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THE EFFECTIVENESS AND CONSTRAINTS OF MONETARY POLICY IN PANDEMIC TIME

UČINKOVITOST I OGRANIČENJA MONETARNE POLITIKE U VREMENU PANDEMIJE

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Abstract

The coronavirus has caused enormous negative consequences for humanity and the economy in whole, which also has a negative impact on the implementation of monetary policy. After the global financial crisis, most central banks have been implementing expansionary monetary policies. Due to that, during the pandemic, central banks are facing the lack of available monetary instruments, in order to improve the recovery of real sector. The aim of this paper is to analyse the impact of monetary policy tools that have been used as a response to the pandemic. The analysis considers the effect of monetary tools for encouragement bank's credit activity and the inflation dynamics. The model is estimated with Vector Auto-regression analysis and impulse response functions that illustrate the response of CPI to the unconventional monetary policy instruments during the pandemic crisis. The findings prove that additional access to bank liquidity affect the inflation stability which positively influence to the financial system and the macroeconomic balance.

Keywords: *monetary policy, inflation, pandemic*

JEL classification: E47, E58

Sažetak

Koronavirus je prouzročio ogromne negativne posljedice za čovječanstvo i gospodarstvo u cjelini, što također negativno utječe na provedbu monetarne politike. Nakon globalne financijske krize, većina središnjih banaka provodi ekspanzivne monetarne politike. Zbog toga se tijekom pandemije središnje banke suočavaju s nedostatkom dostupnih monetarnih instrumenata, kako bi poboljšale oporavak realnog sektora. Cilj ovog rada je analizirati utjecaj alata monetarne politike koji su korišteni kao odgovor na pandemiju. Analiza uzima u obzir učinak monetarnih alata za poticanje kreditne aktivnosti banke i dinamiku inflacije. Model se procjenjuje vektorskom analizom autoregresije i funkcijama impulsnog odgovora koji ilustriraju odgovor CPI-ja na nekonvencionalne instrumente monetarne politike tijekom pandemijske krize. Rezultati dokazuju da dodatni pristup likvidnosti banaka utječe na stabilnost inflacije što pozitivno utječe na financijski sustav i makroekonomsku ravnotežu.

Ključne riječi: monetarna politika, inflacija, pandemija

JEL classification: E47, E58

1 INTRODUCTION

Negative consequences for humanity that coronavirus has imposed affected the whole economy. Economic and financial systems have adapted and responded to shocks in a variety of ways. However, the uncertainty and unpredictability of the pandemic make it difficult for countries to adopt plans and policies, which also has negative impact on the implementation of monetary policy. In the post-crisis period, after the global financial crisis, most central banks have implemented, and they are still implementing expansionary monetary policies. The main feature of monetary policies before the pandemic escalation, was quantitative easing and low interest rates level. Central banks, especially Federal Reserves, responded to the last global financial crisis by launching liquidity to the banking system until the policy rate reached the historically low levels (Chadha et al., 2020). Albertazzi et al. (2020) found that 1 percentage point reduction in lending rate of European Bank of its refinancing operations reduces the median of banks' default risk across equilibria by around 50%. Finally, the result of monetary quantitative easing is cutting the interest rate levels for banking system till the critical interest rate level. In the position of reaching this tipping point, monetary policy loses the range of available measures and instruments to handle the crisis. (Porcellacchia, 2020) At the same time, loan losses of non-financial corporation within banks have been increasing due to the Covid-19 pandemic (Hirschbühl et al., 2020). Due to mentioned above, the negative consequences of the pandemic in economies could be reflected in the

depletion of available monetary instruments, making it more difficult to transmit monetary impulses to the real sector. The pandemic shock hit the economy at a still vulnerable time and at the time of incomplete recovery after the global financial crisis. The emerging markets (like Croatia) that depend on foreign liquidity are highly sensitive to external vulnerability. Thus, the domestic monetary policy is forced to put extra effort because of lack of international capital flows at the time of crisis (Committee for the Coordination of Statistical Activities, 2020a).

The downturn of economic cycles has adversely impact at inflation and caused huge difficulties in maintaining monetary accommodation. The demand and supply shock triggered funding problems for many firms and led to the problem of deteriorating quality of credit borrowers. (Ferrando, Ganoulis, 2020) As a quick response to the crisis, European central bank (ECB) and national central banks introduced new policy tool called Pandemic Emergency Purchase Programme. The programme is aimed to help households and firms to overcome illiquidity gap through additional banks' lending (Committee for the Coordination of Statistical Activities, 2020b).

