



## Research Article

© 2024 Mustafa et al.

This is an open access article licensed under the Creative Commons Attribution-NonCommercial 4.0 International License (<https://creativecommons.org/licenses/by-nc/4.0/>)

Received: 20 March 2024 / Accepted: 16 June 2024 / Published: 5 July 2024

# Energy Products and the Incidence of Inflation: Empirical Evidence from the Countries of the Western Balkans

Bashkim Mustafa<sup>1</sup>

Ejup Fejza<sup>2</sup>

Agim Thaqi<sup>1</sup>

<sup>1</sup>Faculty of Management,  
University of Applied Sciences in Ferizaj,  
Ferizaj, Kosovo

<sup>2</sup>Faculty of Mathematics and Natural Sciences,  
University of Prishtina "Hasan Prishtina",  
Prishtina 10000, Kosovo

\*Corresponding Author

DOI: <https://doi.org/10.36941/ajis-2024-0129>

## Abstract

*This study examines the impact of monetary policies on the inflation rate in the Western Balkans. Utilizing long-term panel data and a fixed effects estimator, the research explores the dynamic relationships among three key variables: interest rates, energy product prices, and inflation. The findings reveal a negative association between interest rates and inflation. Additionally, the study highlights the significant impact of energy on inflation compared to other commodity prices. These insights offer valuable guidance for policymakers, aiding in the development of targeted and effective economic strategies to address the specific challenges faced in WB6 countries. The implications derived from this research can inform strategic decision-making and policy frameworks aimed at mitigating inflationary pressures in the Western Balkans.*

**Keywords:** *inflation; interest rates; energy prices; import; export*

## 1. Introduction

A prevailing concern within economic frameworks is the overarching escalation of prices, commonly termed inflation. Nonetheless, recent years have witnessed perturbations in global distribution networks, precipitating a pronounced elevation in energy commodity prices. This phenomenon has consequently propelled inflation rates into the double digits, as observed in the year 2022. Inflation brings concerns to individuals, households, and governments, reflecting directly on economic and social well-being universally (Mirza et al., 2023). While some economies may weather these challenges more resiliently, others may find themselves in precarious positions, necessitating extended periods for policy responses aimed at recovery. Inflation impacts economies globally, including the Western Balkans countries (WB6), which experienced a significant rise in energy, oil, and natural gas prices, leading to the highest inflation rates witnessed in recent decades. This

situation underscores the importance of closely monitoring these countries, which serve as a pivotal region between the European Union and Asian nations (World Bank, 2023).

Indeed, inflation poses a significant threat to the stability of wealthy economies, a fact supported by numerous scholars. However, two of the most prominent crises that have accelerated this trajectory are directly linked to the COVID-19 pandemic and the war in Ukraine, which have caused prices to surge enormously, in particular for those products originated from these regions (Ahmed et al., 2023). This illustrates the direct correlation between the surge in immediate aggregate demand within markets and the subsequent rise in inflation. In response to inflationary pressures, Central Banks have implemented monetary measures to maintain control over the general price level. This scenario is evident in the WB6 countries, where price fluctuations have led to the possibility of double-digit inflation. The escalation of the Russia-Ukraine conflict has exacerbated the situation, particularly impacting energy prices and related products. Consequently, the economies of the WB6, heavily reliant on energy imports, experienced an average inflation rate of 11.9% in 2022. This uptick has significant economic and social ramifications, diminishing purchasing power. Central Banks responded by tightening monetary and credit policies, increasing interest rates from 1.98% in 2021 to 4.6% in 2022 and further to 6.5% in 2023. Consequently, the inflation rate in WB6 states moderated to 7.66% in 2023, a trend supported by empirical evidence.

The escalation of inflation presented significant challenges, particularly for lower-income households in the WB6 region. Bednář et al. (2022) advocate prioritizing electricity within the energy mix to address this issue. The onset of the Russia-Ukraine war further exacerbated the price surge, with crude oil prices doubling and natural gas prices tripling from 2022 onwards, followed by increases in corn and wheat prices (Castle et al., 2023). Throughout the production cycle, fluctuations in energy, oil, and natural gas prices directly impacted household consumption, leading to reduced purchasing power proportional to their consumption share (Soliman et al., 2023).

