ICEMIT BLACE
The Second International Scientific Conference on Economics, Management and Information Technologies – ICEMIT 2025
CONFERENCE PROCEEDINGS

Monetary policy effectiveness in the context of global inflation growth: Evidence from North Macedonia

Filip Taskovski[a*], Vlatko Paceskoski[b]

[a] Goce Delcev University, Stip, Faculty of Economics, N. Macedonia

Article info

Original scientific paper

DOI:
https://doi.org/10.71159/icemit2508T

Abstract

Monetary policy, in interaction with fiscal policy, is a central instrument for ensuring macroeconomic stability, especially in periods of heightened global inflationary pressures. The recent global surge in prices, largely triggered by disruptions in supply chains and the restricted availability of oil and energy products, has significantly affected small and open economies. North Macedonia represents a particularly relevant case, as its high external dependency has amplified the transmission of global shocks into domestic price dynamics. This study investigates the effectiveness of monetary policy in stabilizing inflation and safeguarding macroeconomic balance in North Macedonia. The analysis focuses on the transmission channels through which monetary measures operate and evaluates the extent to which domestic policy responses mitigate external inflationary pressures. The findings reveal that while inflationary trends were predominantly driven by global factors, monetary policy interventions contributed meaningfully to cushioning adverse effects, supporting price stability, and preserving the broader macroeconomic framework.

***Keywords*:** *monetary policy, inflation, global shocks, macroeconomic stability, North Macedonia*

1. Introduction

The COVID-19 pandemic, which unfolded in early 2020, exposed profound vulnerabilities in the global economic system and precipitated a wave of destabilization across financial and commodity markets. For small and open economies such as North Macedonia, the repercussions of this crisis were especially severe, as their structural dependence on imports magnified external shocks. The situation was further aggravated by the outbreak of the war in Ukraine, which disrupted global supply chains, curtailed energy flows, and restricted the availability of essential commodities, most notably Ukrainian wheat—a factor vital for the stability of international food prices (Posen, 2022).

The imposition of sanctions and the reconfiguration of global trade relations exacerbated inflationary pressures, leading to substantial increases in the prices of energy, raw materials, and food (Akindoyin, 2024). Although sanctions were primarily intended to restrain the Russian economy, their spillover effects proved particularly damaging for smaller economies. North Macedonia, heavily dependent on imports of energy and basic goods, experienced pronounced "imported inflation," which quickly translated into elevated domestic consumer prices.

In this context, the National Bank of the Republic of North Macedonia was compelled to respond with conventional stabilization measures, most notably by increasing the reference interest rate. This policy instrument aimed to temper credit expansion, adjust expectations regarding cheap borrowing, and thereby suppress aggregate demand as a mechanism to curb inflationary growth (Taskovski & Paceskoski, 2024). The effectiveness of such a measure lies not only in its immediate impact on consumption and investment but also in its signaling role, reinforcing public confidence in the central bank's commitment to price stability.

The central premise of this study is that the reference interest rate serves as the most significant transmission channel for inflation stabilization in North Macedonia under current global conditions. The research hypothesis (H1) posits that monetary policy interventions by the National Bank of the Republic of North Macedonia, specifically adjustments to the reference interest rate, are expected to moderate inflationary pressures and contribute to the stabilization of economic

*Corresponding author
E-mail address: filip.30825@student.ugd.edu.mk

dynamics in North Macedonia. Utilizing secondary data, descriptive statistics, correlational analysis, and a Structural Vector Autoregression (SVAR) model, the study assesses the responsiveness of inflation to monetary policy interventions. The findings are expected to contribute to a broader understanding of the effectiveness of monetary policy in small, import-dependent economies facing persistent external shocks.

2. Theoretical background

The COVID-19 pandemic engendered a profound contraction in global economic activity. Widespread closures of enterprises, particularly in advanced economies such as the United States, alongside declines in aggregate demand and the deferment or cancellation of numerous commercial transactions, events, and investment projects, exacerbated financial market instability and heightened overall economic uncertainty. Empirical evidence suggests that, during this period, both households and firms adopted highly conservative financial behaviors, emphasizing cash preservation to safeguard liquidity. Consequently, this cautious stance constrained the credit supply of banking institutions, further impeding economic activity (Milstein & Wessel, 2024).

Aguilar, Cantú, & Guerra (2023) observe that, for the first time since the Great Depression, both developed and developing economies confronted a synchronized recession of unprecedented magnitude. In response, governments and central banks implemented a combination of conventional and unconventional policy interventions designed to mitigate the downturn and catalyze economic recovery. Their findings indicate that countries with higher public revenue capacity were able to deploy more extensive fiscal measures than those with limited fiscal space. Moreover, sovereign credit ratings emerged as a pivotal determinant of public expenditure, with lower-rated nations possessing constrained fiscal maneuverability to design and execute countercyclical strategies during the crisis (Pera, 2023) (Calderon & Kubota, 2021).

