

**TRANSMISSION OF MONETARY POLICY IN DEVELOPING COUNTRIES IN  
CONDITIONS OF GLOBAL INFLATION GROWTH- THE CASE OF NORTH  
MACEDONIA AND SERBIA**

**Vlatko PACESKOSKI**

PhD, Faculty of Economic, Goce Delcev University, Stip, North Macedonia

E-mail: vlatko.paceskoski@ugd.edu.mk

ORCID ID: 0009-0006-4352-798X

**Filip TASKOVSKI**

PhD Candidate, Faculty of Economic, Goce Delcev University, Stip, North Macedonia

E-mail: filip.30825@student.ugd.edu.mk

ORCID ID: 0009-0002-6440-3944

**Abstract**

Monetary policy in coordination with fiscal policy is a key determinant for maintaining the macroeconomic stability of countries through the creation of conventional and non-conventional measures in crisis situations. The disruption of global supply chains and the limitation of the supply of oil and oil products resulted in a global increase in inflation, from which developing countries were the most affected countries. Similarly, the Central Banks undertook a series of measures aimed at cushioning the shock and returning inflation within the established corridor. The subject of the research paper is an analysis of the effectiveness of monetary policy in the stabilization of inflation in North Macedonia and Serbia. The purpose of the research is to evaluate the impact of monetary measures on the economic flows of North Macedonia and Serbia through the transmission channels by applying the SVAR model. The research was done using secondary methods and the SVAR model. According to the results of the research, it can be concluded that North Macedonia and Serbia recorded a significant increase in inflation caused by mostly global factors, and the monetary policy in both countries had a significant participation in the stabilization of inflation and the macroeconomic situation.

**Keywords:** Inflation, transmission mechanism, monetary policy, Central bank, interest rate.

**INTRODUCTION**

The emergence of the Corona crisis at the beginning of 2020 caused a significant global economic destabilization that contributed to the destabilization of the financial and commodity markets and conditions for the creation of a series of macroeconomic measures in the direction of the stabilization of national economies (di Giovanni, Kalemli-Özcan, Silva, & Yildirim, 2022). Namely, the beginning of the Russian special operation in Ukraine caused further disruption of global supply chains, interruption of trade in Russian oil and Russian gas, and difficult export of Ukrainian wheat, which is one of the key conditions for maintaining stable prices on the global stock markets (Peterson, 2022). The introduction of economic sanctions and the termination of trade relations between Western countries and the Russian Federation further disrupted international economic relations, conditions for the growth of prices of key energy sources, raw materials and food, resulting in a significant global increase in inflation (Pera, 2023) (Akindoyin, 2024). Although the sanctions were intended to slow down the Russian economy, the countries that introduced the sanctions faced a high rate of inflation, primarily the countries of Europe. It is characteristic that small and import-dependent economies faced the highest rates of inflation, which was characterized as import inflation.

After the beginning of the Russian special operation in Ukraine, North Macedonia and Serbia, as small and open economies, faced a series of economic consequences, mostly of an import nature. As a result of the high rate of inflation, the central banks of the countries undertook a series of conventional measures, the most widespread of which was the measure of growth of the reference interest rate, which was aimed at slowing down credit placements, and thus reducing the expectations of companies and the population for the so-called cheap borrowing, which would reduce consumption and stabilize inflation (Paceskoski & Taskovski, 2024).

The starting hypothesis in the research is that the reference interest rate is an effective transmission mechanism for the stabilization of inflation in North Macedonia and Serbia.

The research is based on secondary methods and applied descriptive statistics, correlational analysis and SVAR model respectively for North Macedonia and Serbia.

