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NOTES

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C O N T E N T

ABSTRACT

The scope in this study is to assess the impact of unconventional monetary policy (UMP) of European Central Bank (ECB) on the dynamics of the Albanian economy. First, I evaluate the impact of the UMP relative to standard MP innovations of ECB and to domestic shocks in a benchmark model. To disentangle an unconventional policy shock I use both sign and zero restrictions on the responses of Euro are variables to policy shocks. The approach is consistent with the trend in literature and allows for a comparison. Results support the view that UMP shocks have strong positive effects on financial condition of Albania, but small negative effects on real sector. Second, I investigate the transmission channels of unconventional MP shocks on Albanian economy. I find that negative effects of unconventional monetary policy through the portfolio-rebalancing channel counterbalance the potential of positive effects through the financial channel. In addition to UMP shocks, 'risk' shocks emerge as a potentially significant factor for the dynamics of the real sector of the Albanian economy, in particular for investments and output. The latter operate via portfolio re-balancing channel, remittances and bank lending channel.

Keywords: Unconventional Monetary Policy, BVAR, block exogeneity, Albania

JEL Codes: E52, F42, C11, C32, G15

1. INTRODUCTION

The expansion of central bank balance sheets of large economies observed after the recent global financial crisis has raised concerns regarding the potential spillover effects of these non-standard measures across neighbouring economies and trade partners. There are good reasons for these concerns. In an increasingly interconnected global economy, the greater financial and macroeconomic links of these large economies with other countries have led to the transmission of these foreign shocks particularly on smaller economies with strong financial or trade links to advanced economies.

The introduction of unconventional policies through the purchase of large quantities of private or public securities, has withdrawn the greatest attention. Negative interest rates have withdrawn less interest. The expansion of balance sheets and rapid increase in base money in these economies, has driven large portfolio shifts towards emerging market which have enjoyed higher growth rates or towards neighbours which are linked to advanced ones financially or via trade (BIS (2014)). The literature has addressed two sides of these non-standard policies. On one side, the studies that look at the impact of UMP on domestic financial markets and real sector have blossomed earlier on. The second strand of literature, addressing the spillover effects on other countries during the post-crisis period, has been expanding quickly in recent times.

From a domestic perspective, the UMP has aimed at easing monetary conditions, pushing up the prices of these securities and reducing the cost of borrowing in their respective economies. The literature on the effects of the UMP in financial markets and real economy in US has started early in the first years of the crises (see Bhattarai and Neely (2016), and Cecioni et al. (2011) for a survey). Gilt purchases by Bank of England have been successful in restoring financial markets in UK (Joyce et al. (2011a), Joyce et al. (2011b), Meier (2009)). There is a longer and earlier history of unconventional policies in Japan (see Miyao and Okimoto (2017) for a recent review). The general consensus of these studies is that unconventional policies have been effective in restoring the ordinary

functioning of financial markets. Their impact in pulling the economy out of recession finds also wider consensus in US and UK but less in Japan.

The stream of literature focusing exclusively on implications of European Central Bank (ECB) balance sheet expansion on Euro area and EU member economies has also been growing after 2014 (Gambacorta et al. (2014), Boeckx et al. (2014), Lewis and Roth (2015), Bluwstein and Canova (2015), Burriel and Galesi (2016)). The reason is that the massive purchase of securities started at a later date, approximately in the second half of 2014. In the first years after the crisis the ECB made extensive use of its existing operations, like Long Term Refinancing Operations (LTRO) to satisfy market needs for liquidity. The finding across all studies in the Euro area economy is that exogenous shocks to ECB's balance sheet have had significant impact on real output but the impact on prices is weaker.

These unconventional policies have worked themselves out mainly though an operative financial channel. Boeckx et al. (2014) report that for the euro area economy the credit channel (bank lending, liquidity), the confidence (risk) channel, the portfolio re-balancing channel and wealth channel (equity prices) have all been active channels of transmission. But, Bluwstein and Canova (2015) conclude that while financial variables respond as expected following an UMP shock, only liquidity and wealth channels transmit those effects, while confidence channel does not. Similarly, Burriel and Galesi (2016) find that an exogenous increase in ECB's total assets had a significant positive effect on real activity, prices, private credit and equity prices of euro area member economies. Contrary to Bluwstein and Canova (2015) and Peersman (2012), and in line with Boeckx et al. (2014) they also report that the response of these variables is stronger compared to the responses upon a conventional monetary policy shock. Bluwstein and Canova (2015) conclude that UMP disturbances have a greater impact on inflation, while conventional monetary policy shocks affect real activity. Another finding from these studies is that those countries with most fragile banking system are the ones benefiting the most from such UMP policy (Boeckx et al. (2014) and Burriel and Galesi (2016)).

A less conclusive finding that emerges from studies on the effects of UMP measures in advanced economies is that their magnitude varies widely across economies. On one side, spill over and heterogeneity effects across Euro area are large (Burriel and Galesi (2016)). On the contrary, among advanced economies individual country results imply similar conclusions compared to those drawn from panel VAR estimation (Gambacorta et al. (2014)). The latter assess the effects of an exogenous increase in central banks' assets of the eight advanced economies in a panel VAR model[1]. Their finding that individual country results are similar to panel VAR results lends support to diminished spillovers across those countries.

An increasing number of studies have further expanded the focus of the research to look at international spillover effects of unconventional policies of ECB on small open economy (SoE) or emerging markets (Curcuru et al. (2018), Bernhard and Ebner (2017) Punzi and Chantapacdepong (2017), Gagnon et al. (2017), Georgiadis and Gräb (2016), Neely (2015), Fic (2013)). While different studies look at different channels, the common view is that unconventional policies of central banks from advanced economies have had spillover effects for emerging market or smaller open economies via trade, liquidity in foreign currency and global portfolio re-balancing channels. In particular, the policies of ECB have led to appreciation of exchange rate of other economies vis-a-vis the euro (depreciation of euro), to higher equity prices and financial inflows to those countries. In some cases (see Georgiadis and Gräb (2016)) the portfolio re-balancing channel worked in the opposite way as investors shifted their portfolios out of emerging into advanced economies' financial markets (flight to safety.

Of a particular interest within that strand of literature are several recent studies that focus on the spillover effects of Euro area shocks on Central, Eastern and Southeastern Europe (CESEE) economies (Moder (2017), Feldkircher et al. (2017), Horváth and Voslárová (2017), Fadejeva et al. (2014), Hájek and Horváth (2016), Backé et al. (2013), Angelovska–Bezhoska et al. (2018), Bluwstein and Canova (2015)), including event studies (Ciarlone and Cola-

[1] *The countries included in VAR are Canada, the euro area, Japan, Norway, Sweden, Switzerland, the United Kingdom and the United States.*

bella (2016), Falagiarda et al. (2015))[2]. The general conclusion that emerges from most of the studies is that there has been some spillover effect of shocks originating from Euro area ECB on CESEE economies.

A thorough review of the above list shows that there has been limited interest on the impact of the unconventional policies of ECB relative to domestic shocks on the southeastern European countries. In some of the studies cited above the data sample starts from 1995 and include few years from the post-crisis period or focus mostly on shocks other than monetary policy (Backé et al. (2013), Fadejeva et al. (2014), Hájek and Horváth (2016), Feldkircher et al. (2017)). Of these only Feldkircher et al. (2017) and Angelovska–Bezhoska et al. (2018) have a scope to analyse the indirect impact of ECB policies in non-euro area economies. The former do not identify the UMP directly but instead assess the spillover effects of a decline in long term yields or of terms spreads. They find significant effects on industrial production, inflation and equity prices of CESEE economies. They also find that local currencies appreciate relative to Euro in these economies. The more latter study, analyse a sample of data starting from 2003 in a panel VAR to find either a negative or an insignificant impact on capital inflows of some CESEE economies subject to a change in ECB balance sheet.

Of the above list of studies only Fadejeva et al. (2014) includes Albania in their sample, though their focus is to investigate the international spillover effects of credit supply shocks in Euro area on CESEE economies, by employing a global VAR for the the period 1995-2013. They find strong evidence of a negative response of output in all CESEE countries following a negative supply shock in Euro area.

The number of studies that evaluate the spillover implications of UMP shocks on CESEE economies in the post 2008 era is relatively small (Bluwstein and Canova (2015), Horváth and Voslárová (2017) and Moder (2017)). The first two include countries that became EU members in 2004 while the last focuses on non-EU countries. There

[2] *See Moder (2017) for a summary of other studies that focus on spillover effects of foreign shocks on CESEE before the global financial crisis.*

is a consensus regarding the spillover effects on financial markets of these smaller economies following a shock in Euro area. First,the strongest effects take place through the financial channel, mainly risk variables and liquidity channels. Second, the intensity depends critically on factors like trade or financial integration with Euro area economy.

The effects on real activity are mixed. The panel VAR results of Horváth and Voslárová (2017) indicate strong response of output but weaker response of prices following a change in ECB balance sheet size. Contrary to these findings, Moder (2017), employing BVAR methodology, suggests strong response of prices but weaker dynamics of output following an UMP shock. As a reconciliation, earlier on Bluwstein and Canova (2015) had concluded that it is the countries with a high share of foreign bank ownership that have displayed stronger output dynamics. The latter find that transmission takes place mainly via exchange rate channel and financial (wealth, risk, and portfolio rebalancing) channels. With regard to transmission channels, Moder (2017) agrees that trade (exports) is the main channel of transmission for non-EU Southeastern Europe (SEE) economies.

Finally, there are two event studies (Ciarlone and Colabella (2016) and Falagiarda et al. (2015)) that assess the impact of ECB's unconventional policies on CESEE economies. Both studies find that the ECB's unconventional policies have eased the financial conditions across smaller EU and non-EU economies. In addition similar to Bluwstein and Canova (2015) they conclude that portfolio re-balancing (cross-border capital flows) channel and banking liquidity channel have been main channels of transmission of these policies.

There has been little focus on the spillover effects of ECB policies on the Albanian economy after the crisis. Of the above list of studies reviewed so far only Moder (2017) and Ciarlone and Colabella (2016) include indicators of the Albanian economy on their estimations. The former estimates bilateral BVAR models to assesses the impact of UMP shocks on six variables of the Albanian economy, namely output, inflation, exchange rate, interest rate and policy

rate. The latter does an event study including only two indicators of Albanian economy, besides those of other 10 countries.

In this study I assess the relative size of potential spillover effects of both ECB's policies, standard and unconventional measures, on Albanian economy. My focus is in the post-crisis period. To that end I ask questions like (i) whether the UMP policies generate financial and real effects in Albania and (ii) how they compare to conventional monetary policy effects. By employing a much broader set of home variables I am able to answer questions regarding (iii) the channels that are most relevant for the transmission of those policies.

The framework allows me to expand the scope of this study by (iv) assessing the size of ECB's policy shocks relative to that of individual domestic shocks and further explain the dynamic behaviour of key variables in a SoE environment with foreign policy shocks. To do so I define the domestic shocks not on sign or zero restriction but based on the ordering of the (domestic) variables, which I motivate later.

The closest to this work is the study by Moder (2017). In a nutshell, I distinguish my paper in those three different aspects.

1. The transmission channels I explore are different,
2. The policy shocks in my paper are 2 compared to 1 in Moder (2019), and
3. the structural identification of shocks is different in my paper, clearly in line with policy shocks of ECB identified in the literature.

I will elaborate at some detail through each of these aspects.

1. Transmission channels. There is a distinctive set of local (Albanian) variables employed in my paper compared to that of Moder (2017), aiming at the investigation of ECB policy shocks through a broader set of transmission channels.

- Moder (2017) employees at maximum 5 variables of Albanian economy, 2 benchmark indicators from real sector (GDP and prices) and 3 variable interchangeably employed each at a time, 2 financial ones (interbank market rate and exchange

rate) and 1 from external sector (exports). The author's paper is limited to exploring the impact of unconventional MP shock of ECB only on these five variables.

- In addition to the variables used by Moder (2017) like GDP, prices, exchange rate and exports, I also include:

- country risk variable (the spread between 12-month TB yield and 1-year Euribor),
- maturity premium variable (the spread between 12-month and 3-month TB yields), both in the benchmark model.

Furthermore, I explore the impact of ECB policy shocks on Albanian economy through at least 5 more channels (section 5 of my paper).

- I discuss the portfolio re-balancing channel by investigating the impact of ECB policy shocks on two BoP indicators capital flows and financial flows (subsection 5.1);
- I investigate the bank lending channel by investigating the impact of ECB policy shocks on two monetary indicators, credit to economy and broad money (subsection 5.2);
- I discuss the remittances channel by investigating the impact of ECB policy shocks on, remittances and gross reserves of central bank (subsection 5.3);
- I shed more light on the trade channel by investigating the impact of ECB policy shocks on imports (in addition to exports which is also discussed by Moder (2017) (subsection 5.4);
- I investigate the impact of ECB policy shocks on two key components of aggregate demand, consumption and investment, which behave differently from GDP in Albania (sub- section 5.5).

Investigation of all these transmission channels, as detailed above, makes a key difference from Moder (2017), as the focus of her paper is narrowly different regarding Albania.

2. Policy shocks. The second distinction is that I identify two shocks, conventional and unconventional MP shocks of ECB and investigate the impact of both, while Moder (2017) discusses only the unconventional MP shock. I take

comparative approach of the potential spillover effect of ECB's policy measures. Both foreign policy shocks of ECB (MP and UMP) are identified via zero and sign restrictions in the post-crisis period on Albanian economy.

Furthermore, the current approach allows me to identify home shocks through Cholesky ordering of domestic set of variables and assess the relative size of foreign policy shocks vis-a-vis the domestic shocks[3].

3. Structural identification. The third distinction is that I define the UMP shock by only setting the sign and zero restrictions on impulse responses of Euro area economy variables. Moder (2017) in page 12 of his paper conditions ECB policy shocks by the response of local (Albanian) variables. Different shock identification schemes may yield slightly different shocks, particularly when these shocks are identified via zero and sign restrictions

   My motivation for this choice is as follows. While the theoretical literature on international economics provides some guidance on the potential impacts, the empirical literature does not have a consensus yet on the direction of the spillover effects of UMP shocks on other countries variables. In particular, there are much stronger frictions that result in large differences between the empirical results and theoretical predictions in small or open economy models than there are in closed economy frameworks. For a critical review of the frictions that lie behind key puzzles in international open macroe- conomics I refer to Obstfeld and Rogoff (2000) and a more recent study by Kortum et al. (2016). Therefore, unless these frictions are taken into account via additional (dummy) variables, conditioning the ECB's UMP shocks on foreign variables can be difficult to motivate and may distort the results.

   My identification scheme is the same as the one identified in two papers by Boeckx et al. (2014) and Burriel and Galesi (2016) with the same set of variables as documented in page 13 of my paper (see also Gambacorta et al. (2014)).

The study differs from other studies that focus on CESEE economies and include Albania in their samples (Fadejeva et al. (2014) and

[3] *From the methodological perspective, identification of all domestic shocks through sign and zero restrictions is a costly procedure.*

Ciarlone and Colabella (2016)). The former does not address unconventional policy shocks but rather other foreign shocks in their panel VAR. The more recent one does an event study based only on capital flows and bank credit indicators of 11 CESEE including Albania.

This study is similar to earlier studies like Feldkircher et al. (2017) who employ a similar methodology and a focus on CESEE but not Albania. It is also different from earlier studies in the literature with a focus on the region but mostly with samples of data before the crisis.

Finally, my focus here is different from the literature that evaluates the impact of domestic shocks in Albania (Dushku and Kota (2010), Kolasi et al. (2010), Dushku and Kota (2011)). The latter studies work with quarterly data of 2003-2009 (or earlier) that end before the crisis started, while in this study I work with data for the period 2008-2018. Another key difference from these studies and from current literature that focuses exclusively on Albanian economy, is (i) in terms of the scope of this study addressing implications of foreign monetary policy shocks and their identification scheme, in particular the ECB's unconventional monetary policy, and (ii) in terms of the methodological approach.