At the outset of the pandemic, the prevailing low interest rate environment compelled central banks to resort to unconventional monetary instruments to preserve financial stability. Market freezes, declining equity indices, and diminished liquidity within commercial banks necessitated interventions primarily aimed at ensuring uninterrupted market operations while sustaining sufficient liquidity to facilitate corporate lending and stimulate economic activity. These interventions were largely executed through open market operations, including the purchase of government and corporate securities. In developing economies, central banks additionally engaged in active foreign exchange market operations to alleviate pressures on currency valuations and mitigate adverse effects arising from exchange rate volatility (Barone et al., 2025). Notably, reductions in statutory reserve requirements represented a critical tool, enhancing banking sector liquidity and reinforcing support for economic activity.

The nascent recovery from the COVID-19 shock was subsequently disrupted by the Russia-Ukraine conflict, which precipitated severe disruptions in global supply chains, particularly for essential commodities such as grains and energy resources originating from the affected regions. These supply-side constraints curtailed aggregate supply and contributed to a pronounced acceleration in global inflation (Ciu et al., 2023).

In response to the ensuing inflationary pressures, central banks that had previously maintained highly accommodative stances adopted restrictive policy measures, with the most prominent being increases in policy interest rates. For example, the European Central Bank (ECB), which had maintained negative overnight deposit rates prior to the conflict and last increased its key policy rate in 2011, initiated a series of rate hikes (Ferreira et al., 2025). Similarly, the Federal Reserve (FED) raised the federal funds rate multiple times from near-zero levels, ultimately reaching 2.75%. The FED emphasized that these rate increases are largely transitory and that the economy is expected to adjust, maintaining long-term inflation expectations around 2.5% (Tsutsunashvili et al., 2024). Analogously, numerous developing economies affected by the Russia-Ukraine conflict, particularly those with flexible exchange rate regimes, responded by raising interest rates as a primary instrument of monetary stabilization (Lo et al., 2022).

3. Data and methodology

Research design

This research employs a quantitative empirical approach to examine the role and efficiency of monetary policy transmission mechanisms in North Macedonia during the period of global inflationary pressures. The study is designed to identify and evaluate the main monetary policy measures adopted by the National Bank of the Republic of North Macedonia (NBRNM) and to assess the effectiveness of the transmission channels in stabilizing inflation.

The research framework combines descriptive statistical analysis, correlation analysis, and econometric modeling (Structural Vector Autoregression – SVAR) to capture both the short-term and dynamic interactions between monetary instruments, inflation, and macroeconomic indicators.

Data and variables

The analysis is based on secondary monthly data spanning the period from January 2015 to December 2023, totaling 108 observations. The dataset encompasses a range of domestic and international variables, allowing for a comprehensive examination of the factors influencing inflation and monetary dynamics in North Macedonia. The period covers both pre- and post-COVID-19 shocks, as well as the global inflationary pressures following the Russia–Ukraine conflict, providing a robust context for macroeconomic analysis.

Primary sources include the National Bank of the Republic of North Macedonia (NBRNM) for monetary aggregates, domestic interest rates, exchange rates, and the inflation rate; the State Statistical Office of North Macedonia (SSO) for industrial production indices; the European Central Bank (ECB) for the Euro Area reference interest rate; and the Federal Reserve Bank of St. Louis (FRED) for global commodity prices, including oil, gas, energy, and wheat. The key variables employed in the analysis are summarized in Table 1.

Table 1. Research variables

Variable	Symbol	Description	Unit
Inflation rate	INFL	Inflation in Macedonia, monthly data, annualized rate	% per month
Industrial production	IND_PROD	Industrial production index in Macedonia, base year = 2015, monthly data	Index (2015=100)
Exchange rate USD/MKD	EXCH_RATE	Nominal exchange rate of Macedonian denar to US dollar, monthly average	MKD per USD
Monetary aggregate M1	MONET_AGG_M1	Narrow money supply in Macedonia (currency in circulation + demand deposits), monthly data	Million MKD
Macedonian interest rate	INT_RATE	Central bank reference interest rate, monthly observations	% per annum
Euro Area interest rate	EU_INT_RATE	Benchmark interest rate of Eurozone (ECB main refinancing rate), monthly observations	% per annum
BRENT oil price	BRNT_OIL	Average monthly Brent crude oil price	USD per barrel
Global price of energy index	ENER_INDEX	Global energy price index including oil, gas, coal, monthly data	Index (2015=100)
Global gas price	GAS	Average monthly global natural gas price	USD per MMBtu
Global price of wheat	WHEAT	Average monthly global wheat price	USD per ton

In addition to domestic macroeconomic indicators, international commodity prices are included to capture external cost pressures on the economy. Brent crude oil, natural gas, and wheat prices are particularly relevant, as fluctuations in these markets directly influence production costs, energy expenditures, and food prices in North Macedonia. By incorporating these commodities, the dataset allows for a more comprehensive assessment of both global and domestic factors affecting inflation dynamics.

Collectively, these variables capture both domestic and international determinants of inflation and monetary dynamics, providing a solid foundation for econometric modeling and analysis. The inclusion of both macroeconomic indicators and commodity prices allows for a nuanced understanding of inflationary pressures and the transmission of monetary policy.