### LITERATURE REVIEW

The research of inflation and the transmission of monetary policy is significant for the creation of monetary measures and policies. The start of the Russian special operation in Ukraine is causing significant damage to global supply chains that is contributing to global inflation. The interconnectedness of global supply chains makes change highly militarized on or protected. Fick & Tillmann (2022) argue that the disruption of global supply chains causes economic consequences for countries and the Eurozone as a monetary union, and also has a major impact on food price growth. Diaz, Cunado & de Gracia (2024) argue that since 2010 supply-side shocks are key drivers of inflation. They conclude that after the emergence of the Covid 19 pandemic, inflationary pressures on the supply side are strengthening. One of the most common macroeconomic models for inflation research is VAR models. Namely, VAR models provide guidance for predicting the movement of inflation and therefore creating macroeconomic policies (Bobeica & Hartwig, 2023). Lenza & Primiceri (2020) claim that after the emergence of Covid-19, the macroeconomic situation in a large number of countries is unstable, and as a result, macroeconomic analyzes and projections are a challenge due to the emergence of significant standard deviations of selected macroeconomic variables. Diegel & Nautz (2021) for the examination of long-term inflation expectations and transmission of monetary policy shocks, they apply the SVAR model, coming to the conclusion that long-term inflation expectations in the USA react immediately after the monetary shock and that the monetary policy of the Fed is a key factor for stabilizing the economy in conditions of destabilization or structural changes.

### MATERIALS AND METHODS

The subject of research is the role of monetary policy and the efficiency of the transmission mechanism of monetary policy in North Macedonia and Serbia during the global growth of inflation. The purpose of the research is to identify the key monetary measures adopted by the Central Banks of North Macedonia and Serbia and to determine whether the channels of transmission of monetary measures are efficient and have a significant impact on the stabilization of inflation.

The research is based on secondary methods: induction method, deduction method, analysis and synthesis. When choosing a source of data, and with the aim of increasing the degree of relevance of the research results, several criteria are taken into account, such as: the relevance of the institution that publishes the data, the date of publication, the relationship of the data with the objectives of the research and the degree of scientific contribution of data to research. The data in the research are monthly and refer to the period from 01/2015 to 12/2023, that is, a total of 108 observations. Empirical research is composed of: descriptive statistics, correlation analysis and SVAR model.

Research hypothesis:

**H1:** The short-term domestic interest rate is a key intermediate target for controlling inflation.

**H1.1:** The short-term domestic interest rate is a key intermediate target for controlling inflation in North Macedonia.

**H1.2:** The short-term domestic interest rate is a key intermediate target for controlling inflation in Serbia.

Description	Unit	Source
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Inflation rate	INFM/INFS	NBRNM/NBS
Industrial production	INPM/INPS	SSOM/SSOS
Exchange rate USD/MKD; USD/SRB	EXRM/EXRS	NBRNM/NBS
Monetary aggregate M1	MM1M/MM1S	NBRNM/NBS
Domestic interest rate	DIRM/DIRS	NBRNM/NBS
Euro Area interest rate	EUR	ECB
Average global BRENT Oil price	BROL	FED St. Louis
Global price of energy index	GPEI	FED St. Louis
Gas global price	GSGP	FED St. Louis
Global price of Wheat	GPWH	FED St. Louis

\*NBRNM – National Bank of the Republic of North Macedonia

\*SSO – State Statistic Office of the Republic of North Macedonia

## FINDINGS

### Descriptive statistics

As shown in Table 1 it can be concluded that the average monthly value of inflation in North Macedonia in the research period is 3.47%, it has a significant deviation from the maximum and minimum value of 82.48%. A relatively high standard deviation is observed for the USD/MKD exchange rate. It is characteristic that the average value of the short-term interest rate in North Macedonia is 1.75 percentage points higher than the one in the Eurozone and is 1.92. According to the descriptive statistics, the variables representative of the global economic flows has a high standard deviation, which is evidence of the significant oscillations during the observed period.

