and output gap we rely on the one-sided Hodrick-Prescott (HP) filter with the default lambda of 1600 ($\lambda=1600$). We do not apply the commonly used two-sided HP filter estimated from the whole sample because this approach introduces trends that were not known at the time of shocks, which can substantially confound the estimated effects of shocks. Also, some necessary transformations have been performed on the original data, such as seasonal adjustment and differencing. For instance, the series of real GDP, inflation, and fiscal data (government revenues and expenditures) have been seasonally adjusted by the "CENSUS X-12". On the other hand, both domestic and foreign money market rates have been first differenced in order to obtain stationarity. The unit root tests (the Augmented Dickey-Fuller, Phillips-Perron and Kwiatkowski-Phillips-Schmidt-Shin tests) reveal that all the other series are stationary.

The VAR methodology is a standard framework for assessing the effects of monetary and/or fiscal policy (seminal papers include Bernanke and Blinder, 1992; Bernanke and Mihov, 1998; and Blanchard and Perotti, 2002). Given the problems related with the fully-fledged structural models of fiscal and monetary reaction functions, which often incorporate more or less arbitrary identifying restrictions, especially for fiscal policy rules, (Muscatelli et al., 2002) we apply recursive VARs for modelling the interactions between domestic macroeconomic variables. Specifically, we impose the following restrictions in the VARs: *a)* foreign variables have a contemporaneous impact on each of the domestic variables; *b)* policy variables do not have a contemporaneous impact on economic activity because they affect the 'real' sector with a certain time lag (see Blanchard and Quah 1989). As can be seen, we build our empirical model on the assumption that foreign variables are exogenous to the SEE economies so that the VARs incorporate explicitly foreign shocks. This assumption arises quite naturally given that we focus on small open economies, which are integrated with the EU. In addition, in order to fully incorporate the small open economy assumption, we follow Cushman and Zha (1997) by imposing the block-exogeneity restrictions in the model. Specifically, in the baseline unrestricted

VARs, the lags of foreign variables are included in the equations of domestic variables, while the lags of domestic variables are excluded from the equations of foreign variables.

We employ the Bayesian procedure for estimating the VARs in order to overcome the short sample problem. Recently Bayesian VAR methodology has become a relevant tool for evaluation of the effects of macroeconomic shocks (For instance, see Doan et al. 1984; Litterman 1986; Ritschl and Woitek 2000; Caldara and Kamps 2008; Afonso and Sousa 2009). The Bayesian approach offers a solution to the curse of dimensionality problem by shrinking the parameters via the imposition of priors. Koop and Potter (2003), Wright (2003), Stock and Watson (2005, 2006) explore the performance of the Bayesian approach in relatively small systems, while De Mol et al. (2008) and Banbura et al. (2010) confirm its validity even in systems with a large number of predictors compared to the small sample sizes that are typical in macroeconomic analysis. We use the independent normal-inverse-Wishart prior, which is frequently used in the literature; see e.g. Kadiyala and Karlsson (1997), and Banbura et al. (2010), while the set of prior hyperparameters are also taken from the latter paper. The lag length of one quarter is used in the VARs, based on the Bayesian information criteria.

IV Discussion

In this section we provide a discussion on the cumulative impulse responses from the VARs. In assessing the Impulse Response Functions (IFRs) we calculate the 95% Bayesian highest posterior density sets, which are analogous to the confidence bands in classical statistics. The impulse IRFs of the variables from the VARs are provided in the Appendix and are ordered according to the variable from which the impulses are generated.