In the short term, the demand for energy products is relatively inelastic due to the lack of immediate substitutes. WB6 countries exhibit a clear dependency on global market price movements and energy supply from oil, natural gas, and other sources (Huawei, 2022). Import reliance is significant, with 35 percent of energy production sourced externally, primarily from coal (accounting for 47 percent of supply), with the remainder from alternative and renewable sources, albeit falling short of EU standards (European Union Energy statistics, 2021).

Replacing the shortfall in natural gas and addressing the sudden spike in energy prices poses considerable challenges. One potential solution is substantial investment in the WB6 energy sector, although this is hindered by the absence of oil and natural gas sources, making renewable energy the primary alternative with strong potential in the region (Lalic et al., 2011). However, attracting investments remains problematic due to economic indicators indicating limited potential, low per capita income, successive conflicts, political uncertainty, and various technological, financial, legislative, and educational constraints (Cusolito et al., 2023). Despite efforts, energy production in the region remains heavily reliant on international markets (Đurašković et al., 2021).

In the realm of academic discourse, discussions on inflation abound, yet this paper stands out by delving deeply into the pivotal role of energy as an intermediary variable between inflation and interest rates. It specifically investigates how fluctuations in energy prices and related factors propel inflation in the WB6 countries, with the Ukrainian crisis adding a significant dimension to this analysis. The aim is to shed light on these interconnected dynamics and provide a comprehensive exploration of their implications. Moreover, this study elucidates the intricate relationships among interest rates, electricity generation and demand, import and export patterns, and inflation within the Western Balkans countries. By identifying the variables driving inflationary pressures, the research endeavors to propose effective strategies for mitigating inflation rates. Ultimately, this research contributes valuable insights to the existing literature, offering guidance for scholars and policymakers alike as they navigate future decisions in this complex economic landscape. According to Minasyan et al., (2023), inflation in the Western Balkans is not determined only by the volatility of the prices of basic goods, since the prices of energy products have taken a leading role in its

trajectory. The recent non-financial crisis has particularly deepened this gap and made commodity prices sufficiently affected by the growth of energy products.

Furthermore, this study serves to fill a notable gap in the existing literature and offers practical implications for both academia and policymaking. By addressing the limited coverage of issues specific to the WB6 countries within the literature, it aims to provide a comprehensive examination of economic dynamics in this region that have been overlooked by scholars and researchers. Moreover, given the significant energy demand in the Western Balkans, which contributes to inflationary pressures across various industries, this research delves into the spillover effects of energy-related factors on other sectors. This thorough exploration highlights the need for further inquiry into the interconnectedness of inflation and energy within the broader economic landscape. Additionally, the study not only contributes to the body of existing research but also offers insights into policy implications. By outlining specific strategies that central banks can employ to control inflation and ensure the sustainability of the economic cycle, this research provides actionable recommendations for policymakers to consider.

The study is structured into several sections for clarity. Section two provides an extensive literature review, setting the foundation for exploration. Section three outlines hypothesis development. Section four details the methodology. Section five presents research results. Finally, in section six, conclusions are drawn, discussing implications for theory, practice, and future research.

## 2. Literature Review

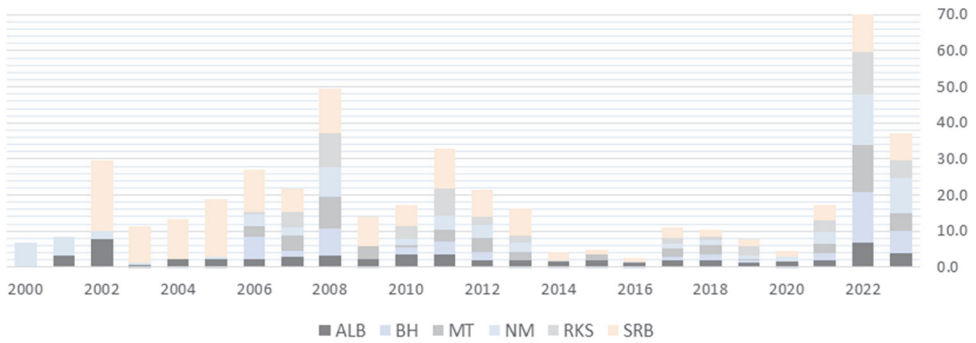
Inflation has been a recurring economic challenge throughout the histories of individual countries and the global economy. Addressing this issue and understanding its sources and consequences remain critical as economic and social contexts evolve over time. Numerous studies have examined inflation across different periods, identifying various factors that contribute to its causes and effects.