Methods

To comprehensively analyze the impact of monetary policy on inflation, this study employs a combination of descriptive statistics, correlation analysis, and a Structural Vector Autoregression (SVAR) model. Each of these methods contributes uniquely to understanding the underlying economic dynamics.

Descriptive statistics - Initially, descriptive statistics were utilized to summarize the central tendencies, dispersion, and distributional properties of the selected indicators.

Correlation analysis - Subsequently, correlation analysis was applied to examine the linear relationships between monetary variables and inflation.

The study applies a Structural Vector Autoregression (SVAR) framework to examine the dynamic interactions among key macroeconomic variables. This approach is particularly effective for identifying structural shocks and tracing the effects of monetary policy interventions, while accounting for endogenous feedback within the system. Lag lengths were determined using standard information criteria, and theoretically justified restrictions were imposed to ensure proper model identification.

Complementing the SVAR analysis, descriptive statistics and correlation measures were computed to explore the characteristics of the data, assess variability, and detect potential deviations from normality. Together, these methods provide a robust foundation for investigating both the patterns and the causal mechanisms underlying monetary policy and inflation dynamics.

4. Results

To investigate the causal relationships among inflation, monetary variables, and external shocks, a Structural VAR (SVAR) model was estimated. Unlike standard regression approaches, the SVAR framework allows for the identification of structural shocks and the tracing of impulse responses, providing a clear understanding of how monetary policy actions propagate through the economy. The estimated model can be expressed as follows:

*INFL = C(1,1)*INFL(-1) + C(1,2)*INFL(-2) + C(1,3)*INFL(-3) + C(1,4)*IND_PROD(-1) + C(1,5)*IND_PROD(-2) + C(1,6)*IND_PROD(-3) + C(1,7)*EXCH_RATE(-1) + C(1,8)*EXCH_RATE(-2) + C(1,9)*EXCH_RATE(-3) + C(1,10)*MONET_AGG_M1(-1) + C(1,11)*MONET_AGG_M1(-2) + C(1,12)*MONET_AGG_M1(-3) + C(1,13)*INT_RATE(-1) + C(1,14)*INT_RATE(-2) + C(1,15)*INT_RATE(-3) + C(1,16)*EU_INT_RATE(-1) + C(1,17)*EU_INT_RATE(-2) + C(1,18)*EU_INT_RATE(-3) + C(1,19)*BRNT_OIL(-1) + C(1,20)*BRNT_OIL(-2) + C(1,21)*BRNT_OIL(-3) + C(1,22)*ENER_INDEX(-1) + C(1,23)*ENER_INDEX(-2) + C(1,24)*ENER_INDEX(-3) + C(1,25)*GAS(-1) + C(1,26)*GAS(-2) + C(1,27)*GAS(-3) + C(1,28)*WHEAT(-1) + C(1,29)*WHEAT(-2) + C(1,30)*WHEAT(-3) + C(1,31)*

In this specification, inflation is modeled as a function of its own lags, industrial production, exchange rate, monetary aggregate M1, domestic and EU reference interest rates, and international commodity prices, including Brent oil, energy, gas, and wheat. The model incorporates theoretically justified restrictions, allowing it to capture the timing and magnitude of inflation responses to monetary and external shocks. This approach provides a detailed view of the dynamic interactions within the macroeconomic system and highlights how changes in policy and external conditions influence inflation over time.

The descriptive statistics in Table 2 highlight substantial variation across the series. Inflation averaged 3.47% with a standard deviation of 5.27%, suggesting episodes of both moderate and elevated price growth. Such volatility is typical for small open economies, where inflation is strongly influenced by global energy and food markets. The negative skewness and excess kurtosis of the inflation series further indicate that extreme values and downside risks were more frequent than would be expected under a normal distribution.

Similar dispersion is observed in the Macedonian and EU reference interest rates, reflecting the monetary policy adjustments undertaken to counter inflationary shocks. While necessary, these interventions increased the variability of policy rates over the sample. Oil prices, consistent with their historical behavior, show marked volatility and heavy-tailed distributions, confirming their susceptibility to geopolitical tensions and supply-side disruptions.

The Russia–Ukraine conflict amplified these dynamics, with gas, energy, and wheat prices recording exceptionally high standard deviations. Their positively skewed and leptokurtic distributions suggest that sudden price surges were more common and more extreme than downward corrections. Overall, the statistics confirm that the data are highly volatile and non-normally distributed, underscoring the need for econometric approaches capable of handling such irregularities.

Table 2. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	Obs.
INFL	3.472	5.272	-1.500	19.800	108
IND_PROD	101.130	11.222	48.900	146.100	108
EXCH_RATE	54.780	2.657	49.330	62.950	108
MONET_A	160743.200	51383.140	85615.060	261404.600	108
INT_RATE	1.916	0.832	1.310	4.500	108
EU_INT_RA	0.168	1.240	-0.582	3.972	108
BRNT_OIL	65.094	19.521	22.740	122.710	108
ENER_INDEX	154.651	64.945	55.890	376.410	108
GAS	11.029	11.790	1.460	69.980	108
WHEAT	211.951	73.087	122.550	444.157	108

Source: Authors' calculation based on Eviews 12

The correlation matrix (Table 3) reveals the presence of statistically significant associations between inflation and the majority of the selected variables, with the exception of industrial production. These findings indicate that the examined variables exhibit a notable relationship with inflation in North Macedonia. In particular, positive associations are evident between the exchange rate and the EU interest rate, as well as with the prices of energy, gas, wheat, and oil. Of particular importance for this study is the robust positive association observed between M1 and both the Macedonian reference interest rate and the EU interest rate.