Table 1. Descriptive statistics – North Macedonia

	INFM	INPM	EXRM	MM1M	DIRM	EUR	BROL	GPEI	GSGP	GPWH
Mean	3.472222	101.1296	54.77954	160743.2	1.916019	0.167544	65.09380	154.6510	11.02889	211.9512
Median	1.500000	101.0750	54.81500	154616.6	1.690000	-0.318925	63.37500	134.6750	6.707019	188.4987
Maximum	19.80000	146.1000	62.95000	261404.6	4.500000	3.971636	122.7100	376.4100	69.98000	444.1566
Minimum	-1.500000	48.90000	49.33000	85615.06	1.310000	-0.581957	22.74000	55.89000	1.460000	122.5498
Std. Dev.	5.271752	11.22154	2.657267	51383.14	0.831942	1.239976	19.52078	64.94501	11.79010	73.08680
Skewness	1.822283	-0.756513	0.324838	0.138918	2.011374	2.208150	0.539821	1.411376	2.595094	1.108964
Kurtosis	5.213215	8.869249	3.333337	1.561218	5.917058	6.356977	3.299360	4.681064	10.38796	3.401316
Jarque-Bera	81.81531	165.3180	2.399363	9.662795	111.1127	138.4785	5.648601	48.57257	366.8401	22.86118
Probability	0.000000	0.000000	0.301290	0.007975	0.000000	0.000000	0.059350	0.000000	0.000000	0.000011
Sum	375.0000	10922.00	5916.190	17360269	206.9300	18.09480	7030.130	16702.31	1191.120	22890.73
Sum Sq. Dev.	2973.677	13473.75	755.5345	2.83E+11	74.05759	164.5167	40773.52	451310.4	14873.68	571559.8
Observations	108	108	108	108	108	108	108	108	108	108

Source: Author's calculation

As shown in Table 2 the mean value of inflation in Serbia is 4.41%, with a relatively high standard deviation. It is characteristic that the domestic short-term interest rate has a higher value than the one in the Eurozone by 3 percentage points.

Table 2. Descriptive statistics – Serbia

	INFS	INPS	EXRS	MM1S	DIRS	EUR	BROL	GPEI	GSGP	GPWH
Mean	4.406481	101.1963	106.2126	907265.9	3.165093	0.167544	65.09380	154.6510	11.02889	211.9512
Median	2.150000	101.7000	106.4859	784782.1	3.065000	-0.318925	63.37500	134.6750	6.707019	188.4987
Maximum	16.20000	117.3000	119.5536	1751528.	10.13000	3.971636	122.7100	376.4100	69.98000	444.1566
Minimum	0.100000	73.00000	95.45240	396418.2	0.870000	-0.581957	22.74000	55.89000	1.460000	122.5498
Std. Dev.	4.573047	7.798453	5.651542	372046.0	1.843640	1.239976	19.52078	64.94501	11.79010	73.08680
Skewness	1.408628	-0.557247	0.085306	0.331539	0.935464	2.208150	0.539821	1.411376	2.595094	1.108964
Kurtosis	3.567484	3.525015	2.416227	1.707579	4.187332	6.356977	3.299360	4.681064	10.38796	3.401316
Jarque-Bera	37.16534	6.829810	1.664550	9.495111	22.09558	138.4785	5.648601	48.57257	366.8401	22.86118
Probability	0.000000	0.032880	0.435058	0.008673	0.000016	0.000000	0.059350	0.000000	0.000000	0.000011
Sum	475.9000	10929.20	11470.97	97984718	341.8300	18.09480	7030.130	16702.31	1191.120	22890.73
Sum Sq. Dev.	2237.665	6507.299	3417.572	1.48E+13	363.6939	164.5167	40773.52	451310.4	14873.68	571559.8
Observations	108	108	108	108	108	108	108	108	108	108

Source: Author's calculation

### Correlation analysis

The correlation matrix in Table 3 shows that inflation in North Macedonia has a strong positive correlation with all variables except industrial production. The correlation between inflation and the domestic short-term interest rate is 0.43, and between inflation and variables representative of global economic flows in the interval from 0.72 to 0.83. The strongest positive correlation exists between the domestic short-term rate and the short-term rate prescribed by the ECB.