I will review the methodological approach used in this study in section 2 and motivate why Albania fits into the SoE definition as argued above by abstracting from a testing procedure. In doing so I summarise the estimation methodology, discuss the Bayesian approach and the procedure for identifying the foreign policy shocks. While, identification of domestic shocks is more straightforward, I motivate the underlying assumptions. In section 3, I evaluate the shocks identified via the zero and sign restrictions. In the 4–th section, I discuss the spillover effects of ECB policies for Albanian economy. In section 5, I expand the analysis further by investigating the potential transmission channels of ECB monetary policy on Albanian economy. In the last one, I sum up the findings.

2. SMALL OPEN ECONOMY MODEL

Albanian economy is closely connected to Euro area economy via trade and financial links. Trade openness is 56% in terms of goods or 96% in terms of goods & services as a share of GDP. Financial and capital inflows range in 10-15 % of GDP and 2-2.5% of GDP respectively. Around 65-70 % of banking system is owned by EU based bank as of 2013. Euroization in Albania in terms of foreign exchange deposits as a share of total deposits and in terms of foreign exchange loans as a share of total loans to private sector is greater than 50%.

Still, for the purpose of this study Albania is a SoE. The fluctuations of macroeconomic and financial indicators of Albania have neither an impact on Euro area economy nor any relevance for policy decision making. I motivate that consideration based on the relative size of GDP and trade flows. The Albanian total exports of goods and services account for only 0.076 % of Euro area total imports (see table 4 in Appendix A). Similarly, Albanian imports of goods and services are only a tiny fraction of 0.1 % of the Euro area total exports. These figures suggest that Albanian trade flows are a negligible figure for the Euro area trade flows even if the only trading partner of Albania were Euro area[4]. These figures reflect the small size of about 0.1% of the Albanian GDP relative to the Euro area economy.

Given these statistics, it is difficult to think of any Euro area indicator that can be affected by the business cycles of Albanian economy, its (monetary) policy decisions or the size of its trade flows. Therefore, rather than rely on exogeneity tests based on small and low frequency data samples, it is undoubtedly reasonable to define the Albanian economy as a SoE vis-a-vis the Euro area.

[4] *About 70-80% of Albanian trade takes place with Euro area.*

2.1 VAR model

Let $Y_t = (Y_{1,t}, Y_{2,t}...Y_{n,t})$ be a $nx1$ vector of endogenous variables of both foreign and domes- tic variables. The structural VAR is:

$$A_0 Y_t = A_1 Y_{t-1} + ... + A_p Y_{t-p} + \epsilon_t \quad (1)$$

where ϵ_t is the set of $iid \sim N(0, \Sigma)$ orthogonal shocks driving the process satisfying $\epsilon_t \sim WN(0, I_n)$, and $A_0...A(p) \epsilon R^{nxn}$. The reduced form VAR(p) model is:

$$Y_t = B_1 Y_{t-1} + ... + B_p Y_{t-p} + u_t \quad (2)$$

where $u_t = A_0^{-1}\epsilon_t$ is the vector of reduced form innovations with variance-covariance diagonal matrix $\Sigma = E[u_t' u_s]$ when $t = s$ or zero otherwise, $u_t \sim WN(0, \Sigma)$ and $B_1, ..., B_p$ are $n(x)n$ dimensional auto-regressive matrices such that $B_i = A_0^{-1}A_i$, $i = 1...p$. In a compact form I can re-write equation 2 as

$$Y_t = BX_t + u_t \quad (3)$$

where $X_t = Y_{j,t-1} + ... + Y_{j,t-p}$ is a $T(x)p$ matrix of the independent variables and deterministic terms, B is a n(x)p matrix of coefficients. For the sake of reference I write down the moving average representation of the VAR:

$$Y_t = \sum_{i=0}^{\infty} \Phi_i u_{t-i} = \sum_{i=0}^{\infty} \Theta_i \epsilon_{t-i}, \qquad \Theta_i = \Phi_i A_0^{-1} \quad (4)$$

where, $\Phi_0 = I_n$. The interpretation is that the element (j, k) of $\Theta_i = \Phi_i A_0^{-1}$ is the impact of the k-th structural shock on the j-th variable at horizon i.

The aim of VAR estimation is to estimate the matrix of reduced form parameters B and the variance of the error term, σ^2, by giving an economically meaningful structure to A_0. In a standard VAR approach we obtain the estimates $\hat{B}_{ols} = (X'_t X_t)^{-1}(X'_t Y_t)$ and the estimator of the error term $\sigma^2 = \frac{u_t' u_t}{T}$ via maximum likelihood function,

based on given set of data $\mathbf{Y}_t$. This allows us to further recover impulse responses as in equation 4.

Most VAR models estimated with the classical approach try to maintain the size of VAR small. As VAR size as goes up the model has a dimensionality problem. The number of parameters to be estimated becomes very large compared to the length of data available. Bayesian VAR (BVAR) approach helps to overcome the curse of dimensionality via the imposition of prior beliefs on the parameters. This helps the estimation process yield generally more precise estimates compared to those obtained using the standard classical approach. In addition, Bayesian simulation methods like Gibbs sampling provide the advantage of an efficient way of getting point estimates and measures of uncertainty around those estimates. In the following section I make a summary of Bayesian estimation method, with greater focus on those issues that were most relevant during estimation and mostly discussed in recent literature.

- Block Exogeneity

The SoE assumption implies that the Albanian economy indicators do not have any impact at any horizon on Euro area variables. This restriction implies that the respective parameters on contemporaneous matrix $\mathbf{A}_0$ and on A matrices in equation (1) should take the value zero. The set up of VAR model follows Cushman and Zha (1997). To make it clearer, it is common to split the vector of endogenous variables $\mathbf{Y}_t$ into a vector of domestic variables $\mathbf{Y}_t^{AL}$ and a vector of foreign variables $\mathbf{Y}_t^{EA}$. Then to allow for Euro area variables affect domestic ones, both contemporaneously and with lag, but not vice-versa I write the equation as in (5).

$$\begin{bmatrix} \tilde{A}_{11} & 0 \\ \tilde{A}_{21} & \tilde{A}_{22} \end{bmatrix} \begin{bmatrix} Y_t^{EA} \\ Y_t^{AL} \end{bmatrix} = \begin{bmatrix} A_{11} & 0 \\ A_{21} & A_{22} \end{bmatrix} \begin{bmatrix} X_t^{EA} \\ X_t^{AL} \end{bmatrix} + \begin{bmatrix} \epsilon_t^{EA} \\ \epsilon_t^{AL} \end{bmatrix} \qquad (5)$$

where, I have denoted by $\tilde{A}_{ij}$ the component matrices of the contemporaneous matrix A_0, by A_{ij} the components of the matrix of lagged coefficients A and by $[\epsilon_t^{EA}, \epsilon_t^{AL}]'$ the vectors of foreign and domestic structural innovations respectively.

2.1.1 Data

The VAR is estimated with monthly data from 2008:01 to 2018:06. The block of variables from Euro area is labelled Y_t^{EA} and the block of domestic data is denoted Y_t^{AL}. Accordingly the matrices X_t^i are defined as $X_t^i = [I, Y_{t-1}^i \ldots Y_{t-p}^i]$ where 'i' stands for $i = \{EA, AL\}$. In setting up the foreign vector of data Y_t^{EA} I stick to a particular set up from Boeckx et al. (2014).

$$Y_t^{EA} = \{y_t^*, p_t^*, b_t^*, ciss_t, sp_t^*, R_t^*\} \qquad (6)$$

where, y_t^* is a monthly measure of output[5], p_t^* is the annual change of log of seasonally adjusted consumer prices, b_t^* is the annual change of log of central bank total assets, $ciss_t$ is the annual change of level of financial stress as measured by the Composite Indicator of Systemic Stress Confidence Indicator of Systemic Stress (CISS) of Holló et al. (2012) available in ECB website, sp_t^* is the spread between EONIA and the MRO-rate, and R_t^* is the annual change of main refinancing operations (MRO) policy rate.

Since the purpose of this study is not to evaluate the impact of unconventional policies for Euro area or any member economies, following the set up of an existing study is a good starting point to cross check the results with regard to the identification of unconventional shock. Such an exercise is particularly critical when the identification is attempted with a yet agnostic procedure of sign and zero restrictions (as will be seen in the next sections)[6].

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[5] *I construct a monthly measure of real GDP following a similar interpolation procedure to Mönch and Uhlig (2005). I use monthly industrial production as a reference series. The Eviews built-in procedure and my state space model estimate with Kalman filter yield similar results.*

[6] *See for example the debate in Arias et al. (2015) with Uhlig (2005) for a discussion of the proper identification procedure.*

The dynamics of the real and financial sector of the domestic economy are proxied by a benchmark vector of 6 key domestic variables. Later I add more variables to this benchmark set up to check for the impact of foreign policy shocks via different channels of transmission. The benchmark model of domestic variables is:

$$Y_t^{AL} = \{y_t^h, p_t^h, R_t^h, s_t, sp_t^h, risk_t^h\} \qquad (7)$$

where, y_t^h is a monthly measure of output in log[7], p_t^h is the annual change of log of seasonally adjusted consumer price index, R_t^h the annual change of policy rate of Bank of Albania, s_t is the annual change of log of exchange rate (lek/Eur), the spread between the 12- and 3-month Treasury Bill yields (sp_t^h), and $risk_t^h$ is a measure of risk proxied by the spread between 12-month Treasury Bill yield and 12 month Euribor.

2.2 Bayesian Approach (BVAR)

VAR models require estimation of a large number of parameters. The number of sample sizes typically available when working with low frequency data, as is the case in macroeconomic applications, is small. As the VAR size goes up the reliability of the estimated coefficients is questioned. In this study, the benchmark model contains six foreign variables and six domestic variables, making up for ((12*p+1)*12) total number of lagged coefficients. Even for the minimum lag of 1 the total number of reduced from coefficients will be more than 100. While some of the number of coefficients that will be restricted due to exogeneity of the SoE, the remaining number of coefficients to be estimated is still large compared to the set of monthly data for less than 11 years.

[7] *I construct a monthly measure of real GDP by employing a state space model estimated via Kalman filter, similar to Mönch and Uhlig (2005) and try different reference series as input. The set of individually employed reference series are real M3, real NDA (net domestic assets) of the banking system, real NDC (net domestic credit) of banking system, capital public expenditures, index of trade volume, a measure of trade opening (imports plus exports) and finally remittances. Based on Bayesian information criteria and AIC I selected the models that include the monetary indicators. The monthly GDP series generated by each of the three models based on M3, NDA, NDC show a correlation of 99%.*

The Bayesian approach allows introduction of priors beliefs about the coefficients B and Σ that even in VAR models with a number of variables beyond 6-10 are critical to obtain improved VAR forecast performance as demonstrated by Litterman (1986) in his early work. For a more recent and compact approach to the Bayesian estimation with large number of data set, reaching 130 variables, it is worth reading Banbura et al. (2017).

2.2.1 BVAR with Independent Normal Inverse Wishart Prior and Block Exogeneity

In this work I use a Bayesian approach to estimate a benchmark VAR with 6 foreign variables and 6 domestic ones and later expand the VAR by including variables of interest. By assuming the prior from a normal distribution for the coefficients $\mathbf{b} = \mathbf{vec(B)}$. The prior are of the independent normal inverse Wishart family.

$$p(b|\Sigma)\ N(\tilde{b}_0, J) \qquad (8)$$

where $\tilde{b}_0$ denotes a vector of prior means and J denotes a square matrix whose diagonal elements denote the respective prior variances, needed to restrict the normal conditional posterior distributions of the b-vector of lagged coefficients (Kadiyala and Karlsson (2012)). The conjugate prior for the VAR covariance matrix has Inverse Wishart distribution with prior scale matrix $\tilde{S}$ and prior degrees of freedeom α.

$$p(\Sigma) \sim IW(\tilde{S}, \alpha) \qquad (9)$$

where, α is the prior degrees of freedom, and denotes the number of regressors in each equation. The conditional posterior distributions are defined as:

$$H(b|\Sigma, Y_t) \sim N(M^*, V^*) \qquad (10)$$

$$H(\Sigma|b, Y_t) \sim IW(\bar{\Sigma}, T+\alpha) \qquad (11)$$

where $V^* = (H^{-1} + \Sigma^{-1} \otimes X_t^{*\prime} X_t^*)^{-1}$, $M^* = (H^{-1}\tilde{b}_0 + (\Sigma^{-1} \otimes X_t')Y_t)$, and, $\bar{\Sigma} = \bar{S} + (Y_t - X_t B)'(Y_t - X_t B)$ and T is the number of observations in the sample.

Posterior inference can be obtained via Gibbs sampling, which is a special case of the more general method Markov chain Monte Carlo algorithm. The first step of the sequence of Gibbs sampling algorithm takes into account the assumptions for SoE (Cushman and Zha (1997)).

1. Set the priors for the VAR coefficients and the covariance matrix 'J'. The priors in the covariance matirx 'J' are set such that they are consistent with the block exogeneity assumption imposed by equation (5).
2. Draw the VAR coefficients $H(b|\Sigma, Y_t)$ from the conditional posterior distribution, given a draw for Σ matrix;
3. Sample the covariance matrix Σ from the conditional posterior distribution $H(\Sigma|b, Y_t)$, given a draw for b coefficients.

Gibbs sampling is simpler by considering a sequence of conditional distributions, $p(x|y)$ and $p(y|x)$, provided they can be estimated, which is easier to obtain compared to obtaining the joint distribution, $p(x, y)$. Usual practice suggests burning a sample of these draws in order to reduce dependency on starting values, b_0, Σ_0, used to initiate the Gibbs sampler.

An alternative approach to Independent Normal Inverse Wishart distribution (INIW), particularly of interest when working with a large set of short series, is proposed by Banbura et al. (2017). Their approach has the advantage of faster Gibbs Sampling procedure and allows for more priors imposing a structure that helps discipline a broader set of data charateristics, like unit roots and cointegration. It has the disadvantage that, to my knowledge, does not allow for block exogeneity. I follow this latter approach as a robustness exercise of identifying unconventional monetary policy shocks. The results show that I get similar impulse responses of Euro area variables to an exogenous unconventional policy shock similar to those obtained with INIW distribution that I report in this study and similar to those in Boeckx et al. (2014). I postpone the discussion of this approach in appendix A (see section A.1 of appendix).

2.3 Identifying Unconventional and Conventional Policy shocks of ECB

A standard approach to define an UMP shock is to identify the exogenous shock conditional on the state of the economy, on financial turmoil and on macroeconomic risks. These conditions are imposed via sign and a small number of zero restrictions. There are other reasons for preferring sign and a small number of zero restrictions to identify a shock relative to recursiveness approach. There is consensus that sign restrictions are milder and least contestable compared to much stronger ones coming with all classical approach. For early works via this procedure see Faust (1998), Uhlig (2005) Canova and De Nicolo (2002), while for a critical review on the approach see Fry and Pagan (2011).

The literature provides some consensus as to which changes in the unconventional policy variable should be ruled out as endogenous response (Boeckx et al. (2014), Burriel and Galesi (2016) and Gambacorta et al. (2014)). I follow exclusively on the definitions of Boeckx et al. (2014) to define macroeconomic and financial conditions to which the ECB's balance sheet responds endogenously. The conditions set by the other two studies are very similar.

For the exogenous unconventional monetary policy to be identified it must have

- a non-negative effect of exogenous UMP shocks on ECB balance sheet due to the increase in liquidity surplus,
- a non-positive effect on spreads of market yields relative to policy rate,
- a zero impact on policy rate itself, and
- a non-positive response of confidence indicator CISS due to the exogenous UMP shock.