Table 3. Correlation analysis

Variable	1	2	3	4	5	6	7	8	9	10
1 INFL	1.000	-0.056	0.530	0.682	0.428	0.524	0.719	0.807	0.757	0.828
2 IND_PROD	-0.056	1.000	-0.072	-0.139	-0.028	-0.034	0.179	0.073	-0.027	-0.052
3 EXCH_RATE	0.530	-0.072	1.000	0.172	0.398	0.418	0.301	0.415	0.469	0.340
4 MONET_A	0.682	-0.139	0.172	1.000	0.384	0.523	0.599	0.598	0.504	0.734
5 INT_RATE	0.428	-0.028	0.398	0.384	1.000	0.972	0.274	0.188	0.095	0.222
6 EU_INT_RA	0.524	-0.034	0.418	0.523	0.972	1.000	0.364	0.276	0.169	0.334
7 BRNT_OIL	0.719	0.179	0.301	0.599	0.274	0.364	1.000	0.928	0.733	0.786
8 ENER_INDEX	0.807	0.073	0.415	0.598	0.188	0.276	0.928	1.000	0.926	0.858
9 GAS	0.757	-0.027	0.469	0.504	0.095	0.169	0.733	0.926	1.000	0.783
10 WHEAT	0.828	-0.052	0.340	0.734	0.222	0.334	0.786	0.858	0.783	1.000

Source: Authors' calculation based on Eviews 12

The unit root testing of the original time series using the Augmented Dickey–Fuller (ADF) test (Table 4) reveals that all variables, with the exception of industrial production, are non-stationary, thereby confirming the null hypothesis of the presence of a unit root. However, after applying first- and second-order differencing, respectively, the subsequent ADF test results (Table 4) indicate that the time series become stationary, leading to the rejection of the null hypothesis.

Table 4. Results of the ADF test

Variable	ADF (level) – Prob.	Integration order	ADF (after differencing) – Prob.
INFL	0.1291	1st diff.	0.0001
IND_PROD	0.0000	—	—
EXCH_RATE	0.1779	1st diff.	0.0000
MONET_AGG_M1	0.9709	2nd diff.	0.0000
INT_RATE	0.9159	1st diff.	0.0201
EU_INT_RATE	0.4020	2nd diff.	0.0000
BRNT_OIL	0.3968	1st diff.	0.0000
ENER_INDEX	0.1408	1st diff.	0.0000
GAS	0.4628	1st diff.	0.0000
WHEAT	0.6894	1st diff.	0.0000

Source: Authors' calculation based on Eviews 12

The results of the multi-criteria analysis of lag periods (Table 5) suggest that a VAR model with a lag length of three periods is the most appropriate specification.

The assessment of the optimal lag length (Table 4) reveals that, with the exception of the SC and HQ criteria, all other selection tests converge in identifying the third lag order as the most appropriate specification.

Table 5. Criteria for the selection of the VAR lag order

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2867.994	NA	8.81e+11	55.88338	56.13917*	55.98698
1	-2681.355	333.4122	1.65e+11	54.20108	57.01487	55.34076*
2	-2574.224	170.5786	1.51e+11	54.06260	59.43438	56.23835
3	-2455.606	165.8346*	1.20e+11*	53.70109*	61.63085	56.91291

*Indicates lag order selected by the criterion; Note: LR: sequential modified LR test statistic (each test at 5% level); FPE: Final Prediction Error; AIC: Akaike Information Criterion; SC: Schwarz Information Criterion; HQ: Hannan–Quinn Information Criterion.

Source: Authors' calculation based on Eviews 12

The SVAR results indicate that inflation in North Macedonia is shaped by both domestic and external factors, with effects occurring at specific lags. Lagged inflation at the second month (INFL(-2)) is negative and significant, suggesting a self-correcting mechanism where past inflation moderates current price changes.

The exchange rate at the second lag (EXCH_RATE(-2)) has a positive and significant effect, highlighting the exchange rate pass-through: currency depreciation raises import costs and overall prices. Global energy variables, notably the energy price index (ENER_INDEX(-2)) and Brent crude oil, also influence inflation with lagged effects, reflecting delayed transmission of external cost shocks.

Other variables, including industrial production, monetary aggregates, and interest rates, show limited immediate significance but indicate potential moderating roles over time. Overall, inflation responds to a combination of past domestic conditions and lagged external shocks, emphasizing the importance of timing and magnitude in policy interventions.