Table 3. Correlation analysis – North Macedonia

	INFM	INPM	EXRM	MM1M	DIRM	EUR	BROL	GPEI	GSGP	GPWH
INFM	1.000000	-0.056204	0.530133	0.682433	0.428468	0.523830	0.718904	0.807361	0.756768	0.828050
INPM	-0.056204	1.000000	-0.072079	-0.138771	-0.028410	-0.033948	0.179072	0.072685	-0.027074	-0.051982
EXRM	0.530133	-0.072079	1.000000	0.171746	0.397720	0.418270	0.301459	0.415038	0.469150	0.339964
MM1M	0.682433	-0.138771	0.171746	1.000000	0.383579	0.523183	0.598816	0.597748	0.503944	0.734041
DIRM	0.428468	-0.028410	0.397720	0.383579	1.000000	0.972199	0.273872	0.187644	0.094679	0.221730
EUR	0.523830	-0.033948	0.418270	0.523183	0.972199	1.000000	0.364436	0.276301	0.168982	0.334455
BROL	0.718904	0.179072	0.301459	0.598816	0.273872	0.364436	1.000000	0.927719	0.733166	0.785883
GPEI	0.807361	0.072685	0.415038	0.597748	0.187644	0.276301	0.927719	1.000000	0.925569	0.857585
GSGP	0.756768	-0.027074	0.469150	0.503944	0.094679	0.168982	0.733166	0.925569	1.000000	0.782792
GPWH	0.828050	-0.051982	0.339964	0.734041	0.221730	0.334455	0.785883	0.857585	0.782792	1.000000

Source: Author's calculation

The correlation matrix in Table 4 shows a strong positive correlation between inflation and M1, the short-term interest rate in the Eurozone and variables representative of global economic flows. The correlation between inflation and the domestic short-term interest rate is 0.23. The strongest correlation is observed between the Global Electricity Price Index. energy and the average monthly price of BRENT oil.

Table 4. Correlation analysis - Serbia

	INFS	INPS	EXRS	MM1S	DIRS	EUR	BROL	GPEI	GSGP	GPWH
INFS	1.000000	0.012498	0.327868	0.732707	0.229293	0.700656	0.721529	0.766532	0.690464	0.801961
INPS	0.012498	1.000000	0.185510	-0.206423	0.284386	0.124732	0.073229	0.021989	-0.016996	-0.127611
EXRS	0.327868	0.185510	1.000000	-0.108025	0.433485	0.268834	0.068101	0.191318	0.283938	0.086999
MM1S	0.732707	-0.206423	-0.108025	1.000000	-0.215135	0.561767	0.604437	0.608993	0.518690	0.739942
DIRS	0.229293	0.284386	0.433485	-0.215135	1.000000	0.581921	0.036680	-0.026098	-0.053530	-0.056661
EUR	0.700656	0.124732	0.268834	0.561767	0.581921	1.000000	0.364436	0.276301	0.168982	0.334455
BROL	0.721529	0.073229	0.068101	0.604437	0.036680	0.364436	1.000000	0.927719	0.733166	0.785883
GPEI	0.766532	0.021989	0.191318	0.608993	-0.026098	0.276301	0.927719	1.000000	0.925569	0.857585
GSGP	0.690464	-0.016996	0.283938	0.518690	-0.053530	0.168982	0.733166	0.925569	1.000000	0.782792
GPWH	0.801961	-0.127611	0.086999	0.739942	-0.056661	0.334455	0.785883	0.857585	0.782792	1.000000

Source: Authors' calculation

### SVAR results

The ADF test tests the null hypothesis that the time series has a unit root. It has been determined that there is a single root in the time series, with the fact that the time series for North Macedonia and Serbia are differentiated from the first order. According to the post-differentiation test, it was determined that the time series are stationary.

According to the testing of the delay period for the specification of the VAR model, according to the Final prediction error, Akaike information criterion, Schwarz information criterion and Hannan Quinn information criterion tests for North Macedonia and according to FP and HQ for Serbia, it was determined that 1 delay period is the most optimal for The VAR model.

As shown in Table 5 in the case of North Macedonia, all variables with the exception of inflation from the previous period have a statistically significant impact. Namely, the monetary aggregate M1 has a positive impact on inflation, also the domestic short-term interest rate has a positive impact on inflation, which shows that it is an efficient transmission mechanism for controlling inflationary pressure, the growth of oil, gas, electricity and grain prices have a positive effect on inflation that matches expectations.