Restrictions on columns (3), (4), (5) and (6) on first row of table 1, rule out any changes in ECB's balance sheet that doe not satisfy these conditions as endogenous response to the respective market and policy variables. The first and the third restrictions distinguish

an unconventional disturbance from a conventional monetary policy (MP) shock. The argument for the second restriction is that the unconventional policy measure has aimed at reducing the spread of Eonia with the policy rate. Empirical documentation of that impact of the UMP measures on the yield spread is sizeable. See Burriel and Galesi (2016) for a review.

In addition, the restriction on column (4) with regard to confidence indicator (CISS) distinguishes endogenous expansions of ECB balance sheet from endogenous UMP shocks due to a positive market sentiment. This restriction captures endogenous expansions of balance sheet due to Fixed Interest Rate with Full Allotment (FRFA). Finally, zero restrictions on output and prices, in columns (1) and (2), imply a lagged impact of ECB policies. The consensus on these two assumptions is based on literature of an earlier vintage (e.g. Peersman and Smets, 2003; Ciccarelli et al. 2013).

Table 1 Identification of UMP and MP shocks.

	Output	Prices	ECB assets	CISS	Spread	ECB rate
UMP shock (on Θ_1)	$\geqslant 0$	0	$\geqslant 0$	$\leqslant 0$	$\leqslant 0$	0
(a) MP shock (on Θ_1)	$\geqslant 0$	$\geqslant 0$	0	-	-	$\leqslant 0$
(b) Systematic MP shock (on $\mathbf{A}_0$)	$\geqslant 0$	$\geqslant 0$	0	-	-	$\leqslant 0$

Notes: indicates the response is restricted to be non-negative, to be non-positive, - is unrestricted, 0 to be zero on impact.

Identification of monetary policy shocks is more controversial than that for the UMP. Restrictions on conventional monetary policy seem to be conditioned by three types of restrictions on output and prices. In both cases there might be extra restrictions with respect to other variables that different authors might have thought necessary to better identify the policy shock. I focus only on the restrictions with respect to output and prices. I show these restrictions in rows 2 and 3 of table 1.

(i) First, is the set of restrictions that relies on the assumption that monetary policy is effective in containing output and inflation. The restriction on basis of this assumption implies that

a negative policy shock has a positive effect on output and inflation within a few or several months following the shock. This is the restriction (a) in table 1). For the sake of completing the picture some others define a zero response of either output or prices or both upon a policy shock (Leeper and Zha (2002) or Uhlig (2005)). The restrictions in this case are set on Θ_1.

(ii) Second, is the restriction that relies on the policy rule of central banks. Accordingly, the policy shock responds positively upon an increase in output and prices as shown in restriction type (b) in 1.

Burriel and Galesi (2016) defines a conventional monetary policy shock by restricting impulse responses as in (a). I addition to the impact on output and prices he assumes no response of ECB balance sheet on impact.

Similarly, Uhlig (2005) specifies a monetary policy shock as one that leads to an increase in Fed Funds rate and a decline in commodity prices and non-borrowed reserves. As he does not specify a particular response of output.

Contrary to the specification of the above authors a different stream of studies evaluates the systematic component of monetary policy. To do so Arias et al. (2015) impose the restriction that "*… the central bank contemporaneously increases the policy rate in response to an increase in output and prices, while leaving the response to commodity prices unrestricted*". This type of identification follows the rationale of a typical Taylor rule that captures the systematic component of the policy rate behaviour and requires restriction A_0 as shown in row (b) of table 1.

In this study I follow the approach in row (a) of table 1 and

restrict the impulse response of output, prices and other variables as shown. The restrictions on Θ_i are set for $i = 0$.

2.3.1 Zero and Sign Restrictions

My approach to setting up zero and sign restrictions on Θ_0 matrix follows in two steps. First, I multiply the Θ_0 matrix with an orthogonal Q matrix such that $Q'Q = I_{nxn}$. Second, I further multiply with a G matrix that is a function of givens rotation matrices of the form $G(\theta_i)$ to impose the three zero restrictions. Finally, I check if the sign restrictions are satisfied. If not, I repeat the procedure until zero restrictions are satisfied.

$$G(\theta_i) = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & \dots & \dots & 1 & 0 \\ 0 & 0 & \cos & 0 & -\sin & 0 \\ 0 & 0 & \dots & 1 & \dots & 0 \\ 0 & 0 & \sin & 0 & \cos & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

To set up the G matrix as a function, I follow the approach similar to the one proposed by Canova and De Nicolo (2002). Their proposal is to define a finite-dimensional grid of values between 0 and 2π for each θ, computing the implied $G_{\theta 1, \theta 2, \theta 3}$.

The downside of grid search is that with 5000 Gibbs draws beyond the burn threshold and about 100 such $G * Q$ matrices generated for each draw, any extra 1/10 of a second spent on grid search will add up to the time it takes to obtain the output[8]. This point is brought up by Kilian and Helmut (2017) as well.

[8] *About 5000*100 *1/10 seconds.*

I proceed with a faster approach as proposed by Haberis and Sokol (2014). To get three zero restrictions I solve a system of three nonlinear equations with three unknown θ's and solve the system of three equations to obtain the values of θ's as a function of $\mathbf{Q\Theta}_0$ coefficients yielding the required number of zero restrictions. The only requirement of my routine is that each of the three proposed Givens Rotation matrices in $\mathbf{G = G1*G2*G3}$ matrix has at least two elements placed in different rows on the *nxn* dimensional matrix. The routine allows to solve for one, two or maximum three zero restrictions. Then G matrix will be a product of the same number of givens rotations matrices. Computation of a larger number of zero restrictions with this procedure is beyond the scope of this paper. As emphasised by Kilian and Helmut (2017), such a procedure is also burdensome.

Having solved for the right G matrix, in the second step I retain only those solutions that yield a structural impact multiplier matrix $\mathbf{G}_{\theta 1,\theta 2,\theta 3}\mathbf{*Q}$ that agree with the maintained sign restrictions. The number of $\mathbf{Q}$ matrices that satisfy the sign restrictions is unlimited and may be subject to criticism due to different parametrizations of the contamporaneous covariance matrix that result from pre-multiplication with $\mathbf{G * Q}$ (see Fry and Pagan (2011)). Therefore, to address this criticism it is suggested by the authors and widely used in the literature that for each Gibbs draw generate several such matrices and get the one that is closest to the median. In my benchmark model, for each Gibbs draw I generate 100 matrices $\mathbf{G}_{\theta 1,\theta 2,\theta 3}\mathbf{*Q}$ satisfying both, the zero and sign restrictions, and use the median estimate of the impact multiplier for that particular draw. Such procedure should address the multiple prametrization criticism raised by Fry and Pagan (2011). Eventually, I obtain 10^4 replications satisfying all criteria (including sign restrictions) and keep only the second half of these replications to draw impulse responses.

2.4 Identifying Domestic Shocks

For the sake of simplicity I have allowed a Cholesky decomposition of domestic shocks based on the ordering of domestic variables. The ordering $\{y_t^h, p_t^h, R_t^h, s_t, sp_t^h, risk_t^h\}$ assumes few basic principles for the contemporaneous covariance matrix A_0.

- First, it is a standard view that policy rate is contemporaneous affected by aggregate demand and price shocks.

  To a large extent this identification scheme relies on the recursiveness assumption of monetary policy (Christiano et al. (1998)). According to this rule, monetary policy shocks are orthogonal to the information set of monetary authority. Specifically, the set of information that guides the policy rate of Bank of Albania (BoA) is stipulated in its Monetary Policy Document of 2015[9]. I cite:
  "In the formulation and implementation of monetary policy, the Bank of Albania will, therefore, strike a fair balance between restoring inflation to target and smoothing economic fluctuations." (Bank of Albania (2015)).

  While in most cases actual values of inflation and output may not be available within the month that decision making takes place, preliminary information on real activity allows any central bank to make reliable forecasts of these variables for that period.

- Second, as BoA operates under a free floating exchange rate regime, it is clear that the process of setting policy rate does not take into account any target of exchange rate (Bank of Albania (2015) page 14). For the same reason of free floating regime, exogenous policy shocks can affect the exchange rate via the uncovered interest rate principle. Therefore, the ordering

[9] *While this document is reviewed every 3 years, the main principles of the monetary policy regime stipulated in the document have been consistent with a typical inflation targeting regime and have not changed much in the last 15 years.*

of exchange rate after policy rate is consistent with the above rationale.

- Third, the above ordering assumes that financial variables, particularly market interest rates, respond contemporaneously to domestic monetary policy rate, but not vice-versa. Financial variables respond mainly to market factors but any stabilisation of fluctuations not welcomed by the the central bank can be attempted via operational instruments.

  In line with the literature, it is a common practice to assume that fluctuations of the financial or monetary variables in any month can not be addressed via contemporary changes of policy rule but rather through other operational facilities of central bank (Bernanke and Mihov (1995), Christiano et al. (1998)). Officially, this view is acknowledged in the Monetary Policy Document of BoA:

  "The main purpose of standing facilities is to adjust the level of liquidity in the banking system and steer short-term interest rates in the money market." (see 'Open Market Operations' and 'Standing Facilities' sections in pages 17-18 of the Monetary Policy Document of Bank of Albania (2015)).

The definitions of shocks based on the above ordering of the variables, and the following cholesky decomposition, are considered standard from the perspective of literature on monetary policy in SoE environment. The alternative of following the more recent approach (see section 2.3.1) to identify all domestic shocks with sign and zero restrictions would take a computational burden that goes beyond the scope of this study. The convenience of identifying all domestic shocks via Cholesky decomposition allows the advantage of a comparative view of domestic shocks significance relative to the two foreign policy shocks, due to UMP and conventional MP. Instead, to account for the possible biases due to ordering of the variables I do robustness tests by running VARs with different orderings of some of domestic variables.

3. EVALUATING SHOCKS IN THE BENCHMARK MODEL

In this section I report the results from the benchmark model. The purpose is to first to evaluate how the foreign policy, unconventional and standard MP, shocks identified in this study com- pare to the ones identified in studies that make use of similar identification schemes. To that end, I compare the impact of these shocks on Euro area variables. Second, I summarise re- sponses of the set of 6 domestic (Albanian) variables defined in equation (7) in this benchmark specification[10]1.

3.1 Unconventional MP

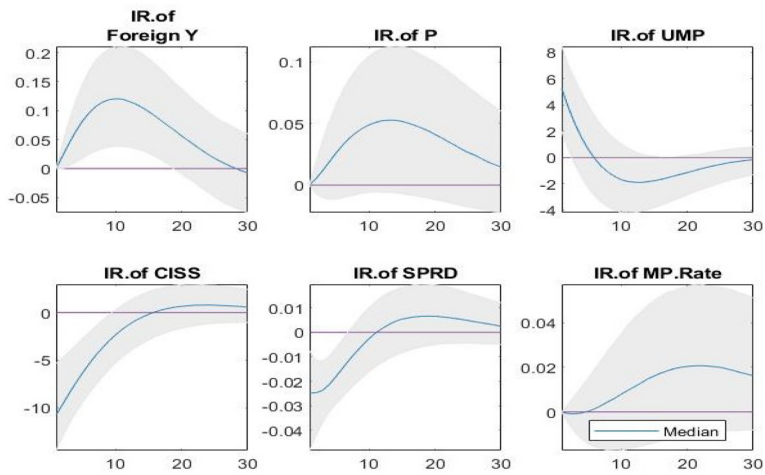
I have used the same set of variables as in Boeckx et al. (2014) in the foreign block of variables. Comparing the impulse responses I get with those from their study is a good starting point. In addition I compare them to two other studies that use the same variables and similar identification schemes (Burriel and Galesi (2016) and Moder (2017)).

The results from this study, shown in figure 1 (page 43), indicate that a positive UMP shock leads to an expansion of ECB balance sheet (denoted "UMP") and strong increase in output, but a muted impact on prices. As expected, the indicators of financial stress in Euro area, the spread of EONIA rate relative to policy rate and CISS indicator, decline sharply following the shock. Except for financial variables that are already in percentage points (times 100), output, prices, ECB balance sheet and CISS are in annual changes multiplied by 100. Therefore, a 5% exogenous expansion of ECB's balance sheet, identified as one SD of UMP shock, leads to a 0.1% expansion of GDP after approximately one year. The median price

[10] *By domestic I will be referring to Albanian variables and by foreign I will be referring to Euro area indicators.*

increase peaks also after a year but the size is smaller. The impact of unconventional policy on financial indicators is immediate as CISS and the Eonia spread decline instantly.

Figure 1. Response of EA variables due ECB's UMP shock.



An eyeball view indicates that I get similar results as in the original study by Boeckx et al. (2014) (see figure 6 in Appendix). Output peaks after 12 months, the effect of UMP shock on ECB balance sheet fades after around 6 months and the two financial market indicators, CISS and Eonia spread, decline instantly.

Unlike them, I get a muted response on prices and almost no impact of policy rate of ECB. The argument for this difference can be that the different sample size of 72 monthly observations in their study, 2008:01-2013:12. The twice as long a sample used in this study can account for these differences. A second factor can be the horizon for which the response of Euro area variables is restricted. Evidence shows that policy rate has already remained at its lower zero bound for the last two years (2016-2018) and has not seen an increase in the last 5 years (2013-2018). The additional observations, beyond 2013, were not included in the original study by Boeckx et al. (2014). In their sample, before

2013, there was at least on episode of ECB raising policy rates compared to no increase after 2013. One should expect that the longer sample size considered in this study will weigh on this latter evidence of no increase in policy rate. Therefore, the responses of both inflation and policy rate for a short sample period considered in Boeckx et al. (2014) may be influencing their results.

One way to check the validity of this argument is to look at impulse responses from two more recent studies that use a similar identification scheme of UMP shocks but with a more recent sample. I refer to Figure 2, page 19, in Burriel and Galesi (2016) and Figure 2 page 23, in Moder (2017) (fig. 18 and 17 in Appendix). In both these studies the impact of a similarly identified shock on prices and policy rate is weak and both have taken into consideration a longer sample[11]. Therefore, I conclude that the sluggishness of Euro area inflation and the long period of policy rate at the lower zero bound in the last 5 years are consistent with the weak responses of inflation and policy rate after an UMP shock obtained in my results.

3.2 Standard MP

I report the responses of Euro area variables following a conventional monetary policy shock in figure 2 (page 43). The shock is identified as a policy loosening of one standard deviation by ECB. Monetary policy easing through the reduction of policy rate, leads to:

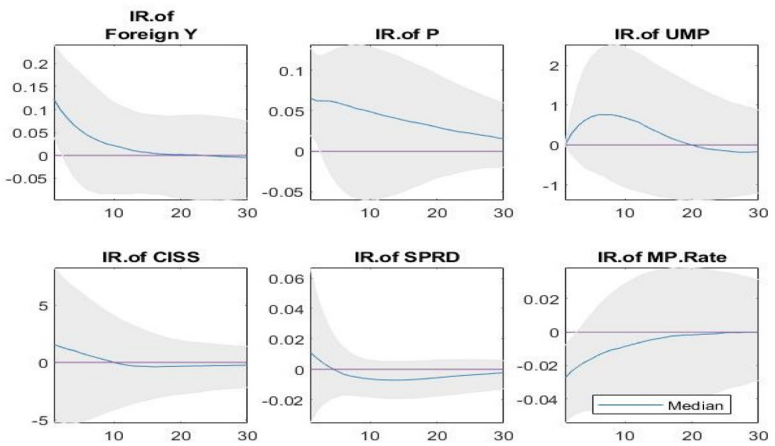
(i) an increase in output and in prices,
(ii) but no change in the financial variables, the Eonia spread and CISS indicator, or in balance sheet of ECB.

The results confirm that for the financial markets to stabilise, conventional monetary pol- icy can not be used in the short run. In addition, the policy rate is not expected to have any impact on

[11] *These studies do the estimation for the sample until September and December of 2015, respectively. The former starts earlier, January 2007.*

the balance sheet of ECB. This follows from the argument that the reason for the financial crisis was not the high cost of liquidity by the ECB, but rather the deterioration of the quality of securities offered as collateral by the borrowers and their price decline. Similar impulse responses are obtained by Burriel and Galesi (2016) (fig. 19 in Appendix).