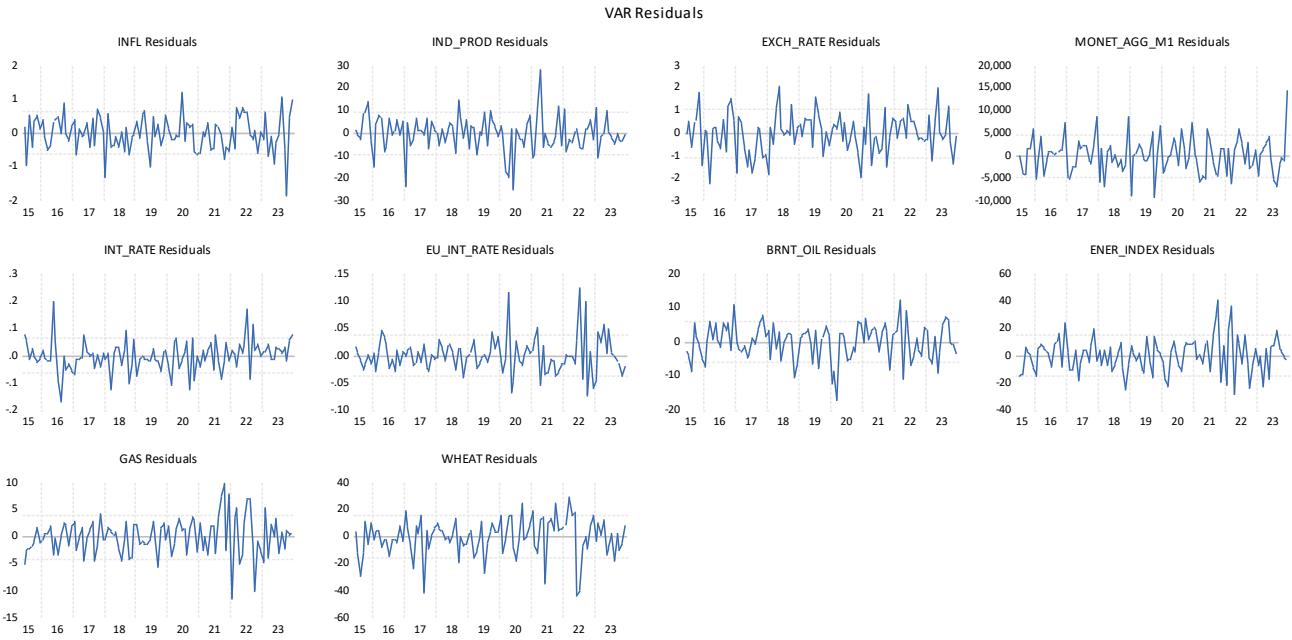
Table 6. VAR Estimates – inflation as a dependent variable

Variable	Coefficient	Std. Error	t-Statistic	p-Value
INFL(-1)	0.077	0.123	0.626	0.531
INFL(-2)	-0.237	0.120	-1.974	0.049
INFL(-3)	0.136	0.133	1.024	0.306
IND_PROD(-1)	0.246	0.721	0.341	0.733
IND_PROD(-2)	-0.401	0.781	-0.514	0.608
IND_PROD(-3)	0.000	0.692	0.000	1.000
EXCH_RATE(-1)	-2352.044	-375.288	-0.627	0.531
EXCH_RATE(-2)	1048.042	-439.056	2.387	0.017
EXCH_RATE(-3)	-3424.108	-359.380	-0.953	0.341
MONET_AGG_M1(-1)	-1928.835	-283.823	-0.680	0.497
MONET_AGG_M1(-2)	0.904	-293.140	0.309	0.758
MONET_AGG_M1(-3)	0.462	-287.808	0.161	0.872
INT_RATE(-1)	-1481.865	-189.173	-0.783	0.434
INT_RATE(-2)	3258.543	-262.741	1.240	0.434
INT_RATE(-3)	-2654.040	-175.879	-1.509	0.215
EU_INT_RATE(-1)	0.368	-169.266	0.217	0.132
EU_INT_RATE(-2)	-1763.752	-209.607	-0.841	0.828
EU_INT_RATE(-3)	-3223.000	-174.521	-1.847	0.400
BRNT_OIL(-1)	-1191.075	-121.892	-0.977	0.055
BRNT_OIL(-2)	-1202.180	-146.687	-0.820	0.329
BRNT_OIL(-3)	-1092.111	-147.673	-0.740	0.413
ENER_INDEX(-1)	4446.893	-209.719	2.120	0.460
ENER_INDEX(-2)	-1870.093	-233.870	-0.800	0.034
ENER_INDEX(-3)	2568.047	-184.740	1.390	0.424
GAS(-1)	-0.679	0.574	-1.183	0.165
GAS(-2)	0.412	0.729	0.565	0.237
GAS(-3)	-0.545	0.607	-0.897	0.572
WHEAT(-1)	0.805	-107.718	0.747	0.370
WHEAT(-2)	0.501	-140.894	0.355	0.455
WHEAT(-3)	-0.717	-106.204	-0.675	0.723

Source: Authors' calculation based on Eviews 12

The descriptive analysis of the VAR residuals (Figure 1) demonstrates that, for almost all residuals, a noticeable deviation from the central tendency emerges during specific periods. Analogously, the majority of these deviations are concentrated in the period following the onset of the COVID-19 crisis. The divergence is most pronounced in the cases of inflation, industrial production, the Eurozone three-month interest rate, as well as gas and wheat prices.