The reaction of monetary and fiscal policies to a shock in the output gap is shown in Panel A in the Appendix. Here, in both countries, an increase in the domestic economic activity leads to higher cyclically adjusted budget surpluses. This suggests that fiscal policy behavior in these economies is countercyclical, i.e. fiscal authorities adjust budget revenues and expenditures according to the changes in the economic cycle. In other words, fiscal policy authorities take advantage of the economic expansion by increasing the budget surplus or reducing the budget deficit. In Croatia, the countercyclical reaction of fiscal authorities is lower as compared to Macedonia as well as statistically insignificant. In Macedonia, the reaction is short-lived, i.e. the impulses decay within a year

reflecting the lower degree of persistence of output shocks. Overall, these findings confirm that, typically, fiscal policy has a stabilising role in the business cycles by running countercyclical primary deficits (Fatas and Mihov, 2001; Melitz, 1997; Galí and Perotti, 2003). Also, they are consistent with Crespo-Cuaresma et al. (2011) who provide evidence for a countercyclical behavior of fiscal policy in Central European economies. As for the monetary policy makers, Panel A reveals that they seem to react in an opposite manner: following a positive output shock, money market rates decline, thus, suggesting procyclical behaviour of central banks. This type of reaction on the part of the central bank may be explained by the efforts to offset the potential adverse effects of the fiscal tightening. Yet, the reaction of monetary policy is short-lived, especially in Croatia.

Panel B of the Appendix shows the response of macroeconomic policies to an inflation shock. Once again, one can observe a countercyclical reaction of fiscal authorities in the two countries, which is closely related to the differences in the response of the output gap. In Croatia, higher inflation is accompanied by a positive output gap and, thus, fiscal authorities run budget surpluses. On the other hand, in Macedonia, higher inflation leads to a negative output gap and small budget deficits. The response of monetary policy is in line with the *a priori* expectations, i.e. money market rates increase in both countries though the central banks' reaction is both too small and short-lived. Finally, one should note that all the impulses are not statistically significant.

The next two panels in the Appendix show the effects of macroeconomic policies. As shown in Panel C, a positive shock in the cyclically adjusted budget balance leads to economic expansion in Macedonia, probably reflecting the favourable effects of fiscal tightening on inflation expectations. In Croatia, we obtain a mirror-shaped response, i.e. the fiscal tightening is accompanied by a decline in economic activity. At the same time, in both countries fiscal tightening leads to a short-lived decline in inflation. However, the impulses are statistically significant only in Macedonia. As for the reaction of monetary policy one can observe a short-lived decline in money market rates in Croatia and Macedonia, but, once again, the impulses are statistically significant only in Macedonia where the central bank attempts to offset the effects of fiscal shocks. This result may be related to the countercyclical behaviour of fiscal policy: the attempts of fiscal authorities to counteract the positive output gap have favourable effects on inflationary expectations, leading to monetary easing.

Panel D of the Appendix reveal the IRFs to a shock in the money market rates. Here, the effects of monetary tightening are as expected, i.e. it leads to output contraction and a decline in inflation. Yet, we find an opposite

reaction of the fiscal authorities: in Croatia, monetary contraction is accompanied by tight fiscal policy whereas in Macedonia fiscal authorities run budget deficits in response to higher money market rates.

V Conclusion

This paper examines the reaction functions as well as the effects of monetary and fiscal policies in two SEE economies with fixed exchange rates: Croatia and Macedonia. Specifically, we conduct an empirical investigation in the linkages between several macroeconomic and policy variables (output, inflation, interest rates and budget surpluses) based on the impulse response functions estimated with Bayesian VARs.

We find that domestic economic expansion leads to positive fiscal balances in both countries. This implies that fiscal policy behavior in these economies is countercyclical suggesting that fiscal policy makers are actively adjusting the fiscal revenues and expenditures according to the changes in the economic cycle. On the other hand, we find a short-lived procyclical reaction of the central banks, possibly reflecting their efforts to offset the potential adverse effects of the fiscal tightening.

Fiscal tightening leads to economic expansion in Macedonia, probably reflecting the favourable effects on inflation expectations, while in Croatia fiscal tightening is accompanied by a decline in economic activity. At the same time, in both countries fiscal tightening leads to a short-lived decline in both inflation and money market rates.

The effects of monetary tightening are as expected, i.e. it leads to output contraction and a decline in inflation. Yet, we find an opposite reaction of the fiscal authorities: in Croatia, monetary contraction is accompanied by fiscal tightening in Croatia and loose fiscal policy in Macedonia.