Key factors identified as drivers of inflation include immediate increases in aggregate demand, rising production costs, fluctuations in raw material prices, and overall costs of goods and services. Additionally, expenses influenced by global market dynamics, economic instability, inadequate credit and monetary policies, and escalating energy prices have been highlighted. In response to increased consumer demand and insufficient market supply, companies often raise prices to capitalize on these conditions (Giri, 2022).

Governments have been compelled to identify efficient strategies to achieve sustainable economic development by tackling inflation. This involves utilizing monetary and credit policies to control inflation rates (Suh, 2014). To this end, governments have adopted a macroprudential model of New Keynesian economics, employing a range of regulatory tools within financial institutions to mitigate the buildup of systemic financial risks (Malovaná et al., 2023).

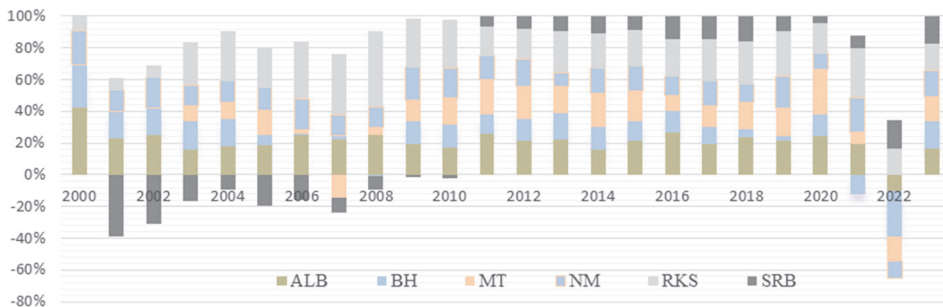
As per the World Bank (2022), while the Western Balkan countries witnessed declining poverty rates in 2022, the prevalence of high inflation posed risks for future poverty growth. Without government intervention, the substantial impact of escalating energy and food prices could lead to a projected 13% increase in poverty across the Western Balkans countries (Bojaj et al., 2023).

The inflation rate reached its highest level in the past 13 years, hitting up to 15% in select WB6 countries, creating substantial economic pressure. Despite an initial surge in early 2023, price pressures persisted above consumption-based rates. Although increasing interest rates usually curbs inflation, this tactic proved inadequate in easing economic strain. Consequently, purchasing power notably declined, intensifying business challenges. Additionally, monetary policies aimed at curbing inflation by raising interest rates further complicated the economic scenario, as illustrated in Figure 1.



**Figure 1.** Inflation rate 2000 - 2023 in Western Balkans Countries (WB6). Source: Prepared by the authors from the data collected from World Bank and International Monetary Fund database.

Central banks employ the tactic of raising interest rates as a pre-emptive measure in monetary policy to curb the amount of money in circulation. Primarily initiated in mid-2022 and sustained through 2023, this increase in interest rates has demonstrated a subsequent decrease in inflation (Friedman & Kuttner, 2010). This is attributed to the persistent negative real rates of monetary policy resulting from inflation surpassing projections and anti-inflationary measures implemented in 2021. However, the situation shifted following the onset of the Russia-Ukraine war in 2022. Shortages in gas and other energy sources emerged, disrupting both the supply chain and production cycles (Spyromitros, 2023). The ensuing global market instability led to a significant surge in the overall price level (Kučerová et al., 2023). State governments utilized monetary and credit policies, particularly through interest rate hikes, as a stabilizing measure. Given the impact of global price movements on inflationary pressures, the economies of the WB6 countries faced significant uncertainty, prompting the escalation of interest rates. This trend is illustrated over several years, as depicted in Figure 2.



**Figure 2.** Interest rate 2000 - 2023 in Western Balkans Countries (WB6). Source: Prepared by the authors from the data collected from the World Bank and the Central Banks database.