Figure 1. VAR residuals



Source: Authors' calculation based on Eviews 12

To ensure the robustness and interpretability of the SVAR estimates, a Variance Inflation Factor (VIF) analysis was performed. The results indicate that multicollinearity among the regressors is minimal, confirming that each variable provides unique information to the model. This provides confidence that the estimated coefficients accurately reflect the

underlying economic relationships, allowing for a clear assessment of both domestic and external drivers of inflation. In particular, the analysis supports the reliability of the dynamic responses observed in the model, demonstrating that lagged inflation, exchange rate movements, and global commodity price shocks exert measurable and distinct effects without being distorted by overlapping explanatory power among the regressors. Consequently, the VIF results reinforce the validity of the SVAR framework for examining the transmission of monetary policy and external shocks on inflation dynamics.

Table 7. VIF test for multicollinearity

Variable	Coefficient Variance	Uncentered VIF
IND_PROD	0.000	1.300
EXCH_RATE	16.425	1.125
MONET_AGG_M1	8.975	1.216
INT_RATE	1.342	2.180
EU_INT_RATE	1.077	2.325
BRNT_OIL	1.375	3.110
ENER_INDEX	3.028	4.342
GAS	0.317	2.049
WHEAT	1.463	1.063
Included observations: 107		

Source: Authors' calculation based on Eviews 12

Based on the Portmanteau test (Table 8) for residual autocorrelation, the null hypothesis cannot be rejected, thereby confirming the absence of autocorrelation among the residuals. This outcome provides strong evidence in favor of the robustness of the VAR model specification and enhances the empirical validity of the subsequent inference, particularly with respect to the impulse response functions and variance decomposition analyses.

Table 8. Portmanteau test for residual autocorrelation

Lags	Q-Stat	Prob.	Adj. Q-Stat	Prob.	Q-Stat
1	23.261	1.000	23.487	1.000	23.261
2	65.336	1.000	66.386	1.000	65.336
3	145.734	1.000	149.173	1.000	145.734
4	256.482	1.000	264.351	1.000	256.482
5	346.295	1.000	358.700	1.000	346.295
6	447.143	1.000	465.722	1.000	447.143
7	556.890	1.000	583.389	1.000	556.890
8	637.725	1.000	670.960	1.000	637.725
9	745.675	1.000	789.137	0.997	745.675
10	831.070	1.000	883.616	0.997	831.070
11	923.666	1.000	987.165	0.993	923.666
12	1016.766	1.000	1092.409	0.988	1016.766
Included observations: 104					

Source: Authors' calculation based on Eviews 12

The variance decomposition of inflation (Table 9) reveals that 48.31% of the fluctuations in inflation in North Macedonia are attributable to its own shocks, 6.65% to shocks stemming from changes in Brent crude oil prices, 12.51% to innovations in energy prices, 6.60% to shocks associated with gas prices, and 10.75% to variations originating from wheat prices. These results suggest that while domestic shocks play a dominant role in driving inflation dynamics, external shocks related to global energy and commodity markets also exert a considerable and non-negligible influence.