Some additional issues remain open for further research. For example, it will be interesting to investigate the macroeconomic effects of fiscal policy and monetary-fiscal interactions by considering budget revenues and budget expenditure separately. This will enable us to estimate the fiscal multipliers on both the revenue and expenditure side and, thus, to compare the effects of these two fiscal policy instruments for stabilisation purposes. In addition, working with budget revenues and expenditure separately will give us further insights into

the fiscal-monetary interactions because fiscal policy might respond differently to monetary policy shocks on the revenue and the expenditure side.

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Appendix: IRFs of Bayesian VAR with 95% confidence intervals

<u>A: Impulses generated from a shock to the output gap</u>

Impulse responses of output gap:

Croatia
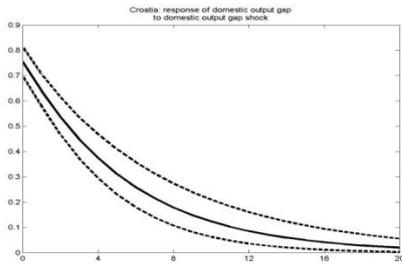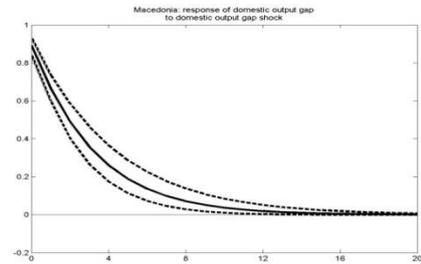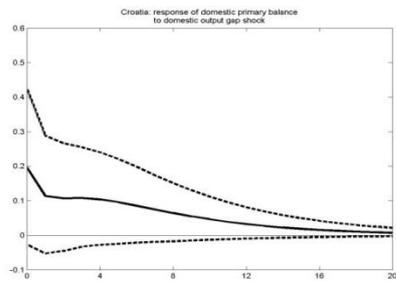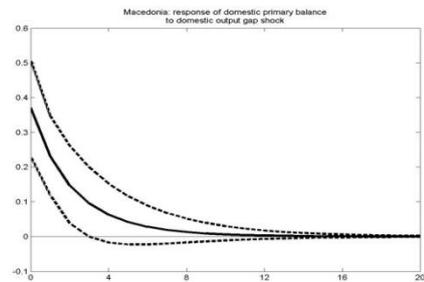
Macedonia

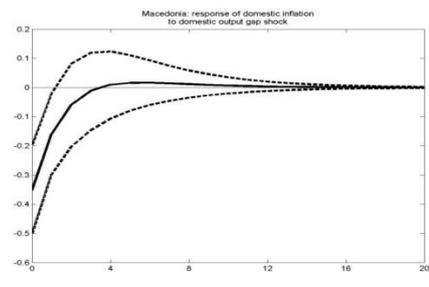Impulse responses of fiscal policy:

Croatia

Macedonia

Impulse responses of inflation:

Croatia
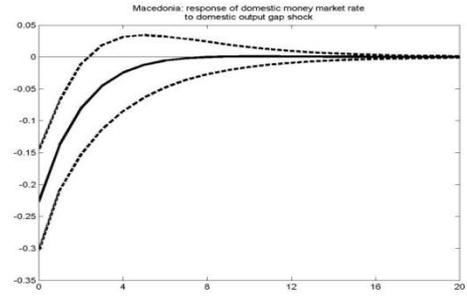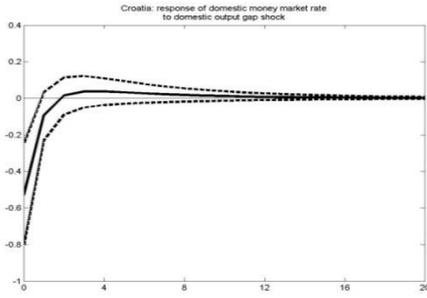
Macedonia