Figure 2. Response of EA variables due ECB's Conventional MP shock.



So far I have checked that the identification of the two foreign policy shocks is in line with that from the literature. The scope of the next section is to assess spillover effects of these shocks on Albanian economy.

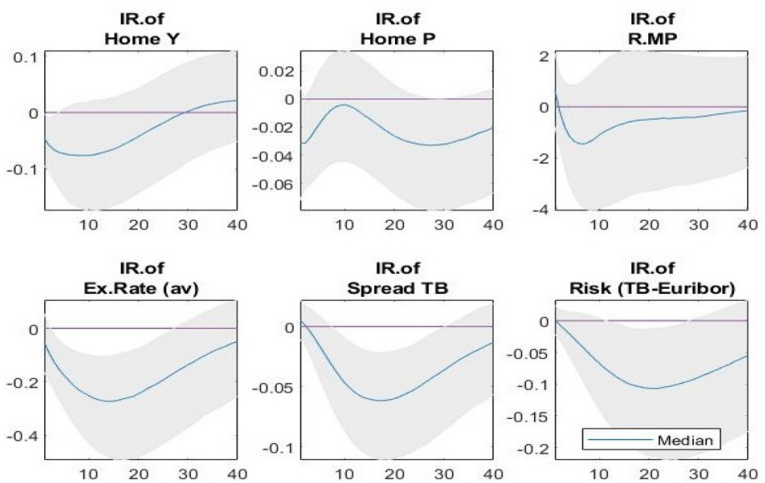
4. SPILLOVER EFFECTS OF UNCONVENTIONAL & STANDARD MP SHOCKS ON ALBANIAN ECONOMY

4.1 UMP shocks

The first set of results are the responses of domestic variables to an unconventional policy shock by ECB as shown in figure 3 (page 44). Impulse responses indicate that an exogenous expansion of ECB balance sheet (UMP shock) has a strong impact on financial indicators of Albania. The effect on output and prices is smaller and fades away quickly while, as expected, it has no impact on domestic policy rate.

These results suggest there is a strong operative financial channel. One standard devi- ation in ECB balance sheet growth leads to 0.25 % appreciation of domestic currency (Euro depreciation), a 0.01% decline in interest rate differential (Risk (TB-Euribor) variable) and a 0.07% point decline in term premia (TB Spread). A similar finding, downward response of Risk (TB-Euribor) variable is consistent with the findings of Bluwstein and Canova (2015) for CESEE countries[12]. The depreciation of Euro is a consistent results across most of the litera- ture on spillover effects (Burriel and Galesi (2016), Gambacorta et al. (2014), Lewis and Roth (2015), Bluwstein and Canova (2015)).

Figure 3. Response of domestic (Albanian) variables due ECB's UMP shock.



[12] *The SEE countries are Bulgaria and Romania*

The transmission of UMP shocks via the financial or risk channel and the exchange rate channel in SoE or emerging economies is consistent through the literature on CESEE (Bluwstein and Canova (2015), Fadejeva et al. (2014), Moder (2017), Ciarlone and Colabella (2016)). The expansion of balance sheet of ECB will first drive the yields in the Euro area economy down, Euro will depreciate, and to prevent further appreciation of their respective curren- cies, the respective authorities or market forces respond by reducing the yields of securities denominated in domestic currencies of SoE or emerging economies[13].

Real sector variables of Albania are negatively affected by an UMP shock, although Euro area output responds positively. The median response of output and prices declines. The decline of prices fades very quickly, within 6-9 months, while the decline of median response of output lasts for 2.5 years. This results may seem contradictory when one reads through literature. For example, EBRD Transition Report (2012) reports positive correlation of busi- ness cycles of CESEE economies with those of Euro area. Also, IMF Spillover Report (2012) estimates that a decline in Euro area output by 1% leads to a drag on real output of CE- SEE economies by 0.4%. On empirical front, Backé et al. (2013) reports positive effects of upward output shock of Euro area on real output of CESEE. Feldkircher et al. (2017) finds positive and significant spillover effects of decline in Euro area spreads (as proxy of unconven- tional MP) on industrial production of CESEE. Textbook literature suggests that a portfolio re-balancing channel would be consistent with upward financial or capital inflows to small open economies following an expansion of ECB balance sheet. Similarly, financial channel and trade channel should have a positive effect. Transmission through these channels should drive up the aggregate demand in SoEs leading to positive responses of output and prices.

[13] *The (i) appreciation domestic currency of SoE and (ii) the declining country spreads can be explained by the negative yields in euro area.*

In light of the above evidence, the negative median response of output in this study can seem puzzling. As a reconciliation one can raise the argument that the wide credible interval does not rule out a non-significant impact of UMP shocks on these two variables, hence on real sector. The latter is consistent with empirical findings of Moder (2017) on Albania and several other economies in the CESEE group.

On the other hand, a negative output response is not unreasonable. For example, similar findings, of a negative effect of UMP shocks on real sector for some SEE countries are also confirmed from other authors. I cite Bluwstein and Canova (2015) in page 87: "*Output responses to euro-area UMP shocks are quite heterogeneous. While in advanced countries…., those in the CEE countries are insignificant, and those in SEE countries are persistently negative and significantly smaller than in the euro area after about two weeks.*" If one is to accept such a result, then we should enquire about the channels that trigger such a negative response. A potential hypothesis is that the portfolio re-balancing channel may be working in the opposite direction. This study considers the sample period only after the global financial crisis. On the other side, the expansion of the ECB balance sheets in the aftermath of the crisis has rebuild investor confidence in the Euro area. One implication of the two facts is that the improved investor confidence may trigger a withdrawal of financial and capital flows from small open economies when investors are not rewarded with high returns from these SoEs.

Alternatively, Bluwstein and Canova (2015) also suggest that countries with higher share of foreign bank ownership might see stronger negative effects during the crisis. Since, foreign bank ownership in Albania has been around 70-90 % until recently, the response of real output to UMP shocks can be due to counterbalancing effects via bank lending channel as suggested by Bluwstein and Canova (2015).

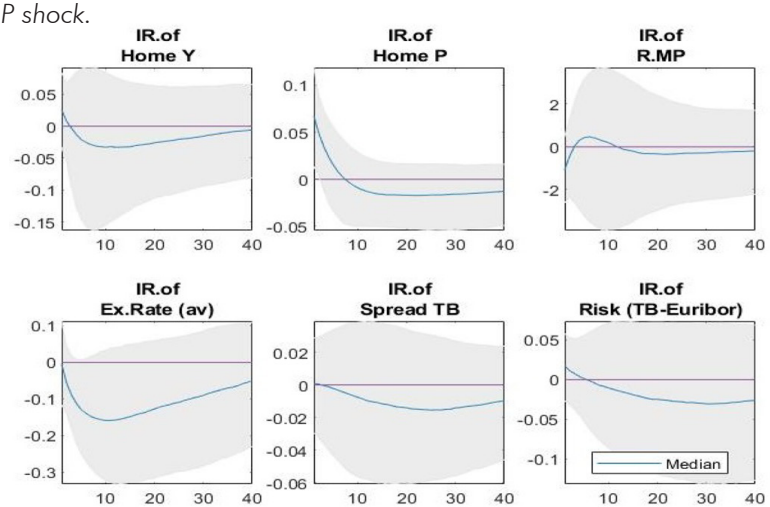
To assess the impact of foreign shocks in the presence of new transmission channels, I modify the benchmark model with additional domestic variables from the balance of payments account or

from monetary account of Albania to allow for different channels of transmission of foreign shocks. Assessing the premise that the reverse portfolio re-balancing channel or the bank lending channel hypotheses do indeed account for the above results is postponed to the next section (see section 5).

4.2 Conventional MP shocks

The second set of results is that domestic variables have responded weakly, if at all, following a(n) (easy) standard MP shock of ECB, as in figure 4 (page 44). The easy MP in Euro area drives up prices in Albania but not output and financial variables. Even the effect on prices dies after around 6 months. The median response of exchange rate implies domestic currency should appreciate reaching the peak after 10 months, potentially due to a narrowing of in- terest rate differential. Credible intervals assume such pressures on domestic currency is not strong. The domestic policy rate, TB spread and risk (TB-Euribor) do not show a significant response to standard MP shock of ECB.

Figure 4. Response of domestic (Albanian) variables due ECB's standard MP shock.



Note: Solid lines represent the median estimates and shadows in grey denote the 16th and 84th percentiles. The X-axis reports months, the Y-axis reports percentage point changes.

One stream of empirical literature suggests that (tight) conventional monetary policy shocks have led to a decline in output and prices in CESEEs with financial or trade links with Euro area. Babecká et al. (2016) report negative response of output and prices in several Central Eastern Europe (CEE) countries upon tight MP policy by ECB. Similarly, Jiménez-Rodríguez et al. (2010) find negative response of industrial production in CESEE following a foreign positive interest rate shock. Fadejeva et al. (2014) also confirm such an implication for CESEE, including Albania.

There are also few empirical studies focusing on SEE countries that report results contra- dicting the above view, but in line with this study. For example, Hájek and Horváth (2016) reports that South East Europe is less sensitive to the euro area shocks, including interest rate shocks. Even more contradictory, Minea and Rault (2011) find a positive response of Bulgarian output following a positive innovation on ECB interest rate.

One potential argument for the weak sensitivity of real output and prices to interest rate shocks in this study is that I include a relatively short sample only in the aftermath of the financial crisis of 2008-2010. The sample choice is motivated by the focus on unconventional shock. The impact of policy interest shocks of ECB during this time period has not been very effective even within Euro area. A quick check on the responses of Euro area variables to a standard MP shock indicates that the positive response of prices and output of euro area dies relatively quickly, within 6 months (figure 2, page 43). It is because of that ineffectiveness that the ECB was forced to approach the zero lower bound since 2014. Furthermore, after 2014, ECB followed other major central banks of advanced economies by engaging unconventional tools like the purchase of securities. Therefore, I conclude that the results from this study may be reflecting this ineffectiveness of standard policy tool available to ECB during the sample considered in this study.

4.3 The Dynamics of Albanian Economy due to Domestic Shocks

The third set of results is the response of domestic variables to domestic shocks, shown in figure 5 (page 45). The identification of domestic shocks is based on the ordering of the variables rather than on any particular identification scheme (see section 2.4). Due to block exogeneity assumption imposed during the estimation the responses of Euro area variables to domestic shocks is zero by definition.

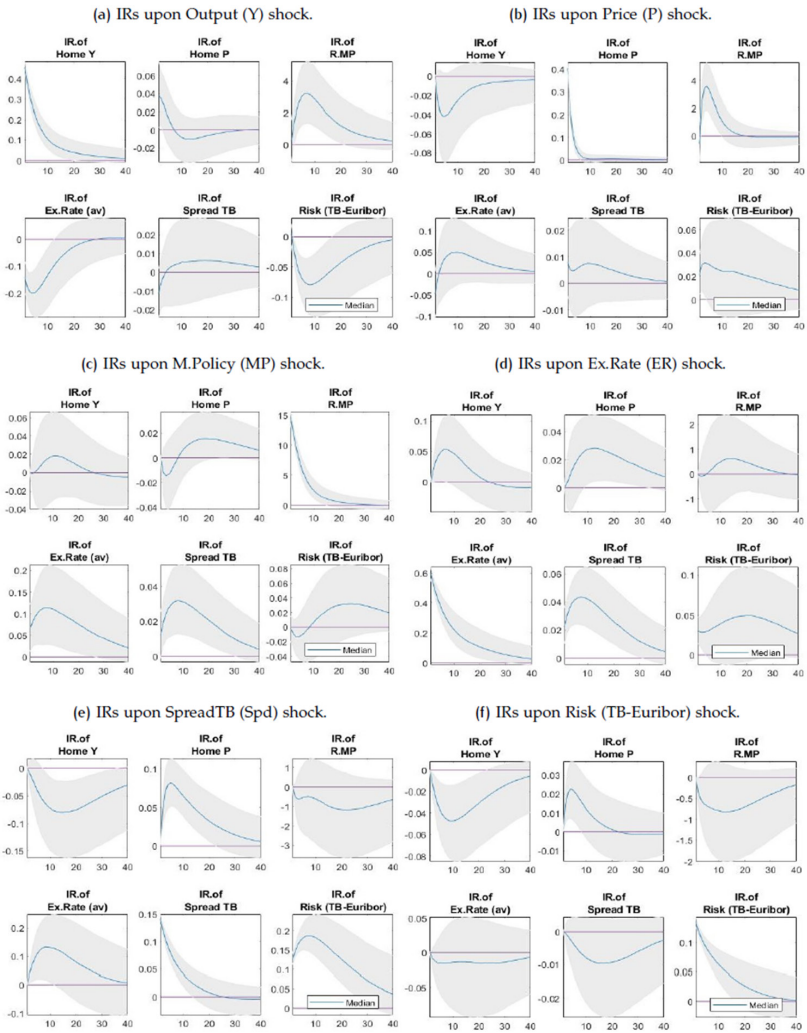
The panels (a) and (b) of figure (5) show the impulse responses of a positive shock to real indicators of domestic economy, output and prices. Both trigger a tightening of monetary policy. The price shock usually captures supply shocks, commodity price shock or a combination of both, hence a slight decline in median response of output and a mild increase in country risk (panel (b)). Given the nature of the shock, potentially a supply shock, the tightening of monetary policy is last for one year.

The output shock captures positive shocks to productivity (panel (a)). As expected, exchange rate appreciates and the country risk declines, with the effects lasting for one to two years. Following the shock, inflationary pressures build up due to higher aggregate demand. Com- pared to the policy response in panel (b), the tightening of monetary policy following an output shock lasts for over 3 years (40 months). It reaches its peak at around 6-9 months after the shock impact.

In panel (c), the median response of prices reflects the tightening of MP but the response dies within 9-10 months (figure 5). The uncovered interest rate parity suggests exchange rate should appreciate upon an increase in policy rate. The positive response of ER (depreciation) and increase in TB spreads following a domestic policy shock may be a sign that the tight MP is perceived as a sign of inflationary expectations by the agents in the economy[14].

[14] *A spread in TB yields is the difference between 12-months and 3-months TB yields.*

Figure 5. Benchmark Model: Impulse Responses due to Domestic shocks.



In panel (d), an exogenous shock to exchange rate leads to higher term premium (TB spread), increase in prices and an increase in country risk. Such responses can be consistent with the hypothesis that the exchange rate shock captures potential foreign shocks due to balance of payments capital and financial outflows. But the positive median response of output rules this interpretation out.

A better hypothesis is that, such disturbances indicate potential interventions of central bank to accumulate foreign reserves in line with its policies. An intervention of central bank by purchasing foreign currency drives up output, but it is the interventions on the foreign currency market raising the supply of domestic currency that has a lasting effect on the positive response of prices. Positive response of TB spreads, prices and output are consistent with such interpretation. The positive median response of prices is relatively small, about 0.02 percentage points at its peaks after 40 months. Eventually, monetary policy may not respond due to such small impact on inflation.

In panels (e) and (f) I show the responses subject to a TB spread shock and to a "risk" (TB - Euribor) shock[15]. The former captures, to a large extent, innovations on government treasury bill rates with 12-month maturity, which can be driven by inflationary expectations shock, by financial shocks or by public expenditures shock. Prices respond upward, exchange rate depreciates and country risk increases. The decline in output rules out public expenditures shock (financed by domestic borrowing). The non-responsiveness of policy rate rules out inflationary expectations shock. Therefore, a reasonable explanation is that the TB spread shock may capture financial market shocks, inflationary supply shocks or a combination of both.

Finally, the "risk" shock in panel (f) triggers strong negative response of output while prices go up. As exchange rate and TB spread do not respond to a positive "risk" shock, the latter can be connected to:

(i) negative shock to Euribor rate at 12 month maturity,
(ii) financial/banking shock or a TB yield shock at medium to long horizon.
(iii) country risk premium shock.