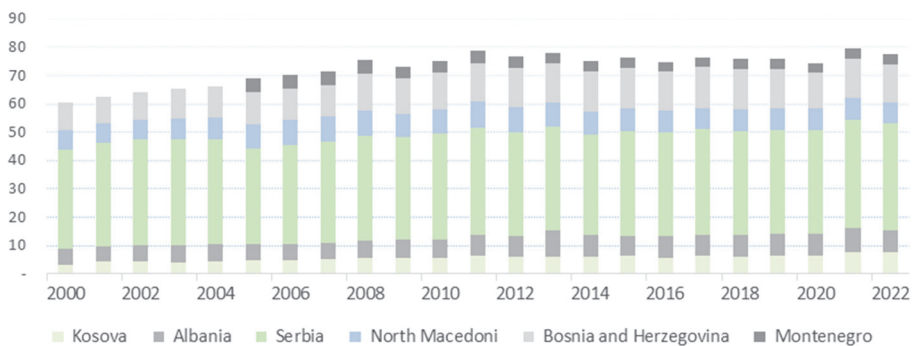
In the countries of the Western Balkans, the widening gap in family economies is attributed to soaring inflation, fueled notably by escalating food and energy costs, which disproportionately affect low-income households (Banna et al., 2023). Despite optimistic economic growth signals following the 2021 reopening post the Covid-19 pandemic, the trajectory changed in 2022, marked by sluggish growth and heightened inflation (Kraff et al., 2022). According to the World Bank. (2023), poverty decreased by a mere 1% in 2022, significantly slower than pre-pandemic rates, with unemployment

falling to 13.2%, albeit youth unemployment remaining double the national average. By the end of 2022, the region had 878,000 unemployed individuals, yet rising prices and inflation revived regional labor market disparities, rekindling the debate surrounding the "Phillips Curve" dilemma, challenging policymakers to strike a balance between unemployment and inflation.

The smaller economies in the Western Balkans lack the autonomy to impact monetary policy independently, as economic leaders in the Eurozone wield significant influence over the relationship between unemployment and inflation (Combes & Lesuisse, 2022). Factors contributing to inflation, such as the surge in aggregate demand post-reopening and the Russia-Ukraine conflict affecting energy prices, were already recognized (Husaini & Lean, 2021). Recent studies, including those by Yildirim & Arifli, (2021) and Benk & Gillman (2023), emphasize the intertwined nature of inflation with energy prices and oil price fluctuations (Jawadi et al., 2023). The volatility in energy prices, encompassing oil, natural gas, and other resources, not only impacts inflation but also disrupts food supply chains (Lin, 2023).

The interplay between energy price hikes and inflation is underscored by their significant impact on producers, suppliers, and distributors, as evidenced by studies such as that by (Aharon et al., 2023). Ha et al. (2023) assert that global price shocks contribute substantially to inflation variance, with oil price changes alone accounting for a noteworthy percentage. Moreover, the influence of global shocks on inflation appears to intensify over time, as observed in the Western Balkans over the past three years, characterized by escalating energy prices and inflation (Yagi & Managi, 2023). Despite displaying resilience, the Western Balkans' economy faces persistent challenges, including energy and food resource shortages and potential Eurozone recession risks, which could exacerbate the economic crisis (Liosi, 2023). This study corroborates the linkage between energy prices and inflation, underscoring the region's vulnerability to external economic shocks.

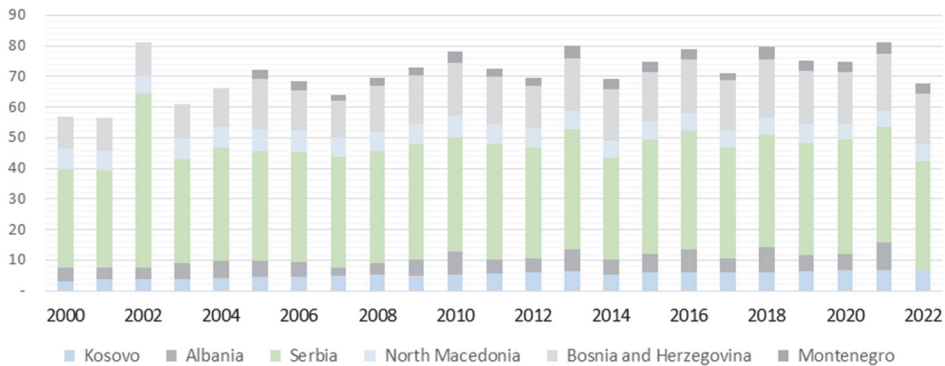
Additionally, according to Figure 3, there is a notable surge in electricity demand across the region. Serbia stands out as the highest electricity consumer, followed by Bosnia and Herzegovina, Albania, and Kosovo, among others. Collectively, the region consumes approximately 90 TWh of electricity, indicating a pressing need for additional energy resources.