Impulse response of monetary policy:
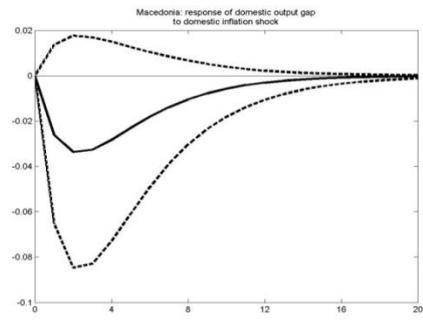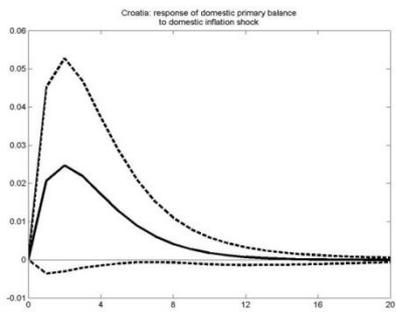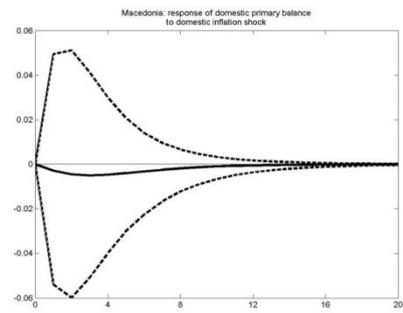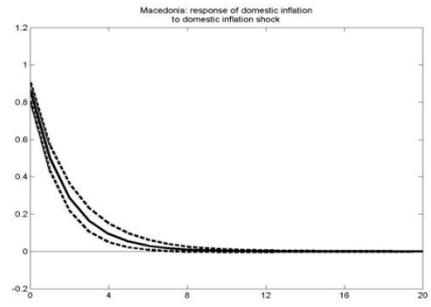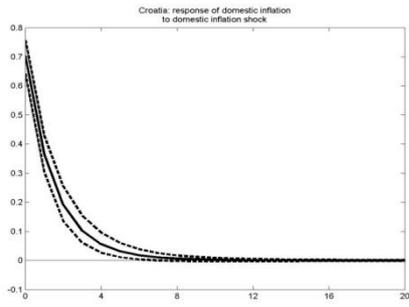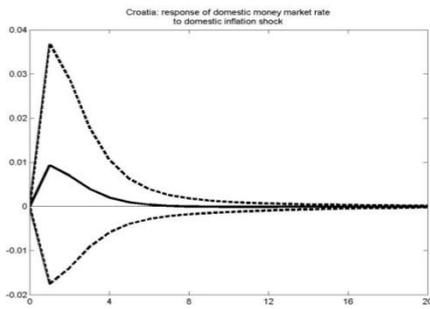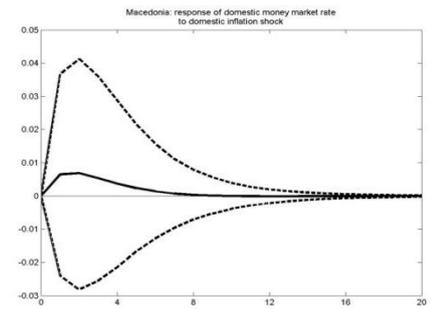
Croatia   Macedonia

Croatia: response of domestic money market rate to domestic output gap shock

Macedonia: response of domestic money market rate to domestic output gap shock
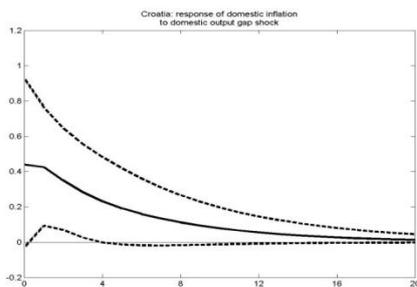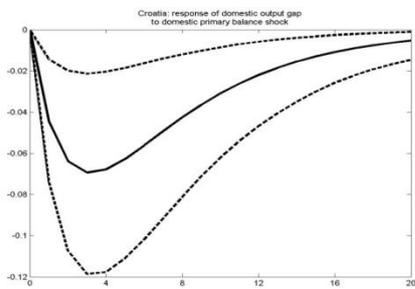
B: Impulses generated from an inflation shock