The aim of this paper is to analyse the impact of implementation of monetary policy tools that have been used as a response to the pandemic. The monetary tools are structured in two main groups: lending operations and asset purchases. The analysis will consider the response of banking system to extra liquidity and overall impact to the inflation dynamics (approximated by Consumer Price Index). The model is estimated with Vector Auto-regression analysis and impulse response functions that illustrate the response of CPI to monetary easing during the pandemic crisis.

The findings prove that additional bank liquidity increase the inflation stability which positively influence to the financial system and the macroeconomic balance.

2 LITERATURE OVERVIEW

In the pandemic period, it is very challenging to set the macroeconomic tools for handling the recovery of economy. The pandemic brought new challenges for monetary policy. Central banks, at the same time, faced unexpected shocks and constraints according to the already existing trends which have been remaining since last global financial crisis. Even before Covid-19 had hit the world, monetary policy has been aiming to the recovery from global financial crisis. To boost the economy, central banks have been using unconventional and macroprudential measures (Popsek Biškupec, Bilal Zorić, 2017). Multifarious macroprudential tools were used to encourage credit and business cycles and stimulate economies. The common feature of all macroprudential instruments is strengthening liquidity and capital buffer in banking system and keeping

low interest rate environment (Popek Biškupec, 2015). Among others, some studies confirmed that restrictions on profit distribution, exposure limits and asset-based capital requirements impact on credit to the non-financial private sector (Budnik, 2020). As this pandemic is unpredictable in time and scope, the policy makers can hardly predict the financial stress and behaviour of financial variables. So far, variety of analysis have tried to predict the future trends and risk impacts to the economic activity. De Santis and Van der Veken (2020) used quantile regression and the skewed t-distribution to evaluate the forecasting properties of models. The results confirmed that financial variables contribute to the real-time forecast of GDP growth and its associated risk during the Covid-19 crisis. Also, some research questioned the alternative measures of financial conditions indicators that could approximate financial stability and monetary policy monitoring, like interest rate and exchange rate (Arrigoni et al, 2020). Based on the analysis, Arrigoni et al. (2020) found that indicators based on simple averages create financial condition with credible indices. Furthermore, lot of studies examine the correlation between financial indicators and financial risks. Figueres and Jarociński (2020) questioned the financial indicators and risks to output growth in euro area. The results confirmed that retail banks' credit activity spread is not confidential to provide risks to growth specially in period of financial distress, as Covid-19 recession. In the end, none of the mentioned is informative about inflation. The problem with modelling the shock volatility during the pandemic occur with VAR estimating, as the most often used time-series model in econometrics. Lenza and Primiceri (2020) propose ad-hoc procedure of dropping the extreme observation due to parameter estimation, which could make the model more robust. Similar problem that referred to uncertainty of duration and scope disturbed the studies during the pandemic of Spanish Flue and its consequences to the GDP growth. According to the nature of problem, De Santis and Veken (2020) used a non-linear model in a country panel setting where they used risk of pandemic as an exogeneous regressor for implementation of risks in macroeconomic model. Various research has been dealing with forecasting inflation trends. Banbura and Bobeica (2020) evaluated the forecasting performance of Philips curve specifications for euro area. Even though the inflation in euro area is hard to predict when the trends are more recently, they found well established result for cross-checking nominal and real developments in the economy of euro area.

Due to the integration of global financial system, any shock that hits financial market increases the risk of contagion numerous financial institutions. There are various models that have good forecasting performance, but during the actual pandemic shock, these models are losing their robustness (Guerrieri et al., 2018). Ferrari (2020) provided DSGE model that can capture the probability and scope of contagion. Also, the model predicts the possible consequences of macroeconomic financial stability. Results of this analysis suggest that there is trade-off between stability of financial system and overall macroeconomic stability. Monetary policy can stimulate the output, but in that point, it increases

the risk of financial instability. On the other hand, in the period of contraction, monetary policy can decrease the risk of contagion, but then monetary tools are not enough that by self-achieve macroeconomic stability. Camacho et al. (2020) proposed a new multilevel dynamic factor model with a block structure that has high performance in capturing spill over effects and which could be approximated on different models for measuring responses of GDP to shocks.

With the rise of global integration of financial institutions, many small open economies become exposed to international effects of price dynamics. The spill over effect has impact on domestic prices and the regulators have to adopt their frameworks according to the inflationary pressures. The high level of financial and economic interconnectedness diminishes the impact of monetary policy what could limit the pass-through of shocks to inflation (Balatti, 2020).