The interpretation of (i) can be that of easy future monetary conditions or signalling effect due to continuation of UMP by ECB to keep medium to long term yields at low levels. But, the response

[15] *TB-Euribor spread is the difference between 12 month TB yields in Albania and 12 months Euribor.*

of "risk" variable was negative upon an UMP shock, which implies Albanian TB yields have declined more than Euribor yields. Expectations of loose conventional MP is also ruled out by the zero response of domestic output and prices upon such shock (see figure 4) compared to strong Y & P responses in panel (f) in figure 5.

Identification with (ii), or a domestic financial shock that raises the yield of domestic (Albanian) securities by a similar magnitude across maturities that may not show up in the TB spread. Episodes of such shocks in 2002 and 2009 show that, exchange rate depreciates upon such financial shocks. The zero response of exchange rate seems to rule out a shock on TB yields captured by disturbances in "risk" variable. Finally, (iii) country risk shocks can not be ruled out, if one thinks of banking system owned to a large part by foreign banks. I leave the interpretation of a risk shock as combination of all these factors. It is an important shock since the "risk" shock is (a) critical since all domestic variables seem to respond to such shock and that (b) it is connected to foreign financial conditions via Euribor. I will evaluate the responses of domestic variables to this shock in the next section.

Finally, in table figure 8 I report the forecast error variance decomposition of Euro area (panel (a)) and of Albanian variables (panel (b)). Results indicate that domestic shocks are the dominant drivers of the main dynamics in Albanian economy at 1-12 month horizon (panel (b). At two year horizon shocks to ECB balance sheet size seem to explain a share of dynamic behaviour of Albanian economic variables which ranges in the interval 6-15% while conventional monetary policy shocks explain around 6-9% of their behaviour at two year horizon.

Other foreign shocks, not identified in this study, can explain around 30-44% of the dy- namics of Albanian economic indicators at 2 year horizon. E key unidentified component of the unidentified shocks can be Euro area demand (output) shock. A potential question that may raise in this context is whether a better identification scheme would yield policy shocks, UMP and MP shocks, that explain a larger share of Albanian economy dynamics, at the cost of lower fraction explained by unidentified foreign shocks. I do not explore

this hypothesis any further motivated by the following argument. The identification scheme in this study has introduced very minimal restrictions. Stricter restrictions to identify UMP and MP shocks, like restricting the impulse responses at longer horizon, for example at t>0, would narrow the number of shocks that qualify as UMP or conventional MP shocks. That in return would mean a lower fraction of FEVD of Albanian variables explained by these shocks.

5. ASSESSING THE TRANSMISSION CHANNELS OF FOREIGN POLICY SHOCKS ON ALBANIA

There is a broad empirical consensus that unconventional measures of major central banks, particularly Fed and ECB, have triggered financial and capital inflows towards emerging economies or SoEs. The greater the connection to the former ones via trade or financial links the larger the impact. The most cited channels of foreign monetary policy transmission on small economies are interest rate channel, exchange rate channel, portfolio re-balancing channel (capital inflows), bank lending channel and risk channel (BIS (2014))[16].

There are real effects for a SoE that are transmitted via these channels. The interest rate channel affects the relative cost of capital and the relative price of assets which work them- selves through into investment and consumption. Effects to real sector are transmitted via the wealth channel. Similarly, the portfolio re-balancing channel can generate financial flows due to a re-balancing of portfolio by investors between UMP economies, like Euro area or US, with low return and emerging or SoE economies with higher returns. Other channels of transmission like exchange rate channel and bank lending channel or risk channel are also a source of concern. Financial flows may trigger appreciation, hurting exports and real economy. Bank lending channel works through liquidity effects that small economies with high share of foreign bank ownership can see due to improved liquidity conditions in advanced economies. Risk channel is also activated in times of financial distress.

[16] *See the collections of research studies in a collection of papers by BIS.*

The real effects take place through higher consumption and investment leading to higher aggregate demand. A schematic view of all potential channels of international transmission is provided in figure 7 of Appendix while for a theoretical review of the transmission mecha- nism of unconventional monetary policy I refer to a paper by Joyce et al. (2012).

In this section I try to address the transmission channels of ECB's unconventional mone- tary policy on Albanian economy. One of the puzzling results I obtained early in section 4.1 was that the expansion of ECB balance sheet had negative impact on real sector in Albania. The benchmark model with 6 domestic variables relies mostly on financial channel and on exchange rate channel. Results suggested that:

(a) The spread on domestic medium term securities relative to short term ones (TB spread) and the country risk premium (TB-Euribor) decline upon an UMP shock, suggesting that financial channel is operative.
(b) Exchange rate appreciates.
(c) The impact on real sector is negative: output and prices display a slight decline.

A not so common result is the controversy that arises between (c) and (a). The improvement of financial conditions in Albania should translate into a positive impact for the aggregate demand in the economy. Clearly other channels are in place that counterbalance positive effects of improved financial conditions. To investigate other channels of transmission I modify the benchmark model by allowing variables that may capture transmission via a specific channel. Alternative specifications of the benchmark model are shown shown in figure 7 of Appendix (page 46).

(1) By adding variables like the capital or financial inflows of balance of payments to Albania to the benchmark specification, I hope to get signals of a (non-) operative portfolio re- balancing channel.
(2) Instead, by including remittances or gross international reserves of Bank of Albania we can get an indicator of the

response of remittances. One shortcoming of using reserves is that the results can be spurious due to the impact of financial or capital inflows or other factors that influence the total gross reserves.

(3) The inclusion of bank credit to economy in foreign currency or broad money, helps to check if the bank lending channel is operative or not[17].

(4) By adding exports or imports to the benchmark specification I intend to explore how strong the trade channel is.

Finally, I consider the inclusion of expenditure components of output, real consumption and real investment into the benchmark specification, as a cross check with regard to how *transmission via different channels so far is consistent with the dynamic behaviour of the two components of aggregate demand*.

The latter, inclusion of real consumption or investment, is an exercises to cross check the results from previous tests. To illustrate, if the foreign policy shock has been transmitted via remittances than one might expect a response in consumption. If the channel of transmission is via capital inflows than we should expect a similar response on real investments or on both. I provide a summary of these exercises and the specification of variables used in table 5 of Appendix.

The approach used here is to open a new channel of transmission for the effects of foreign policy shocks to be transmitted into real sector variables. A similar approach of shutting down transmission channels one by one is also used by Bluwstein and Canova (2015). While the ordering can be a matter of discussion, I decide to order the added variables at the end of list of home variables to avoid the transmission of contemporaneous effect of UMP through these newly added variables on the existing domestic variables of the benchmark specification. On one side the UMP shock affects the new variable contemporaneously and through lags, and on the other side the added variable can transmit those effects only via

[17] *Monetary indicators are sterilised from exchange rate effects using a fixed exchange rate to convert foreign cur- rency components into domestic currency.*

the lagged coefficients into benchmark real sector variables. Two exceptions are the ordering of exports and imports before all the other variables and the order of consumption and investment right after output. For these cases the literature is firmly suggestive about such ordering.

The impulse responses are reported in figures 9 to 16 of Appendix (pages 48 to 51). From left to right I list the responses of domestic variables of that particular VAR specification upon (a) UMP shocks, (b) standard MP shocks and (c) country risk shocks. I list the responses following a risk shock since it is a difference of 12 month TB yield to 12 month Euribor. As argued earlier in section 4.3, the dynamics of the risk shock can be identified with negative shock to Euribor rate at 12 month maturity, financial stability shock or a country risk premium shocks. In any case it can be connected to the dynamics of Albanian economy relative to the Euro area one. For convenience I have summarised the key results I obtain from these exercises in table 6 of Appendix. Next I discuss the results.

5.1 Portfolio Re-balancing & Risk Channel

In panel (a) of figures 9 and 10 are shown responses of domestic variables to ECB's balance sheet expansion (page 48).

(1.a) The capital inflows (BP.CA) and financial inflows (BP. FA) decline upon an UMP shock, by around -10 % and -8% respectively (table 6). Both financial and capital inflows reach their troughs around 6-9 months after the shock.

The responses of most variables are very similar to those from the benchmark model shown earlier in figure 3. One exception is the negative response of output in specification with capital flows (i.e figure 9-a), whose negative response is now of a greater magnitude than in the benchmark estimation (-10% in figure 9-a relative to -7% in figure 3). A clear difference is that the credible interval is narrower in figure 9-a, suggesting a clear effect of UMP shock via the capital flows.
Impulse responses in panel (a) of figures 9 and 10, suggest that the portfolio re-balancing channel may be operating in

the opposite direction. A withdrawal of capital flows and financial inflows is possible upon improvement of financial conditions in Euro area due to extensive unconventional measures of ECB. Capital outflows are more critical while the impact of financial inflows is short-lived and has little impact on the response of output.

(1.b) In panel (b) the median response of BP.CA and BP.FA to a easy MP shock is positive, with financial flows being more responsive to such policy shocks. The effect of such shock dies very quickly, within 9 months and the credible interval assumes these effects are weak.

(1.c) Following a (+0.15%) risk shock in panel (c), the median response of capital flows shows a -3% decline, while the median response of financial flows indicates a +10% increase.

A comparison of responses of other domestic variables with the respective response in benchmark specification (figure 5, panel (f)) indicates:

(i) stronger decline in median response of output, -0.06%, in the model with capital flows (figure 9-c) compared to -0.04-0.05% decline seen in the benchmark model (5-f) upon a risk shock of similar size in both cases;
(ii) weaker decline in median response of output, -0.03%, in the model with financial flows (figure 10-c) compared to the benchmark -0.04% output decline (5-f) upon a risk shock of the same size, possibly due to positive response of financial flows in the current set up;
(iii) the responses of other domestic variables is similar in both specifications.

To get e clearer picture of the relative effects of these opposite effects, from (i) and (ii), I look at the size of (net) capital and financial inflows in the balance of payments account of Albania in the last 10 years. The magnitude of the capital inflows is only 1/10th of the size of net financial inflows on average. A question arises as to, following a risk shock, how can a negative small capital inflow trigger a larger effect on real output compared to a positive

response of financial inflows which have a magnitude 10 times bigger in the balance of payment. To reconcile these contradictory results, a potential explanation is that financial flows are short-lived and can go partly to finance imports. Positive response of financial flows dies after 18 months (figure 9-c), while the negative response of capital outflow lasts beyond 40 months (figure10-c).

Due to their liquid nature the financial flows may exit earlier and therefore do not go for investments in real sector which require a longer commitment. Contrary to that, capital inflows may be of a longer term nature and therefore more relevant for investment, employment and output.

Based on these responses, I conclude that a "risk" shock seems to trigger capital out- flows, which are more relevant for real sector than positive financial inflows triggered by the same shock.

The question remains as to what triggers these risk shocks. I partly address this question in subsection 5.5 in page 32.

5.2 Bank Lending Channel

The responses of credit to economy in foreign currency and of broad money aggregate (M3) to two foreign policy shocks and to risk shock are shown in figures 11 and 12 respectively.

(3.a) Panel (a) of both figures, credit to economy and broad money, respond negatively, both by a similar magnitude of -0.2%, upon a positive UMP shock but the effect dies in less than 10 months. The new channel of transmission has not changed the response of other domestic variables.

(3.b) The responses of both monetary indicators to a conventional MP shock of ECB is almost zero (panel (b)).

(3.c) In panel (c) the credit to economy in foreign currency declines by 0.15% at its trough about 10 months after a risk shock hits the economy. The impact lasts for 35-40 months. The -0.05%

negative response of output at its trough (figure 11-c) upon a risk shock is similar to that in benchmark specification (figure 5-f).

The responses of other domestic variables are similar to that in benchmark specification (see panel (f) figure 5). The median response of broad money is also negative but the credible interval assumes the impact is weak.

Based on these results in paragraph (3.a) and in (3.c) I can conclude that the bank credit channel is a critical means of transmission. The impact of UMP shocks is short lived, while risk shocks seem to activate a strong response of bank credit to economy.

5.3 Remittances Channel

The responses of remittances (BP.REMITnet) and of gross reserves (GrossReservesEUR) are shown in figures 13 and 14 respectively, in Appendix.[18]

(2.a) In panel (a) credible intervals indicate the impact is muted in both cases, while the median response of both remittances and gross reserves to UMP shock is slightly negative.

(2.b) The responses to easy MP shock, in panel (b), is again weak but positive and short-lived if measured by the median response.

(2.c) In panel (c) remittances show a strong negative response to positive risk shock, while gross reserves respond positively to such shock. Given their weak response to (unconventional & conventional) MP shocks and the variety of factors that may determine its behaviour, I conclude the dynamics of gross

[18] *The dynamics of gross reserves can be explained by a variety of factors including policy decisions of Bank of Albania to accumulate reserves which is partly an exogenous shock on its own. I define it as a partly exogenous shock since intervention timing can take into account the appropriate timing with respect to the demand and supply factors in foreign exchange market (in addition to the exogenous factor related to the need to accumulate reserves).*

reserves have little to tell about the trans- mission of other shocks[18].

I will focus on the response of remittances only. To do so I compare responses of domestic variables in the specification with remittances to those in benchmark specification upon "risk" shock of similar magnitude, around +0.15%. Results are summarised in table 6.

In the new specification, remittances respond negatively, by -1%. As this channel be- comes operative, the negative response of output is slightly stronger now (-0.06% in 13-c compared to -0.05% in 5-f). Response of prices is also of a higher magnitude now (+0.03% in 13-c compared to +0.02% in 5-f). Results suggest that **risk shocks seem to matter for the dynamics of remittances, and through them for the real sector.**

As remittances are an outside source of revenue that enter the economy via household expenditure, it is interesting to see how expenditure components of output, consumption and investment, respond to such risk shock. That is a cross check that I do at the end of this section.

5.4 Trade Channel

I report the responses of trade variables, exports and imports in figure 15 of Appendix, while a summary is provided in table 6.

(4.a) Exports respond sharply upward by 2% with a peak in 3-4 months and a lifespan of 20 months upon an UMP shock (panel (a)). The median response of imports is also positive but very weak. Exports of goods make up for a small share of GDP (10%) and therefore do not have the weight or the size to transmit those effects on output. The rest of domestic variables respond in the same way as in benchmark model.

(4.b) Neither of trade indicators respond to a policy rate shock of ECB.

(4.c) In panel (c), only imports respond negatively upon a positive risk shock (figure 15-c). The negative median response of imports has a magnitude of around -0.25% with a trough within 6-9 months, a lifespan of 40 months and with a clear effect as suggested by the credible intervals.

I conclude that, **trade channel is a source of transmission of foreign policy shocks via positive effects on exports upon an UMP shock with no positive effects on output. Risk shocks also contribute to improved trade balance via lower imports, but the magnitude is too small to matter for the dynamics of output.**

5.5 The effects of ECB policies and Risk shocks on real sector of Albania

In this section, first I check how the monetary policy shocks (conventional and unconventional) and the risk shock affects the two expenditure components of output, consumption and investments. Their responses are reported in figure 16 of Appendix. Second, I summarise the results regarding the transmission of these shocks on real dynamic of Albanian economy.

(5.a) In figure 16-a, real investments decline by -1% following an UMP shock, which peaks 9 months after the shock and dies in 20 months. The response of real consumption is positive only on impact, but dies within 2-3 months after the shock (figure 16-a).

(5.b) Conventional monetary policy shock of ECB are not important for real sector dynamics in Albania.

(5.c) In panel (c), (figure 16-c), the median response of investments reaches a maximum size of -0.45% in about 6-9 months and lasts for 20 months. Credible intervals suggest this impact is strong. Median response of real consumption reaches a magnitude of +0.07% with a peak in 12 months after the shock. Very wide credible intervals suggest the impact is weak.

To get a clear picture of the results in sections 5.1 to 5.5 I summarise the results in table 2.

Table 2. Change in response of Output due to ECB Policies & Risk shocks (based on table 6 and fig.9-16).