Table 9. Variance decomposition of inflation

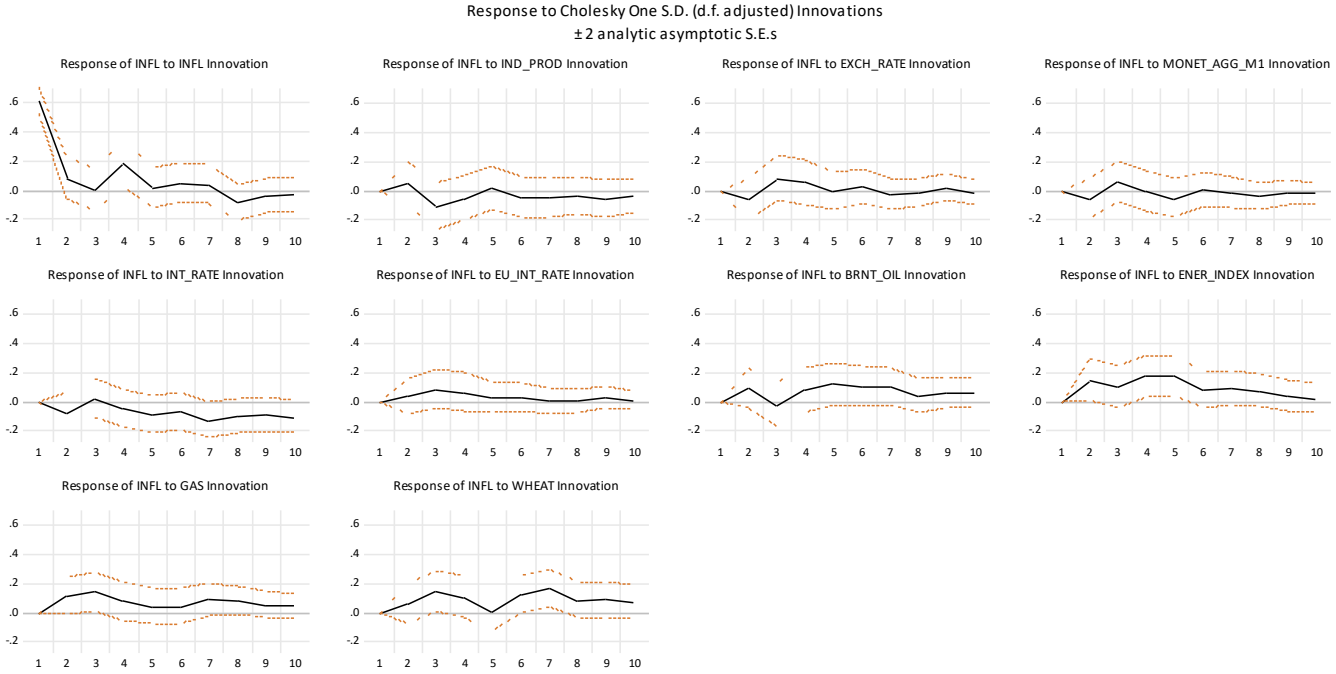
Variable / Period	1	2	3	4	5	6	7	8	9	10
S.E.	0.612	0.665	0.722	0.786	0.822	0.848	0.891	0.913	0.928	0.942
INFL	100.000	86.301	73.151	67.162	61.593	58.140	52.955	51.186	49.656	48.312
IND_PROD	0.000	0.489	2.690	2.759	2.551	2.688	2.695	2.728	3.002	3.110
EXCH_RATE	0.000	0.090	2.061	2.203	2.023	2.003	1.903	1.838	1.817	1.785
MONET_AGG	0.000	0.774	1.285	1.089	1.447	1.358	1.255	1.404	1.390	1.378
INT_RATE	0.000	1.272	1.152	1.345	2.336	2.839	4.596	5.522	6.233	7.331
EU_INT_RATE	0.000	0.261	1.574	1.901	1.842	1.855	1.685	1.606	1.625	1.581
BRNT_OIL	0.000	1.817	1.641	2.278	4.227	5.471	6.332	6.224	6.426	6.645
ENER_INDEX	0.000	4.953	6.037	9.840	13.272	13.313	13.093	13.112	12.832	12.511
GAS	0.000	2.566	5.864	5.859	5.601	5.497	5.921	6.456	6.564	6.591

Source: Authors' calculation based on Eviews 12

The analysis of the impulse response functions (Figure 2) indicates that a positive shock to inflation elicits a significant response in inflation itself after the second month, with effects persisting beyond the tenth month. A change in industrial production triggers an immediate response in inflation within the first month, with responses dissipating after the ninth

month. Changes in the exchange rate and monetary aggregates generate relatively swift responses in inflation, both of which dissipate by the ninth month. A domestic interest rate shock induces a rapid response in inflation that persists for a relatively longer period, remaining active beyond the tenth month. In contrast, the Eurozone interest rate elicits a strong and rapid response in inflation during the initial five months, after which the response gradually decelerates.

Figure 2. Impulse response functions (INFL)



Source: Authors' calculation based on Eviews 12

Shocks to Brent crude oil prices, the energy price index, and gas prices provoke substantial responses in inflation, exhibiting high intensity up to the sixth month, followed by a decline in magnitude. Finally, changes in wheat prices strongly affect inflation, particularly in the third month, after which the response declines moderately but does not fully dissipate.

5. Discussion

The findings of the research provide clear evidence that the recent increase in inflation in North Macedonia was predominantly driven by external shocks, particularly as a result of fluctuations in global energy, oil, gas, and food prices. The research further suggests that monetary policy interventions during the inflationary period likely contributed to alleviating inflationary pressures, with the interest rate emerging as the most effective transmission mechanism, particularly in a small and open economy with underdeveloped financial markets.

Estimates from the SVAR model confirm that lagged inflation, exchange rate fluctuations, and changes in global oil and energy prices significantly influenced domestic inflationary dynamics. The variance decomposition particularly highlights the dual nature of inflationary pressures: while domestic shocks incorporated in the model explained nearly half of the fluctuations in inflation, global shocks maintained a dominant role as key factors contributing to inflationary increases in the country.

These findings are consistent with the current literature in the field, further demonstrating the importance of global transmission of price instability and fluctuations on the domestic economic conditions of small and open economies (Calderon & Kubota, 2021). Based on the empirical evidence, it can be concluded that timely and credible measures undertaken by the Central Bank substantially mitigated the effects of these external shocks, indicating the capacity of monetary policy to stabilize expectations of the economy and population, and to preserve macroeconomic balance even under adverse and crisis-driven global conditions (Caravelli et al., 2024).

6. Conclusion

The study demonstrates that the effectiveness of monetary policy in North Macedonia is largely determined by the responsiveness of the interest rate channel and its interaction with external shocks. Despite notable inflationary pressures arising from global factors, such as oil and energy prices, monetary policy measures—particularly adjustments to the

reference interest rate—appear to have significantly mitigated these effects and contributed to stabilizing the macroeconomic environment.