Table 5. Variance decomposition of inflation – North Macedonia

Variance Decomposition of D(INFM):											
Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5	Shock6	Shock7	Shock8	Shock9	Shock10
1	0.708721	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.803199	94.07328	1.441484	0.147104	0.753865	0.788065	0.002937	0.831495	0.085768	0.027208	1.848794
3	0.837896	91.41830	1.438266	0.281497	0.870154	1.192059	0.124469	2.109792	0.154397	0.068628	2.342438
4	0.850424	89.81244	1.443819	0.449574	0.920379	1.343384	0.447753	2.758343	0.150164	0.096984	2.577157
5	0.855847	88.82178	1.428902	0.550229	0.938784	1.428782	0.885255	3.001616	0.164754	0.102792	2.677107
6	0.859266	88.11630	1.418057	0.613620	0.937135	1.489746	1.321517	3.081712	0.197381	0.103727	2.720805
7	0.862058	87.59018	1.412934	0.652720	0.932219	1.531220	1.707354	3.098780	0.236661	0.103893	2.734034
8	0.864511	87.19026	1.411696	0.677486	0.926964	1.557836	2.030170	3.093327	0.274399	0.103538	2.734320
9	0.866635	86.88502	1.412472	0.693521	0.922509	1.575187	2.289000	3.082268	0.307807	0.103124	2.729093
10	0.868413	86.65284	1.414159	0.704125	0.918994	1.586471	2.491749	3.070837	0.335650	0.102725	2.722444

Source: Authors' calculation

As shown in Table 6 Serbia, with the exception of inflation from the previous period, all variables have a statistically significant impact on inflation. It is characteristic that the domestic short-term interest rate has a significant negative impact on inflation, which makes it an effective intermediate target for inflation control.

Table 6. Variance decomposition of inflation – Serbia

Variance Decomposition of D(LINFS):											
Period	S.E.	Shock1	Shock2	Shock3	Shock4	Shock5	Shock6	Shock7	Shock8	Shock9	Shock10
1	0.325853	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.358178	83.95402	0.050602	0.000424	0.270594	10.78063	0.529277	4.187898	0.085081	0.065768	0.075703
3	0.363148	81.82448	0.229029	0.279794	0.516052	10.55087	0.532758	5.501304	0.101043	0.101730	0.362935
4	0.363723	81.57003	0.238670	0.329854	0.536477	10.54854	0.545628	5.483993	0.263894	0.106605	0.376311
5	0.363943	81.47226	0.250798	0.336311	0.563083	10.53608	0.544969	5.508876	0.266397	0.130913	0.390304
6	0.363973	81.45902	0.251207	0.337800	0.564731	10.53680	0.545554	5.511447	0.270428	0.132314	0.390702
7	0.363980	81.45620	0.251197	0.337808	0.564713	10.53715	0.545569	5.513472	0.270438	0.132683	0.390769
8	0.363980	81.45598	0.251248	0.337823	0.564717	10.53713	0.545627	5.513480	0.270481	0.132736	0.390780
9	0.363980	81.45591	0.251251	0.337823	0.564728	10.53712	0.545677	5.513475	0.270492	0.132743	0.390785
10	0.363980	81.45587	0.251251	0.337828	0.564728	10.53712	0.545702	5.513473	0.270492	0.132743	0.390790

Source: Authors' calculation

## DISCUSSION

The research shows that inflation in North Macedonia has a strong correlation with all research variables except industrial production, in the case of Serbia a significant positive correlation is observed between inflation and the monetary aggregate M1 and the short-term interest rate in the Eurozone. A positive correlation is also found between inflation and the domestic interest rate. According to SVAR, all variables in the model, with the exception of inflation from the previous period, have a statistically significant impact on inflation in North Macedonia and Serbia. Consequently, the general research hypothesis is accepted.

## CONCLUSION

North Macedonia and Serbia, in order to stabilize domestic inflation, which had significant growth as a result of world economic and political challenges and the growth of global inflation, permanently increased the reference interest rate on treasury bills. According to the research, it can be concluded that the short-term interest rate in North Macedonia is a significant intermediate target for controlling inflation, and in the case of Serbia, the interest rate has a statistically significant impact on the decline in inflation in Serbia, which makes it a significant intermediate target and an efficient channel of monetary policy transmission.

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