	Portfolio re-balance		Bank Lending		Remit.ch.	Trade ch.		Real Effects	
$Z^h \longrightarrow$	(2) CA	(3) FA	(4) CP	(5) M3	(6)Rmn	(8) X	M	(9) C	I
	UMP shock of size {+5%}								
Z^h response	-10	-8 short	- short	- short	- weak	+2	..	..	-1
Δ in Y^h response	-0.03	..	..	..	..	..		- 0.08	
	risk shock of size {+ 0.15%}								
Z^h response	-3	+10 short	- 0.15	- weak	- 0.5	+ weak	–	+0.07	0.05
Δ in Y^h response	- 0.01	+0.02	..	..	- 0.01	..		..	
	conventional MP shock								
Z^h response	+ weak	+ short	..	..	+ weak	..	..	..	..
Δ in Y^h response	..	..	..	..	..	..		..	

Notes:

(1) Based on results from sections 5.1 to 5.4 and IRFs in figures 9 to 16, summarised in table 6 of Appendix.

(2) cMP: conventional MP; UMP: unconventional MP; CA: Capital Flows; FA: Financial Flows; Remit: Remittances; CP: Credit to Economy in FX; M3: Broad Money; X: Exports; M: Imports; C: Consumption; I: Investments; Y: Output.

(3) The sign 'weak' or 'short' means credible intervals are very wide, not ruling out zero response, or impact is very short.

The story that emerges looking at this table row-wise is the following.

(i) The portfolio re-balancing channel operating via capital flows of balance of payments could have counterbalanced the positive effects of ECB balance sheet expansion via the financial channel. A raw graphical representation of the real GDP annual growth rate and of capital inflows as percentage of GDP confirms a correlation of the two (see figure 20 in appendix). Other channels of transmission of ECB unconventional policy, like remittances, trade or bank lending channels, seem less critical. The net effect of the increase

in ECB balance sheet size on real investments and output is slightly negative.

(ii) Conventional MP shocks are not significant for the real sector in Albania.

(iii) Risk shocks are also important for real investments and output. The effects of risk shock on real sector, particularly on real investments and output, are transmitted via all three channels, the portfolio re-balancing, remittances and bank lending channels. Trade channel seems to smooth down a fraction of the negative effect via the negative response of imports to risk shock.

The importance of risk shocks for the real dynamics of the Albanian economy raises one more question. How can we identify a risk shock?

Earlier in section 4.3 I had raised the possibility that such shock may capture (i) the dynamics of 12 month Euribor, hence expectations about financial conditions in Euro area, (ii) potential domestic financial shock or banking shock or alternatively (iii) country risk premium in Albanian economy. While exogenous risk shocks are orthogonal innovations, forecast error variance decomposition of the difference between 12-month TB yield and 12-month Euribor may provide a hint regarding the source of these innovations. I refer to the last rows in table 8, panel (b) (in page 47). A reasonable line of arguments implies that risk shocks should be connected to the unconventional monetary policy shocks of ECB. My line of reasoning is as follows.

(1) The forecast error variance decomposition numbers indicate that at 1-month horizon, a significant portion of the variance of 'risk' variable is explained by innovations to other foreign shocks (23%). At 24 month horizon, 40% is explained by innovations to other foreign shocks(table 3). The fraction explained by TB spread in Albanian economy at 1- and 24 month horizon is 31% and 25%, respectively.

(2) A reasonable guess would be that, by definition, of the 23% explained by other foreign shocks a large fraction is potentially explained by the term spread in Euro area (12month - 3 month Euribor yields)[19].

(3) From impulse responses of Euro area variables I know the term spread in Euro area (12month - 3 month Euribor yields) declines upon an UMP shocks. There is a consensus through literature that the Euribor yields at medium horizon are connected to unconventional shocks. I refer to the study by Feldkircher et al. (2017), and the references in their paper who identify the unconventional monetary policy shock of ECB by similar term spread variables (i.e term spread in Euribor yields).

(4) At 12 month horizon 10% of the risk variable variance is explained by UMP shock.

If this set of arguments holds than, a part of the medium horizon effect of unconventional policy shocks of ECB are captured by the 'risk' shock in my study. The interpretation is as follows. If ECB managed to reduce medium term yields (12 month Euribor rates) than an upward 'risk' shock in my study is a downward Euribor rate shock at 12 month horizon combined with a downward shift in Albanian TB yield of a smaller magnitude[20].

Table 3 FEVD of Risk variable in Albanian economy.

		Euro area shocks		underlinedomestic shocks	
	horizon	UMP	other Foreign Shocks	Spread TB	Risk
Risk (TB-Euribor)	1 month	1	23	31	36
Risk (TB-Euribor)	24 month	10	40	25	5

[19] *This is only a guess based on the definition of Euro area 'Spread' variable which is the 12month - 3 month Euribor yields difference since other foreign shocks are not identified in this study. The 12 month Euribor rate is a component of the proxy 'risk' variable in the set of Albanian variables.*

[20] *An upward innovation to 12-months Albanian TB yields would also lead to the same 'risk' shock.*

We should not rule out the possibility that 'risk' shocks capture shocks identified with country risks on Albanian economy other than the TB yield to Euribor spread. Since results in table 2 showed that 'risk' shocks trigger (i) negative response of capital flows, and (ii) negative response of bank lending than other factors that trigger such response may be identified with such 'risk' shocks.

For example, International Monetary Fund (IMF) warns that some EU banks have have shown signs of intentions to sell Albanian subsidiaries (IMF (2018)). Such an announcement would be an exogenous innovation to "country risk". The announcement on its own may trigger (a) disinterest by potential foreign investors (decline in capital inflows), (b) a deterioration of the pool of potential borrowers or (c) disincentive of the existing bank management to expand its loan portfolio. Yet, any such shocks should operate via TB-Euribor spread since domestic shocks are all identified based on the simple ordering of the variables. Other country risk factors like macroeconomic performance relative to other economies in the region may lead to similar consequences as in (a) to (c).

While the above analysis can be extended and lead to other questions of interest and further research questions, I will summarise the results of this analysis as follows.

(i) From the analysis above and table 3, it is probable that 'risk' shocks capture the implications of innovations to UMP shocks, via the impact of the latter on 12-month Euribor, given that the identification of 'risk' shock is based on a different identification scheme.
(ii) A possible implication from policy making perspective is that a portion of the 'risk' factors can be smoothed by a reduction in the spread between 12 month TB yield and Euribor rate of the same maturity.

6. SUMMARY OF FINDINGS

The scope of this study is to assess the impact of the unconventional monetary policy of ECB on Albanian economy. I ask two key questions regarding these policies. (i) How do the ECB policies affect Albanian economy and (ii) through which channels are these spillover effects transmitted. Few results emerge.

(1) The exogenous expansions of ECB balance sheet size leads to improved financial conditions in Albania, through an operative financial channel. UMP shock triggers a decline in the term premium of Albanian securities and slight decline in country risk premium measure, but also appreciation of Albanian currency.
(2) The effects of unconventional MP shock on real sector are slightly negative suggesting opposing effects via alternative channels.
(3) Domestic shocks explain a large fraction of the dynamics in Albanian economy.

Results also suggest that the conventional monetary policy has had little effects, if any, on Albanian economy during the post-crisis period. A possible bias factor is the sample period including only the post-crisis period, during which interest rate policy of ECB has not been effective even in the Euro area.

I further investigate alternative transmission channels through which Euro area UMP shocks have been transmitted into the Albanian economy. Results suggest the following.

(4) The portfolio re-balancing channel turns to be an active channel of transmission. UMP shocks trigger negative response of capital inflows which are further transmitted into real sector.
(5) 'Risk' shocks emerge as an active source of impact factor for the dynamics of the real sector of the Albanian economy, in particular for investments and output. Relative to UMP shocks, 'risk' shocks seem to have a smaller effect on output and operate via (1) portfolio re-balancing channel, (2) remittances and (3) bank lending channel.

Analysis based on variance decomposition (table 3) suggest that 'risk' shocks possibly capture the implications of innovations to UMP shocks, via the impact of the latter on 12-month Euribor, given that the identification of 'risk' shock is based on a different identification scheme. A possible implication from policy making perspective is that a portion of the 'risk' factors can be smoothed by a reduction in the spread between 12 month TB yield and Euribor rate of the same maturity.

Finally, two issues may deserve some attention. The historical decomposition of the behaviour of domestic variables would help understand the share of the past dynamics in Albanian economy due to UMP shocks and risk shocks. In terms of the methodology, extending the horizon for which zero and sign restrictions are valid in the identification scheme can add to the robustness of these results.

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A. APPENDIX

A.1 BVAR with dummy variables

An alternative approach particularly of interest when working with a large set of short series follows Banbura et al. (2017). He implements prior information by generating artificial $y_{d,t'}$ $x_{d,t}$ as a function of parameters. Regression of artificial data $y_{d,t}$ on $x_{d,t}$ gives the prior mean for the VAR coefficients b_0 and the sum of squared residuals gives the prior scale S matrix for the error covariance matrix in equations 12 and 13.

$$b_0 = (x'_{d,t} * x_{d,t})^{-1}(x'_{d,t} * y_{d,t})| \tag{12}$$

$$S = (y_{d,t} - x_{d,t}b_0)'(y_{d,t} - x_{d,t}b_0)) \tag{13}$$

The prior are of the Normal inverse Wishart family.

$$p(B|\Sigma) \sim N(\tilde{b}_0, \Sigma \otimes (x'_{d,t} * x_{d,t})^{-1}) \tag{14}$$

$$p(\Sigma) \sim IW(S, T_d - K) \tag{15}$$

where, T_d is size of dummy data, K denotes the number of regressors in each equation. The conditional posterior distributions are defined as:

$$H(b|\Sigma, Y_t) \sim N(vec(B^*), \Sigma \otimes (X_t^{*'}X_t^*)^{-1}) \tag{16}$$

$$H(\Sigma|b, Y_t) \sim IW(S*, T*) \tag{17}$$

where **(*)** are the VAR data appended by the artificial data.

A.2 Data

The list of Eur oarea variables in the benchmark specification is:

$$Y_t^{EA} = \{y_t^*, p_t^*, b_t^*, ciss_t, sp_t^*, R_t^*\} \qquad (18)$$

where,

- y_t^* is a monthly measure of output[21],
- p_t^* is the log of seasonally adjusted consumer prices,
- b_t^* is the log of central bank total assets,
- $ciss_t^*$ is the level of financial stress as measured by the Composite Indicator of Systemic Stress CISS of Holló et al. (2012) available in ECB website,
- sp_t^* is the spread between EONIA and the MRO-rate, and
- R_t^* is the main refinancing operations (MRO) policy rate.

The set of Albanian variables in the benchmark model is:

$$Y_t^{AL} = \{y_t^h, p_t^h, R_t^h, s_t, sp_t^h, risk_t^h\} \qquad (19)$$

where, each variable is defined as follows:

- y_t^h is a monthly measure of output in log[22],
- p_t^h is the log of seasonally adjusted consumer price index,
- R_t^h the policy rate of Bank of Albania,

[21] *I construct a monthly measure of real GDP following a similar interpolation procedure to Mönch and Uhlig (2005). I use monthly industrial production as a reference series. The Eviews built-in procedure and my state space model estimate with Kalman filter yield similar results.*

[22] *I construct a monthly measure of real GDP by employing a state space model estimated via Kalman filter, similar to Mönch and Uhlig (2005) and try different reference series as input. The set of individually employed reference series are real M3, real NDA (net domestic assets) of the banking system, real NDC (net domestic credit) of banking system, capital public expenditures, index of trade volume, a measure of trade opening (imports plus exports) and finally remittances. Based on Bayesian information criteria and AIC I selected the models that include the monetary indicators. The monthly GDP series generated by each of the three models based on M3, NDA, NDC show a correlation of 99%.*

- s_t is the log of exchange rate (lek/Eur),
- the spread between the 12- and 3-month Treasury Bill yields (sp_t^h), and
- $risk_t^h$ is a measure of risk proxied by the spread between 12-month Treasury Bill yield and 12 month Euribor.

Except for spread and risk measures all other variables are in annual change of the respec- tive series multiplied by 100. Spread and Risk measures are in levels multiplied by 100.

A.3 Tables and Figures

Table 4: Size of Albanian economy relative to Euro Area economy.

	(in billion USD)	2014	2017
[a]	Albanian Exports	3,732	4,110
[b]	Euro Area Imports	5,532,357	5,387,792
[a/b]	Ratio (%)	0.067 %	0.076 %
[c]	Albanian Imports	6,243	6,070
[d]	Euro Area Exports	6,048,105	5,986,659
[c/d]	Ratio (%)	0.1%	0.1%
[e]	Albanian nominal GDP	13,228	13,039
[f]	Euro Area nominal GDP	13,478,925	12,589,497
[e/f]	Ratio (%)	0.1%	0.1%

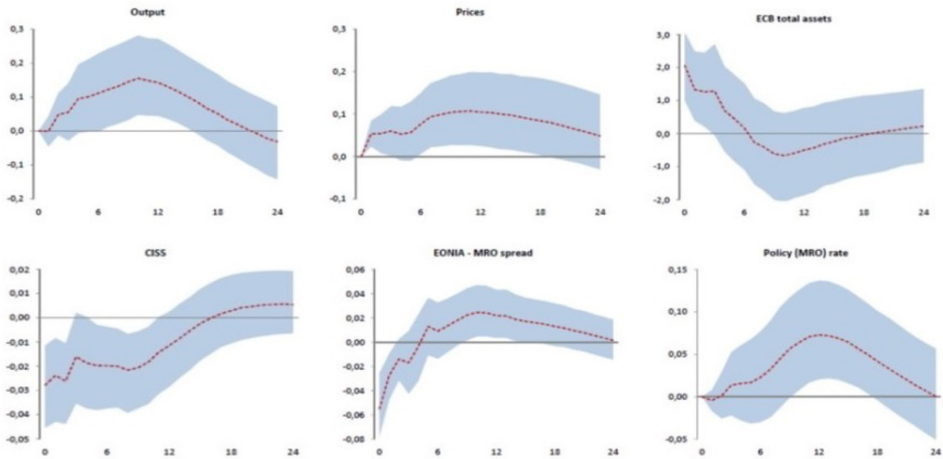
Trade figures account for the total trade flows of goods and services. Source: Bank of Albania, World Development Indicators Database

Table 5 Testing Transmission channels relative to the Benchmark VAR: Ordering.