The findings suggest that, in a small and open economy, monetary policy alone cannot fully neutralize the impact of imported inflation; nevertheless, the measures undertaken play a substantial role in stabilizing expectations. In shaping future macroeconomic policies, authorities should prioritize enhancing the resilience of the transmission mechanism while ensuring effective coordination between fiscal and monetary policies. Such an approach can strengthen North Macedonia's economic resilience to external shocks and support sustainable, long-term macroeconomic stability.

This study relies exclusively on secondary data, which may be subject to revisions or methodological changes by the publishing institutions. Furthermore, the relatively short time series (2015–2023) may limit the robustness of long-term inferences. Nonetheless, the high-frequency monthly data and the diverse set of macroeconomic indicators employed provide robust insights into the dynamics of monetary policy effectiveness in small, import-dependent economies.

References

Aguilar, A., Cantú, C., & Guerra, R. (2023, March 29). *Fiscal and monetary policy in emerging market economies: What are the risks and policy trade-offs?* BIS Bulletin No. 71. Bank for International Settlements. https://www.bis.org/publ/bisbull71.pdf

Akindoyin, D. I. (2024). Impacts of the Russo-Ukrainian conflict on food security in Sub-Saharan Africa. *The Journal of International Relations, Peace Studies, and Development, 9*(1). https://scholarworks.arcadia.edu/agsjournal/vol9/iss1/4

Badinger, H., & Schiman, S. (2023). Measuring monetary policy in the euro area using SVARs with residual restrictions. *American Economic Journal: Macroeconomics, 15*(2), 279–305. https://doi.org/10.1257/mac.20210035

Barone, S., Oggero, N., & Damilano, M. (2025). Monetary policy and financial stability: Evidence from a new macroeconomic environment. *Research in International Business and Finance, 77*, 102992. https://doi.org/10.1016/j.ribaf.2025.102992

Calderón, C., & Kubota, M. (2021, December). *Exploring the growth effects of COVID-19 across developing countries* (Policy Research Working Paper No. 9889). World Bank. https://openknowledge.worldbank.org/handle/10986/37041

Caravelli, G., Bartoloni, E., & Baussola, M. (2024). Monetary policy and innovation in Europe: An SVAR approach. *Finance Research Letters, 66*, 105730. https://doi.org/10.1016/j.frl.2024.105730

Cui, L., Yue, S., Nghiem, X.-H., & Duan, M. (2023). Exploring the risk and economic vulnerability of global energy supply chain interruption in the context of the Russo-Ukrainian war. *Resources Policy, 81*, 103373. https://doi.org/10.1016/j.resourpol.2023.103373

di Giovanni, J., Kalemli-Özcan, Ş., Silva, A., & Yildirim, M. A. (2023). Quantifying the inflationary impact of fiscal stimulus under supply constraints. *AEA Papers and Proceedings, 113*, 76–80. https://doi.org/10.1257/pandp.20231028

Ferreira, V., Abreu, A., & Louçã, F. (2025). The rise and fall of inflation in the euro area (2021–2024): A heterodox perspective. *Structural Change and Economic Dynamics, 72*, 103–110. https://doi.org/10.1016/j.strueco.2024.12.004

Fisher, M. J., & Marshall, A. P. (2009). Understanding descriptive statistics. *Australian Critical Care, 22*(2), 93–97. https://doi.org/10.1016/j.aucc.2008.11.003

Lo, G.-D., Marcelin, I., Bassène, T., & Sène, B. (2022). The Russo-Ukrainian war and financial markets: The role of dependence on Russian commodities. *Finance Research Letters, 50*, 103194. https://doi.org/10.1016/j.frl.2022.103194

Milstein, E., & Wessel, D. (2024, January 2). *What did the Fed do in response to the COVID-19 crisis?* Brookings Institution. https://www.brookings.edu/articles/fed-response-to-covid19/

Pera, J. (2023). The war in Ukraine and the risk of low impact of Western sanctions imposed on Russia. *Central European Review of Economics & Finance, 44*(3), 99–124. https://doi.org/10.24136/ceref.2023.016

Posen, A. S. (2022). *Annual report 2022*. Peterson Institute for International Economics. https://www.piie.com/microsites/annual-report-2022

Rogoff, K. (2022). Emerging market sovereign debt in the aftermath of the pandemic. *Journal of Economic Perspectives, 36*(4), 147–166. https://doi.org/10.1257/jep.36.4.147

Taskovski, F., & Paceskoski, V. (2024). Determinants of inflation in conditions of global changes and conflicts: The case of North Macedonia. In *Proceedings of the EMIDWORLD 2nd International Congress on Economics, Public Finance, Business & Social Sciences*. Altınbaş University. https://eprints.ugd.edu.mk/35735/

Tsutsunashvili, A., Aránega, A. Y., & Urueña, R. C. (2024). Challenged global economics amid conflict in warring countries. *Sustainable Technology and Entrepreneurship, 3*(3), 100068. https://doi.org/10.1016/j.stae.2023.100068