Although, monetary policy instruments have smaller impact on GDP during downturns, it could affect inflation through banks' credit activity. But despite low interest rate environment, the monetary tools were not enough to start transmission of monetary impulses, what in the end contributed to weakening of pass-through of monetary tools to loan and deposit rates (Wang, 2020). On the other hand, low interest rate environment is endangered by interest rate risk. Molyneux (2020) found that banks which reckon on core deposits, despite holding more floating-interest rate loans are less affected by positive change in interest rates.

Traditional monetary tools during this pandemic do not have strong effect at economic recovery in short time, but unconventional monetary tools could have quicker pass-through of monetary impulses to inflation (Bräuer and Rünstler, 2020). Since the lack of available effective tools and measures for economy encouragement, central banks focus on macroprudential measures designed to support bank lending conditions. Even though, if there was an absence of the possibility for extra funding and capital costs decrease, prudential tools could response to the pandemic shock. Bergant et al. (2020) found that tighter macroprudential measures strengthen countercyclically effect of monetary policy. In that way, economies could response better to global financial shocks. The result of countercyclical prudential policy is enhanced macroeconomic stability.

The proof of macroprudential tools effectiveness could be also seen in new model for assessing system-wide banking resilience. The model called BEAST (Banking Euro Area Stress Test) is developed by Budnik et al (2020). It tracks the heterogeneous impact of regulatory or macroprudential policies on banks and has good performance in inflation and output forecasting. Brandea-Marques (2020) evaluates benefits of macroprudential policy using cost-benefit analysis of available regulatory tools. The research confirmed that tightening macroprudential policy decreases risks that could arise from loose financial conditions. In the period of deposition of systemic risks, the monetary policy

which focuses mostly on inflation targeting, it may be subject to greater vulnerability and inefficiency. Tobias et al (2020) presented macroprudential measures that could mitigate the risk of trade-off which arose from the vulnerability of monetary policy channels.

In extraordinary conditions caused by negative shocks, the macroeconomic balance mostly could be achieved only by good coordination between monetary, macroprudential, fiscal, and public debt policy (Westelius, 2020).

The macroeconomic approach to handling pandemic shock includes managing the liquidity in financial sector and combining monetary and macroprudential policy tools. Using the prudential tools, the authorities have been preventing deeper sinking of the economy (Altavilla et al., 2020).

In order to answer the actual crisis and to introduce new liquidity for euro area, it is necessary to increase the scope of the Eurosystem's balance sheet (Kedan and Veghazy, 2021). The pandemic shock led many countries to introduce unconventional tools of monetary policy in the form of asset purchase programs. Sever et al. (2020) analysed the effect of the announcements of asset purchase on domestic financial markets. The research confirmed that this did not lead to a depreciation of domestic currencies.

Despite low interest rate environment and monetary policy constraints, macroprudential policy is able through risk premia mechanism influence to the systemic risk reduction (Van der Ghote, 2020). Altavilla et al. (2020b) proved that accommodative macroprudential policy, in collaboration with monetary policy easing, increases bank lending activity. One of the most important prudential measure was recalibration of targeted longer-term refinancing operations, which includes reduction of interest rate on all targeted longer-term refinancing operations by 25 basis points to -0.5% from June 2020 to June 2021 (ECB, 2020). Altavilla et al. (2020a) showed that additional macroprudential measures have prevented sharper collapse of economic activity by encouraging banks' lending toward real sector.

3 DATA AND METHODOLOGY

The unconventional monetary policy tools and macroprudential policy have strong impact on financial stress decrease in the period of negative shocks. Unconventional monetary policy is used for deriving bank's credit activity and stabilization the inflation. Fratto et al. (2020) made the overall analysis of unconventional monetary measures and instruments used in 27 emerging markets and 8 small, advanced economies. The results confirm that asset purchase programs were successful in emerging markets and developing economies in the sense of increasing liquidity of financial systems and decreasing financial market stress.

The pandemic shock caused huge social and economic changes in consumer behaviour which has spilled over to cost of living. The CPI (Consumer Price Index) is used as variable that is most affected when an extraordinary shock occurs (Diewert and Fox, 2020).

In short-run period, the prices had adjusted to the consumer patterns due to the lockdown situation and the pandemic shock caused the increase in CPI. This was result of increased demand for Food and non-alcoholic beverages component of CPI (Reinsdorf, 2020).