	Model names	Variables								
(1)	Benchmark VAR(12)			y_t^h	p_t^h	R_t^h	s_t	sp_t^h	$risk_t^h$	
	Portfolio Re-balancing									
(2)	Capital Flows			y_t^h	p_t^h	R_t^h	s_t	sp_t^h	$risk_t^h$	ca_t^h
(3)	Financial Flows			y_t^h	p_t^h	R_t^h	s_t	sp_t^h	$risk_t^h$	fa_t^h
	Credit channel									
(4)	Credit to Economy			y_t^h	p_t^h	R_t^h	s_t	sp_t^h	$risk_t^h$	cp_t^h
(5)	Broad Money			y_t^h	p_t^h	R_t^h	s_t	sp_t^h	$risk_t^h$	$m3_t^h$
	Remittances channel									
(6)	Remittances			y_t^h	p_t^h	R_t^h	s_t	sp_t^h	$risk_t^h$	rmn_t^h
(7)	Gross Reserves			y_t^h	p_t^h	R_t^h	s_t	sp_t^h	$risk_t^h$	grs_t^h
	Trade channel									
(8)	Export & Imports	x_t^h	m_t^h	y_t^h	p_t^h	R_t^h	s_t	sp_t^h	$risk_t^h$	
	Aggregate Demand									
(9)	Consumption & Investm	y_t^h	c_t^h	i_t^h	p_t^h	R_t^h	s_t	sp_t^h	$risk_t^h$	

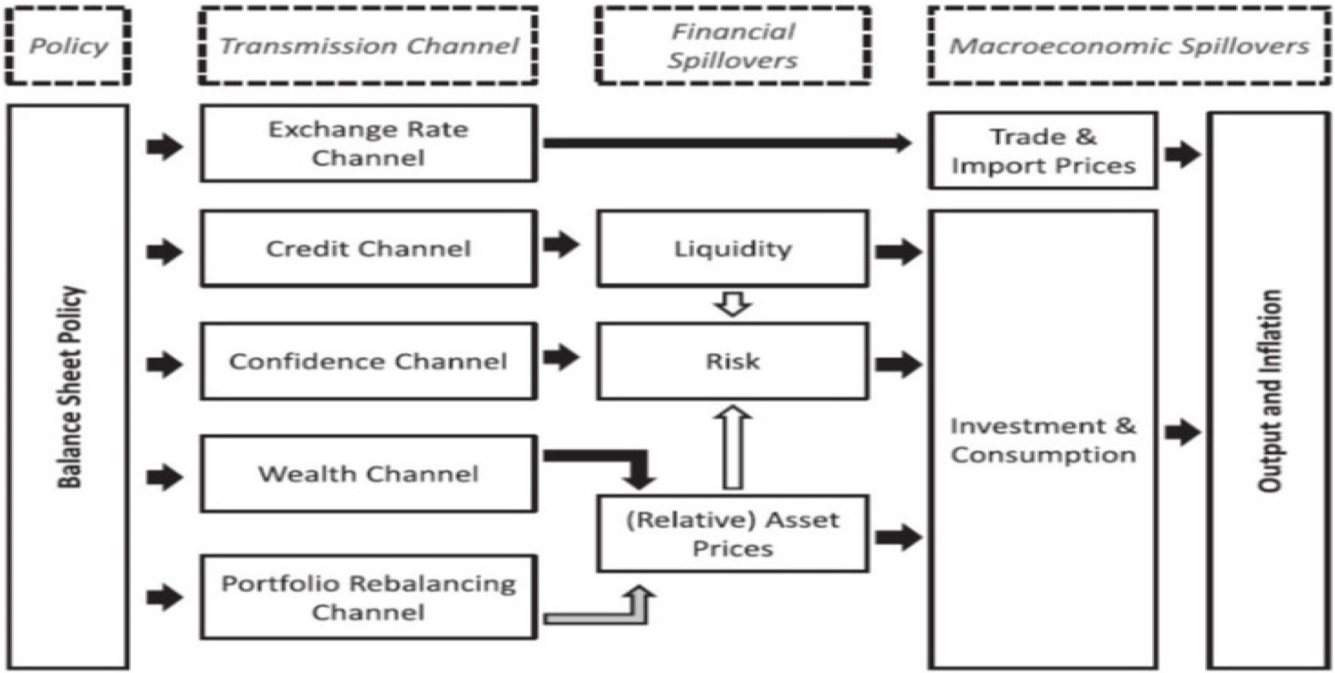
Benchmark: y_t^h: output; p_t^h: prices; R_t^h: policy rate; s_t: exch. rate; sp_t^h: TB spread (12m-3m); $risk_t^h$: 12m TB - 12m Euribor.
ca_t^h: Capital Flows; fa_t^h: Financial Flows; x_t^h: Real exports; m_t^h: Real imports
c_t^h: Real Consumption; i_t^h: Real investments; grs_t^h: Gross Reserves; rmn_t^h: Remittances
nfa_t^h: Net foreign assets (fixed exchange rate); $m3_t^h$: Broad Money (fix exchange rate)
cp_t^h:Credit to economy in foreign currency (fix ex. rate)
Note: Monetary variables like broad money, credit to economy and net foreign assets are in real terms.
Balance of payment items are in nominal terms and denominated in foreign currency.

Figure 6 Response of EA variables due ECB's UMP shock (figure 4 in Boeckx et al. (2014), p.25.)



Note: Solid lines represent the median estimates and shadows in grey denote the 16th and 84th percentiles. The X-axis reports months, the Y-axis reports percentage point changes.

Figure 7 Unvonventional MP Transmission Channels to Emerging Economies and SoE



Note: The gray arrow indicates an indirect effect. The white arrows indicate contemporaneous effects.
Source: Bluwstein and Canova (2015), page 75.

Figure 8 Benchmark Model: Forecast Error Variance Decomposition in percentage points (FEVD).
(a) FEVD of Euro Area Variables.

		Shocks								
Variables	horizon	UMP	R.ecb	other Foreign shocks	Home Y	Home P	R.MP	Ex.Rate	Spread TB	Risk (TB-Euribor)
Foreign Y										
	1-m horizon	0	15	85	-	-	-	-	-	-
	12-m horizon	8	10	81	-	-	-	-	-	-
	24-m horizon	11	10	79	-	-	-	-	-	-
Foreign P										
	1-m horizon	0	14	86	-	-	-	-	-	-
	12-m horizon	6	15	79	-	-	-	-	-	-
	24-m horizon	9	16	75	-	-	-	-	-	-
UMP										
	1-m horizon	28	0	71	-	-	-	-	-	-
	12-m horizon	16	3	81	-	-	-	-	-	-
	24-m horizon	17	5	79	-	-	-	-	-	-
CISS2										
	1-m horizon	41	15	45	-	-	-	-	-	-
	12-m horizon	27	15	58	-	-	-	-	-	-
	24-m horizon	23	14	63	-	-	-	-	-	-
Spread 12m-3m										
	1-m horizon	13	27	59	-	-	-	-	-	-
	12-m horizon	15	17	68	-	-	-	-	-	-
	24-m horizon	14	16	71	-	-	-	-	-	-
R.ecb										
	1-m horizon	0	10	89	-	-	-	-	-	-
	12-m horizon	2	8	90	-	-	-	-	-	-
	24-m horizon	5	8	87	-	-	-	-	-	-

(b) FEVD of Home Variables.

		Shocks								
Variables	horizon	UMP	R.ecb	other Foreign shocks	Home Y	Home P	R.MP	Ex.Rate	Spread TB	Risk (TB-Euribor)
Home Y										
	1-m horizon	2	2	11	85	0	0	0	0	0
	12-m horizon	7	7	35	41	2	1	3	4	1
	24-m horizon	9	8	40	28	2	2	3	6	2
Home P										
	1-m horizon	1	4	11	1	83	0	0	0	0
	12-m horizon	4	6	28	3	44	1	2	11	1
	24-m horizon	6	7	32	3	33	2	4	12	1
R.MP										
	1-m horizon	1	1	4	1	1	91	0	0	0
	12-m horizon	5	7	29	7	5	41	2	2	1
	24-m horizon	7	8	37	7	4	29	2	4	1
Ex.Rate										
	1-m horizon	3	2	19	4	1	1	70	0	0
	12-m horizon	11	7	36	7	2	3	28	4	0
	24-m horizon	15	9	44	5	1	3	18	5	1
Spread TB										
	1-m horizon	1	3	18	1	1	1	2	72	0
	12-m horizon	8	7	35	2	2	5	8	32	1
	24-m horizon	15	9	39	2	1	5	7	20	1
Risk (TB-Euribor)										
	1-m horizon	1	4	23	1	1	1	2	31	36
	12-m horizon	5	4	38	6	2	2	3	31	8
	24-m horizon	10	6	40	6	2	2	4	25	5

Note: The numbers may add up to 99 or 101 due to rounding errors.

Figure 9: VAR with Capital Flows (CA): IR of Domestic Variables upon Foreign Policy & Risk shocks (Specification (2) in Table 5).

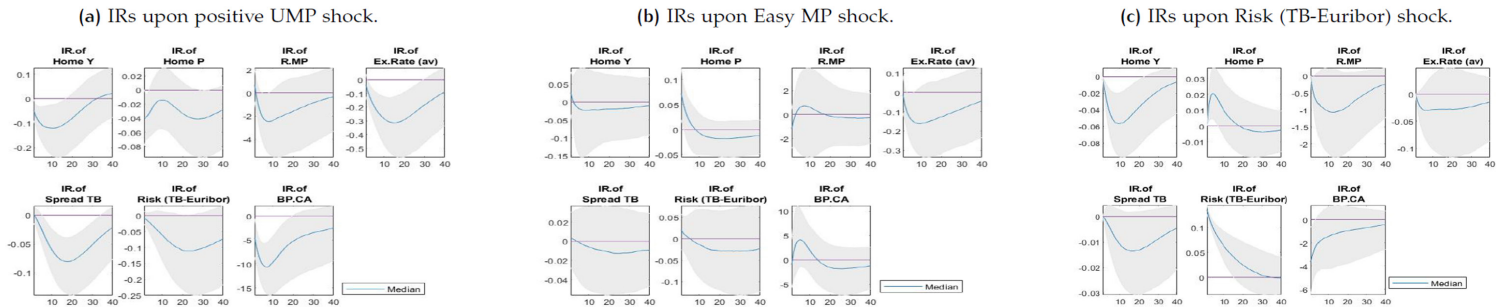


Figure 10: VAR with Financial Flows (FA): IR of Domestic Variables upon Foreign Policy & Risk shocks (Specification (3) in Table 5).

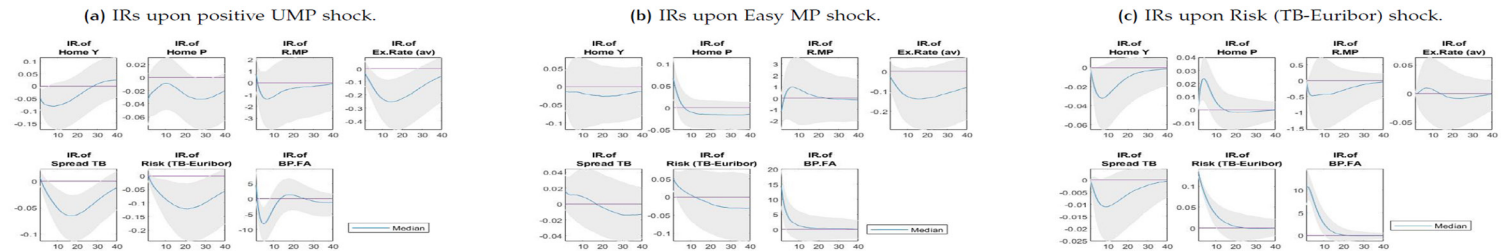


Figure 11: VAR with Credit to Economy in FX (CP): IR of Domestic Variables upon Foreign Policy & Risk shocks (Specification (4) in Table 5).

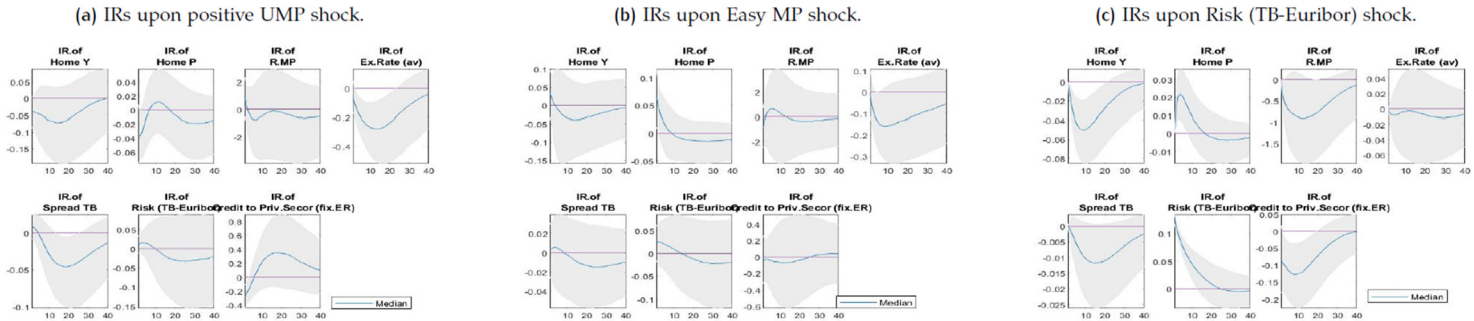


Figure 12: VAR with Broad Money (M3): IR of Domestic Variables upon Foreign Policy & Risk shocks (Specification (5) in Table 5).

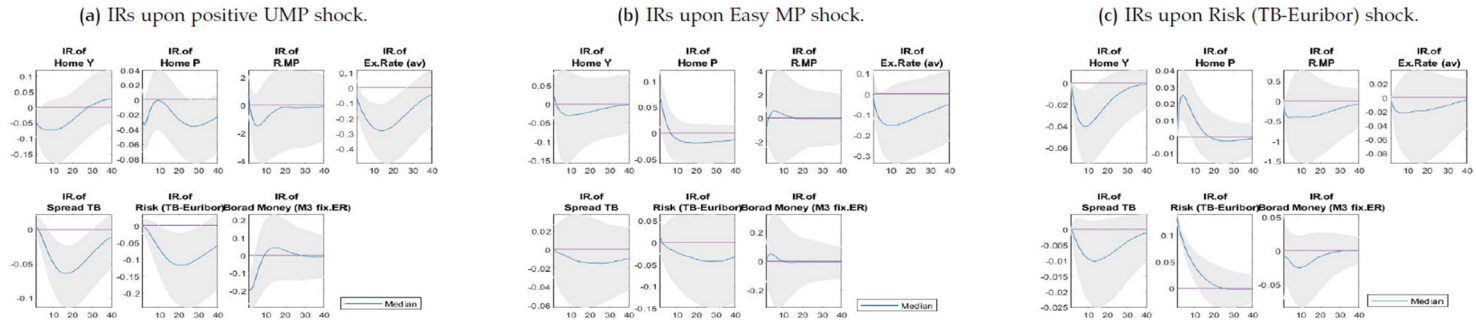


Figure 13: VAR with Remittance (RM): IR of Domestic Variables upon Foreign Policy & Risk shocks (Specification (6) in Table 5).

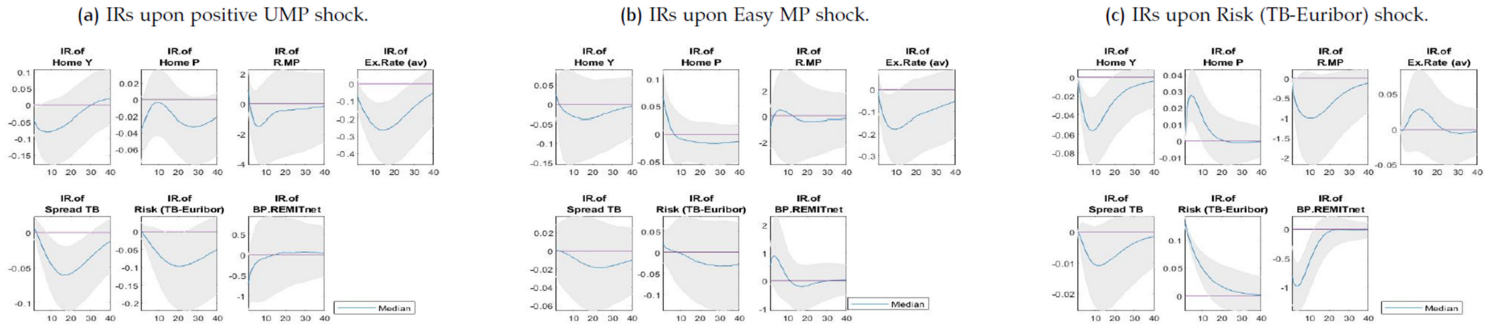


Figure 14: VAR with Gross Reserves (GR): IR of Domestic Variables upon Foreign Policy & Risk shocks (Specification (7) in Table 5).