Impulse responses of domestic output gap:
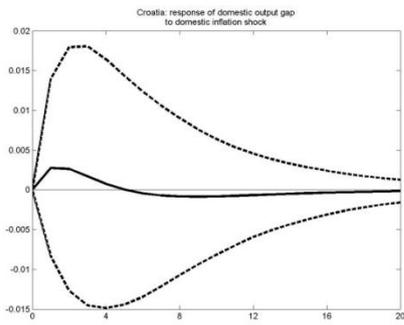
Croatia

Macedonia

Croatia: response of domestic output gap to domestic inflation shock

Macedonia: response of domestic output gap to domestic inflation shock

Impulse responses of fiscal policy:

Croatia

Macedonia

Croatia: response of domestic primary balance to domestic inflation shock

Macedonia: response of domestic primary balance to domestic inflation shock

Impulse responses of inflation:

Croatia

Macedonia

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Impulse response of monetary policy:

Croatia   Macedonia
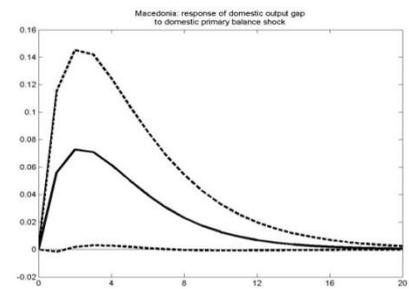

C: Impulses generated from a fiscal policy shock

Impulse responses of domestic output gap:

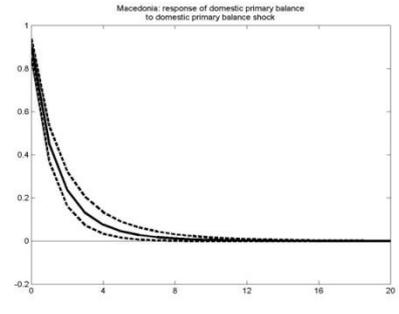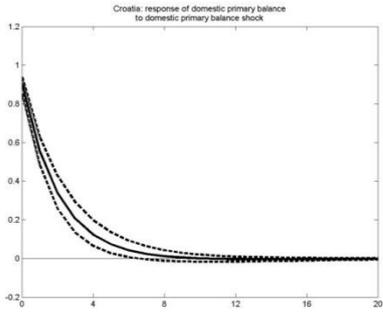Croatia   Macedonia
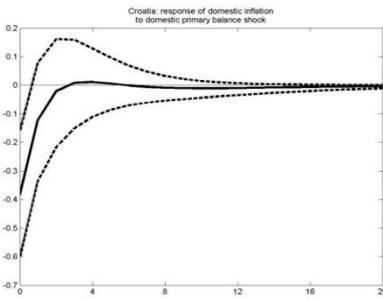

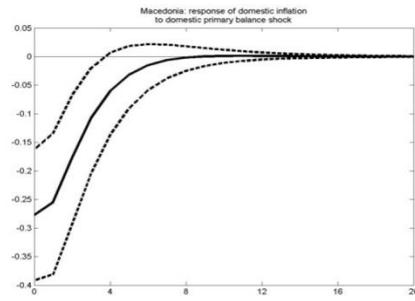Impulse responses of fiscal policy:

Croatia   Macedonia

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Croatia: response of domestic primary balance to domestic primary balance shock

Macedonia: response of domestic primary balance to domestic primary balance shock

Impulse responses of inflation:

Croatia

Macedonia

Croatia: response of domestic inflation to domestic primary balance shock
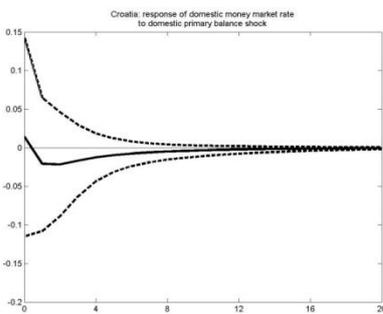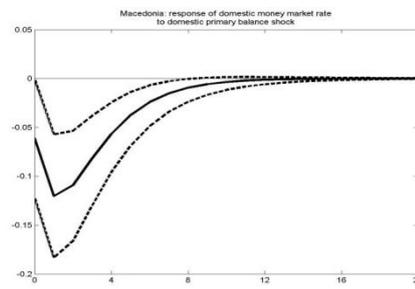

Macedonia: response of domestic inflation to domestic primary balance shock

Impulse response of monetary policy:

Croatia

Macedonia

Croatia: response of domestic money market rate to domestic primary balance shock

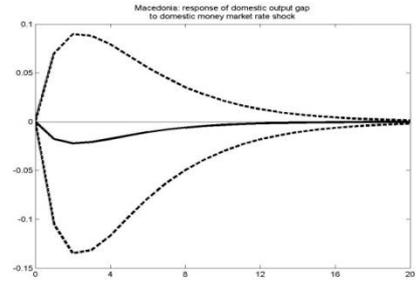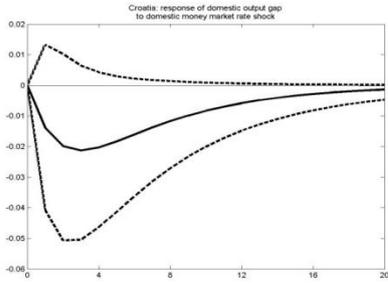Macedonia: response of domestic money market rate to domestic primary balance shock

D: Impulses generated from a monetary policy shock

Impulse responses of domestic output gap:

Croatia

Macedonia

Croatia: response of domestic output gap to domestic money market rate shock

Macedonia: response of domestic output gap to domestic money market rate shock
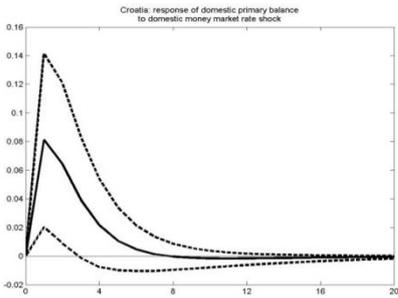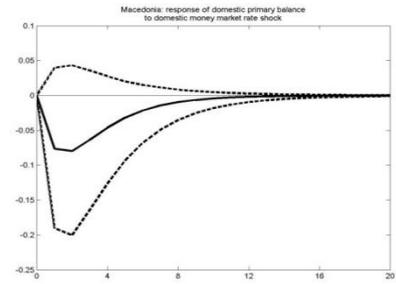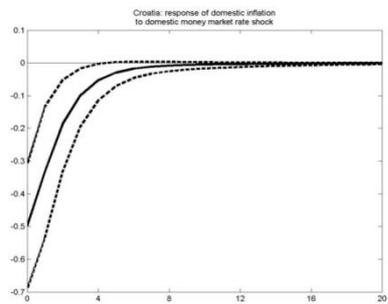
Impulse responses of fiscal policy:

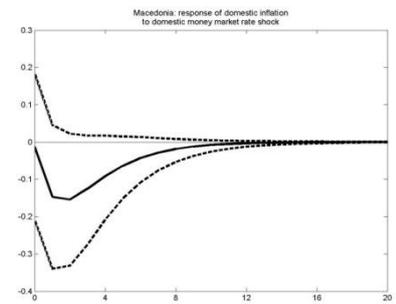Croatia   Macedonia

Croatia: response of domestic primary balance to domestic money market rate shock

Macedonia: response of domestic primary balance to domestic money market rate shock

Impulse responses of inflation:

Croatia   Macedonia

Croatia: response of domestic inflation to domestic money market rate shock

Macedonia: response of domestic inflation to domestic money market rate shock

Impulse response of monetary policy:

Croatia   Macedonia

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Croatia: response of domestic money market rate
to domestic money market rate shock

Macedonia: response of domestic money market rate
to domestic money market rate shock