According to the International Monetary fund data (CPI Database, 2021), Food and non-alcoholic beverages component for Croatia has increased by 5,9% in 2020 (Index reference period 2015).

Empirical analysis is conducted for case of Croatia for the period from January 2006 until December 2020 based on data of the Croatian National Bank. In this research, the chosen variables are similar to those used by Belke and Orth (2007). Dependent variable presents natural logarithm of annual data of Consumer Price Index (CPI). Independent variable present natural logarithm of quarterly data of Placements to the domestic sector, excluding government (PDS) and Excess liquidity (VL). The selected model that is performed using the STATA program is Vector Auto-Regression (VAR). VAR analysis provides the answer to questions related to the reaction of the Consumer Price Index caused by changes in monetary policy. The focus is put on the determination of CPI index behaviour in the latest period of pandemic shock. The model can be constructed only if the variable is integrated in order one which means that all variable need to be stationary after first difference.

VAR model is shown as:

$$\ln GCPI_t = \sigma \sum_{i=1}^k \ln GPCI_{t-i} + \sum_{j=1}^k \Phi_j \ln VL_{t-j} + \sum_{m=1}^k \varphi_m \ln PDS_{t-m} + u_{1t} \quad (1)$$

All variables in VAR model are endogenous and dependent variable is the function of lag and the lag values of the other regressors (VL, PDS). After the model was specified, the optimal lag length (k) was determined and performed stationary test. Finally, the analysis also includes diagnostic tests and presents the results of the LM test, Jarque-Bera test and stability test.

The results of the VAR model confirmed the significant impact of unconventional monetary measures (extra excess to the liquidity for banking sector) for maintaining stability in the financial system. Due to the results, the extra liquidity had significant impact on maintaining price stability during the pandemic times.

4 RESULTS AND DISCUSSION

Results from the ADF test for variable CPI, VL and PDS are lower than 5% of critical value so the null hypotheses of the unite root test can't be rejected, which means that the series is nonstationary. Since the results are nonstationary the extra test is required, using the first differences. Outcome of the Augmented Dickey-Fuller tests using the first difference (Table 1) for variable CPI, VL and PDS shows that the T-statistic is higher than 5% of critical value so the null hypotheses can be rejected.

Table 1 Results of Augmented Dickey-Fuller test using first difference

Variable	Lags	Stationarity in Level		Stationarity in First Difference	
		Test Statistic	P-value	Test Statistic	P- value
<i>lnGCPI</i>	4	-2.152	-2926	-3.831***	-2.927
<i>lnVL</i>	4	0.642	-2926	-3.273***	-2.927
<i>lnPDS</i>	4	-2.193	-2926	-3.277***	-2.927

*Note: *, ** and *** indicates rejection of the null hypothesis of non-stationarity at the 10 percent, 5 percent, and 1 percent significance level, respectively.*

Source: Authors` calculation

Determine optimal lag length (k) for the model with maximum of the 8 lags was the next step. Based on the three model's selection criteria (AIC; HQIC; SBIC) similar to research of Kwadwo, Nyantakyi and Gunaratne (2015) eighth order was preferred. The results of lag order selection criteria choose AIC with 8 lags and the reason for that is the lower number which present the better model. Second step is estimating the unrestricted VAR model by putting the maximum of 8 lags.

Results of the VAR model for the first equation shows the impact of variable VL on CPI:

- L2. (second lag) of VL has the positive impact on CPI at the significant level of 5% ($p > |z| = 0.025$).
- L4. of VL has the negative impact on CPI at the significant level of 5% ($p > |z| = 0.024$).
- L5. of VL has the negative impact on CPI at the significant level of 10% ($p > |z| = 0.044$).

- L6. of VL has the negative impact on CPI at the significant level of 5% ($p > |z| = 0.023$).
- L7. of VL has the negative impact on CPI at the significant level of 1% ($p > |z| = 0.001$).