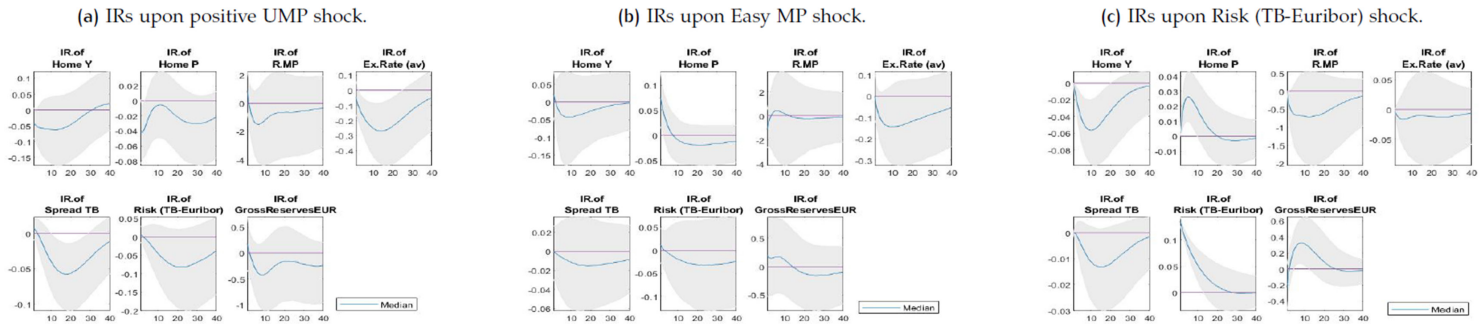


Figure 15: VAR with Imports & Exports (XM): IR of Domestic Variables upon Foreign Policy & Risk shocks (Specification (8) in Table 5).

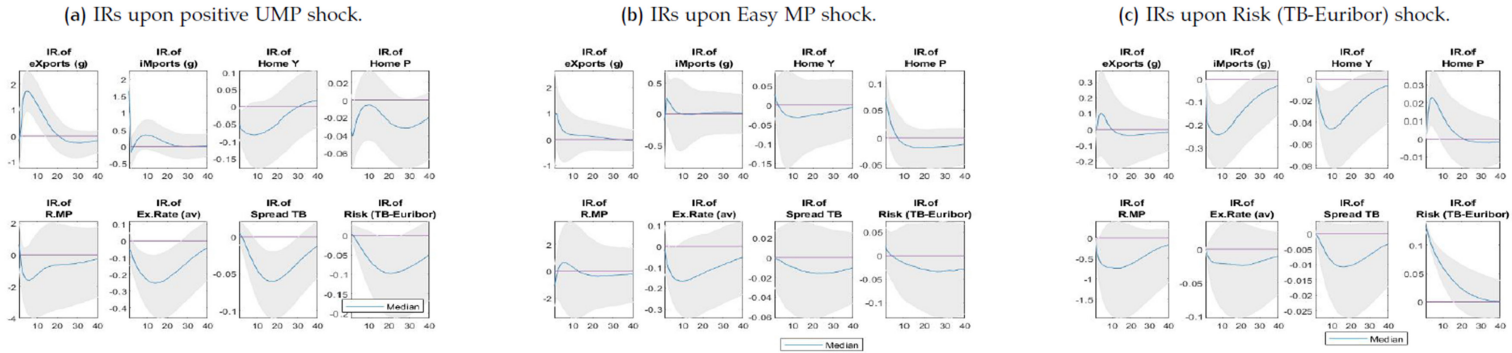


Figure 16: VAR with Consumption & Investment (CI): IR of Domestic Variables upon Foreign Policy & Risk shocks (Specification (9) in Table 5).

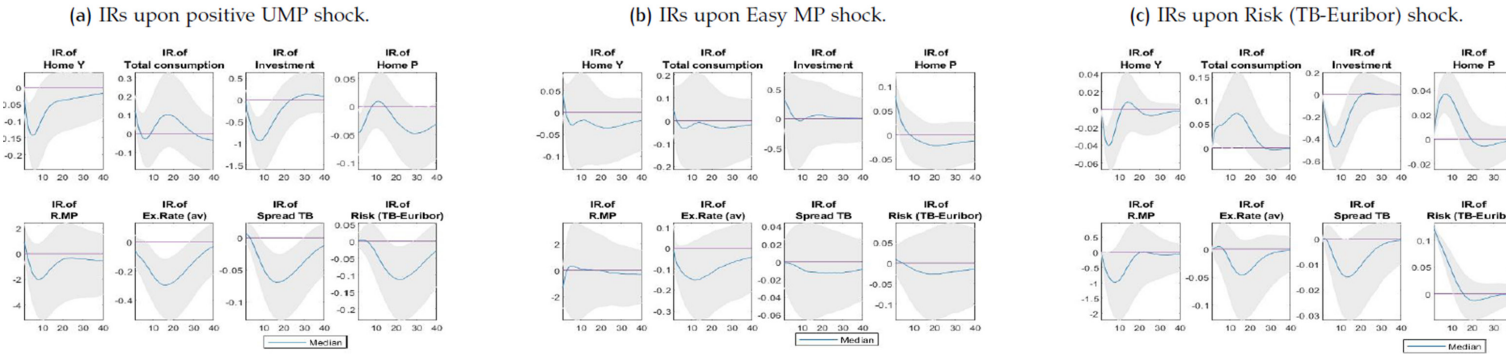


Table 6: Responses of Albanian indicators to UMP & Risk shocks (based on IRFs, fig.9 to 16).

	VAR(12)	Portfolio re-balance		Bank Lending		Remit.ch.	Trade ch.	Real Effects
Z^h –→	(1) –	(2) CA	(3) FA	(4) CP	(5) M3	(6)Rmn	(8) X , M	(9) C , I

Response (in %) at the peak upon UMP shock of size {+5%} (as in fig:3)

Response of Z^h	–	-10	-8	-0.2	-0.2	-0.5	+2 , 0	0 , -1
Response of Y^h	-0.07	-0.10	-0.07	-0.07	-0.07	-0.07	-0.07	-0.15
Response of P^h	-0.03	-0.04	-0.03	-0.04	-0.03	-0.03	-0.04	-0.05

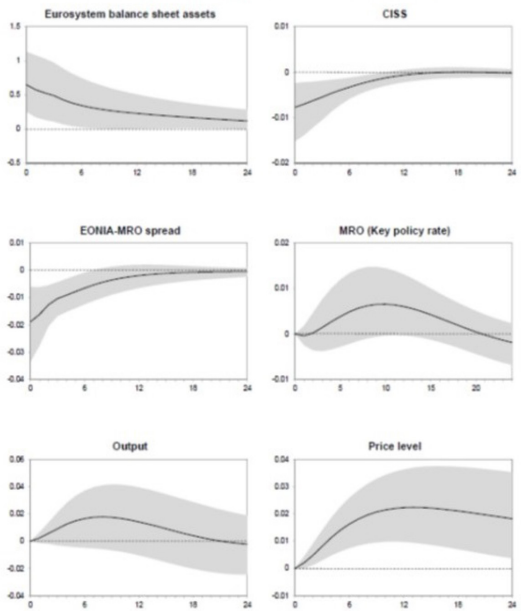
Response (in %) at the peak upon 'risk' shock of size {+0.15%} (as in fig:5-f)

Response of Z^h	–	-3	+10	-0.15	-0.02	-1	0 , -0.25	+0.07 , -0.5
Response of Y^h	-0.05	-0.06	-0.03	-0.05	-0.04	-0.06	-0.05	-0.05
Response of P^h	+0.02	+0.02	+0.02	+0.02	+0.025	+0.03	+0.02	+0.04

$Z^h$is the added variable(s) in each model specification indexed (2) to (9) as shown next to each index. Response of Z^h indicates IR of the added variable(s) in the respective specification. Responses of Y & P upon conventional MP shock are ≈ 0 (not shown).

Figure 17: Response of EA variables due ECB's UMP shock (fig. 2 in Moder (2017), p.23.)

Figure 2: Euro area: Response to a balance sheet shock



Note: Response of variables to an expansionary one standard deviation Eurosystem balance sheet shock. The shaded regions report pointwise 68 percent credibility intervals. The x-axis reports months, the y-axis monthly growth rates in percent for all variables except for financial variables, where percentage point changes are depicted.

Figure 18: Response of EA variables due ECB's UMP shock (fig. 2 in Burriel and Galesi (2016), p.19.)

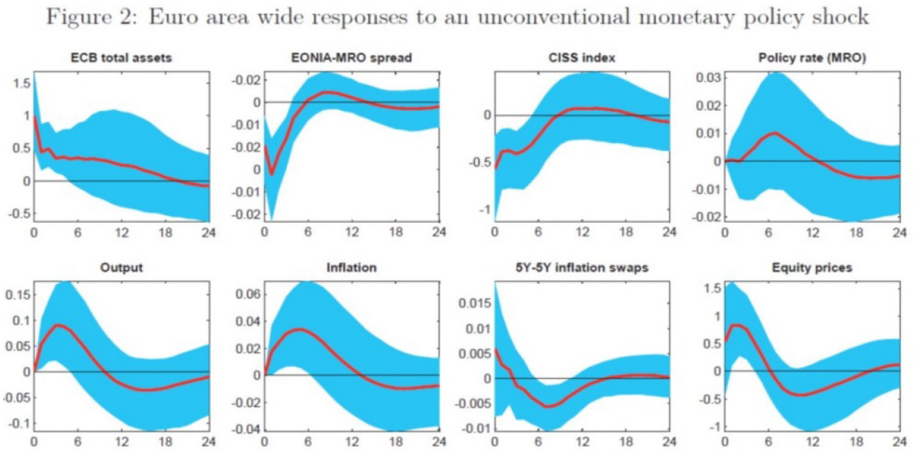


Figure 19: Response of EA variables due ECB's CMP shock (fig. 7 in Burriel and Galesi (2016), p.29.)

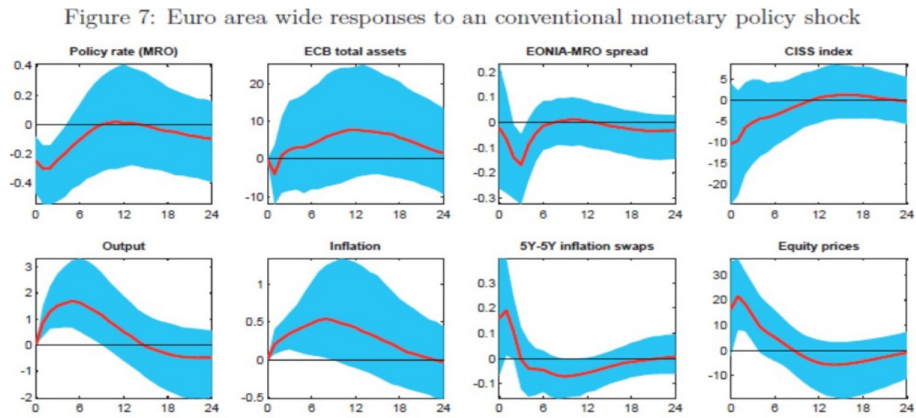


Figure 20: Response of domestic (Albanian) variables due ECB's standard MP shock.

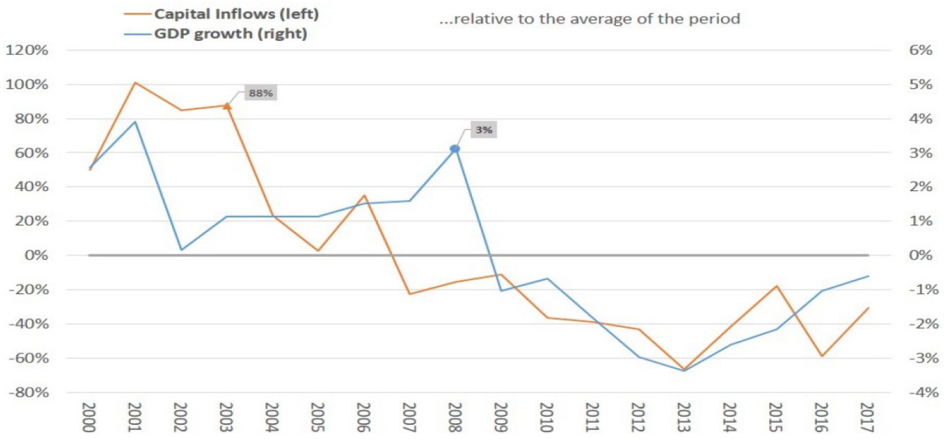
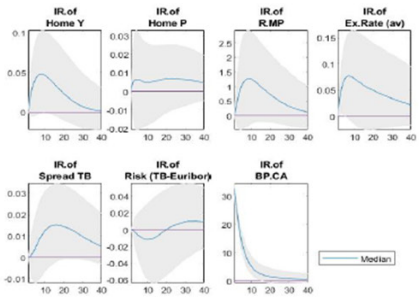
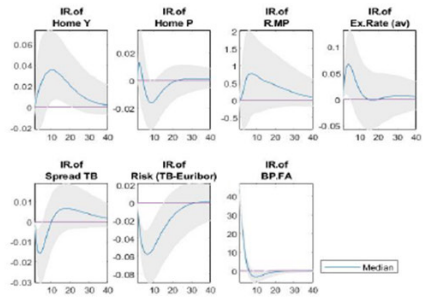


Figure 21: Alternative Specifications: Impulse Responses due to added HOME shocks.

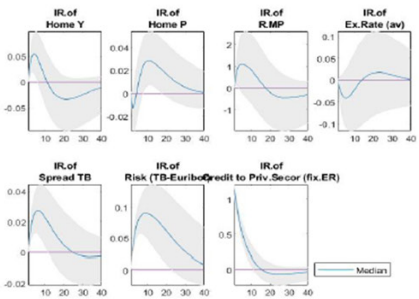
(a) IRs upon CA* shock ([2] in table 5).



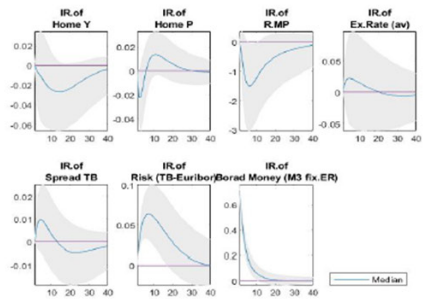
(b) IRs upon FA shock ([3] in table 5).



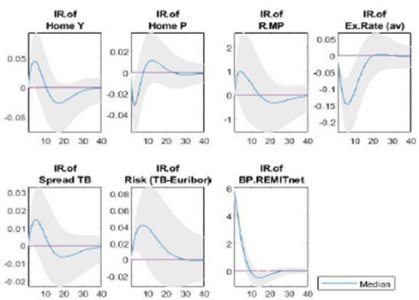
(c) IRs upon CP shock ([4] in table 5).



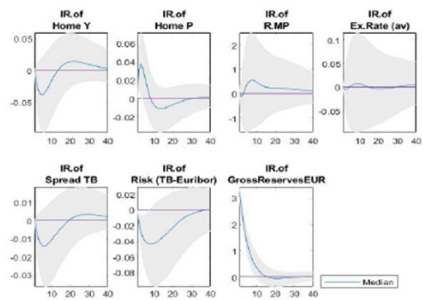
(d) IRs upon M3 shock ([5] in table 5).



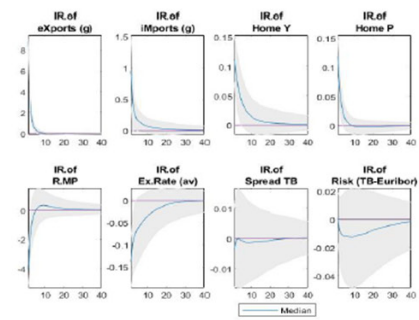
(e) IRs upon Remittances shock ([6] in table 5).



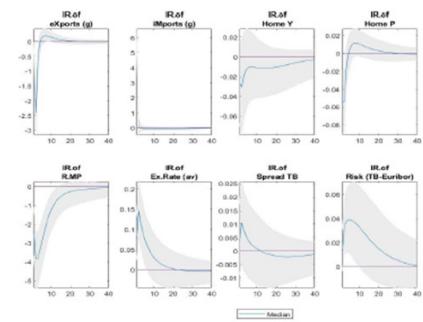
(f) IRs upon G.Reserves shock ([7] in table 5).



(g) IRs upon Export shock ([8] in table 5).



(h) IRs upon Import shock ([8] in table 5).



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