The rest of lags of PDS does not have significant impact on CPI

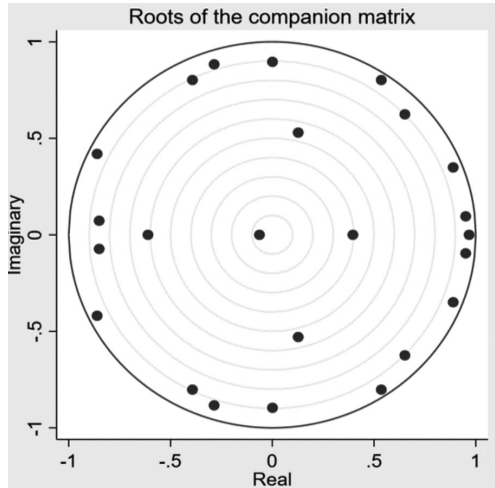
- Results of the VAR model for the first equation shows the impact of variable PDS on CPI:
- L1. of PDS has positive impact on CPI at the significant level of 1% ($p > |z| = 0.010$).
- L3. of PDS has positive impact on CPI at the significant level of 10% ($p > |z| = 0.087$).
- L1. of PDS has positive impact on CPI at the significant level of 1% ($p > |z| = 0.010$).
- The rest of lags of PDS does not have significant impact on CPI

The Lagrange Multiplier (LM) test is a general principle for testing hypotheses according to parameters in a likelihood framework. To perform an LM test the estimation of the parameters subject to the restrictions is required only (Arellano, 2002:1). The results of LM test shows that there is no autocorrelation at any lag order because Prob > chi2 value is higher than 5% so the null hypotheses could be accepted.

Normality of the tested model is estimated according to the Jarque and Bera test (1980). Results of Prob > chi2 0.27949 is higher than 5% for all variables (CPI, VL and PDS) in the model so it could be concluded that for entire VAR model the errors are normally distributed.

Finally, the VAR model stability was tested, and the results show Eigenvalue stability conditions. All the eigenvalues lie inside the unite circle and VAR model satisfies stability condition.

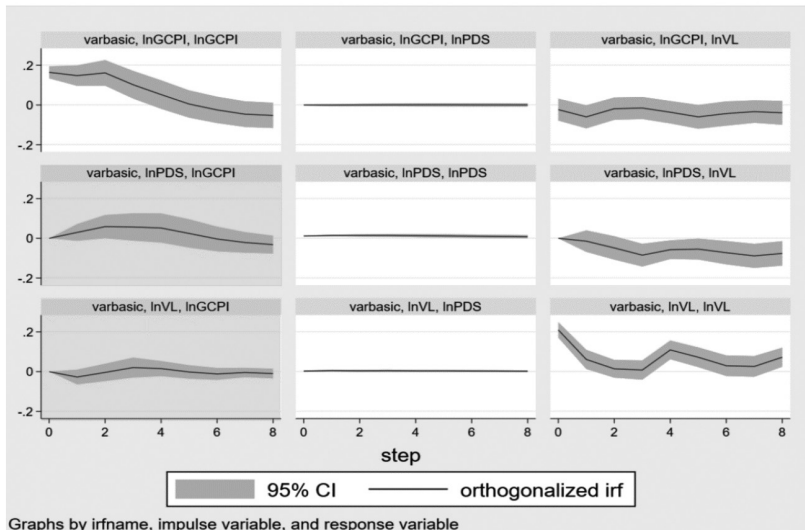
Graph 1 Roots of the companion matrix



Source: Authors` calculation

Impulse response functions (Figure 2) illustrate the response of one variable to shocks in another variable in the system, while keeping all other shocks equal to zero.

Graph 2 Impulse Response Function



Source: Authors` calculation

The Figure 2 presents the response of GDP to the shock of excess liquidity (VL) and placements to the domestic sector (PDS). Specifically, when a positive shock appears in VL and PDS at the current stage, CPI shows positive response during the early periods.

5 CONCLUSION

During the pandemic times, it is necessary to stabilize economy and financial system. The problem with inflation occurs when monetary regulators cannot provide active monetary policy. In the period of external shocks central bank should apply unconventional monetary tools and macroprudential measures. The results of this research confirm that unconventional monetary policy and additional liquidity to the banking system, through unconventional measures, like asset purchasing programs positively affect the inflation. The impulse response function shows the reaction of GDP to the shock of additional liquidity and placements to the domestic sector. When a positive shock appears in unconventional policy at the current stage, CPI shows positive response during the early periods. This confirms the thesis of efficiency of macroprudential policy even in situation of limited monetary policy options.

The main intention of the research was to prove the efficiency of unconventional monetary policy to the external shocks. The analysis confirmed the greater effectiveness of unconventional and macroprudential instruments in times of shock and crisis.

Due to the relatively short period of the pandemic crisis (one year), future research will have a stronger significance. It is recommended to monitor the phases of business and credit cycles and to continuously evaluate the measures and instruments used to recover the economy. It is very important for decision and policy makers to have quantitative bases determined by an adequate methodology for designing policy and regulatory framework.

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