**Figure 3.** Demand for electricity 2000 – 2022 in WB6. Source: Prepared by the authors from the data collected by the "Our World in Data".

In the medium term, the Western Balkans holds a promising outlook for renewable energy, although it still falls short of the targets set by the EU. Prioritizing reforms and bolstering energy generation capacities remain key objectives for the WB6 countries, as illustrated in Figure 4. Aligning policies towards green energy is imperative not only to fortify economic resilience but also to expedite the transition towards a sustainable environment and address underlying structural challenges, prerequisites for EU membership. The urgency to hasten the green transition, particularly in light of

the ongoing energy sector crisis, is undeniable. Implementing measures such as carbon pricing and expanding environmental fiscal policies are pivotal actions to incentivize both individuals and businesses to reduce their carbon emissions in tandem with economic activities.



**Figure 4.** Electricity generation 2000 - 2023, WB6. Source: Prepared by the authors from the data collected by the “Our World in Data”.

### 3. Development of Hypotheses

Inflation poses a universal threat to national wealth, with developed nations typically exhibiting more resilience compared to emerging economies like those in the Western Balkans (WB6). Various factors contribute to inflation, including natural occurrences, supply chain disruptions, workforce issues, and regulatory policies. Recent non-financial crises, such as the COVID-19 pandemic and conflicts like that in Ukraine, have further exacerbated inflationary pressures. These events have disrupted supply chains, leading to increased prices, particularly in energy and essential products.

For instance, Ji & Fan. (2012) conduct an in-depth analysis of energy demand, generation, and pricing across diverse resources such as electricity, gas, wind energy, and water, as well as other critical elements in the energy sector. To better understand the relationship between energy prices and inflation, they incorporate additional influential variables such as the commodity export price index. (Huawei, 2022) asserts that fluctuating prices of oil, gas, coal, and other natural resources directly influence the inflation rate, a view supported by (Coletti et al., 2021), who emphasize how fluctuations in crude oil consumption and commodity prices driven by demand create inflationary pressures, disrupting production and supply chains.

Similarly, the interest rate set by the Central Bank operates inversely to the inflation rate. Lukmanova & Rabitsch, (2023) advocate for an expansionary monetary policy stance, suggesting that inflation rates decrease with rising interest rates. However, concerns have been raised about the potential of high interest rates to impede economic growth and hinder the transition to a higher growth trajectory (Shaukat et al., 2019). Thus, based on these discussions, this paper proposes that an increase in interest rates is influenced by a stringent monetary policy, which in turn negatively impacts inflation. Therefore, the primary comprehensive hypothesis is as follows:

**Hypothesis 1:** There exists a negative association between the interest rate and inflation in western Balkan countries

Moreover, the persistently high level of energy imports in the Western Balkans countries remains a cause for concern, primarily due to their significant reliance on energy imports, which constitute approximately 35% of their total energy consumption. This dependence leaves these nations vulnerable to fluctuations in international energy markets, despite their potential for energy



production. Consequently, the influence of energy product prices on inflation emerges as a critical aspect for economic analysis and management in these regions. Inflation serves as a vital indicator for predicting energy market stability, particularly in adverse conditions. Integrating inflation into energy market models enhances forecasting accuracy, aiding portfolio management, and facilitating policymakers' responses to inflationary pressures (Batten et al., 2024).

Statistical analysis of data on energy product prices and inflation levels in these countries from 2000 to 2022 has been conducted, incorporating correlational and regression analyses. Castle et al., (2023) emphasize the pivotal role of the production function in augmenting energy inputs relative to capital and labour. Although there is a modest direct impact of energy costs on the inflation equation, the significant rise in gas and oil prices since mid-2022 has chiefly contributed to inflationary pressures. Following data processing and statistical analyses, the extent to which energy product prices influence inflation levels in the Western Balkans countries was estimated, leading to the formulation of second hypothesis.

**Hypothesis 2:** There exists an inverse relationship between the increase in prices of imported goods and the inflation rate.

## 4. Data and Methodology

### 4.1 Data

This research is based on statistical data for WB6 countries for the period 2000-2023 divided and tested with 109-time series. The source of the data was taken from credible institutions such as the World Bank, the IMF and the Central Banks of the WB 6 countries and other important sources. Through these data, it has been requested to explore the correlation between monetary policies and the inflation rate in the countries of the Western Balkans, offering empirical insights into their interrelated dynamics.

### 4.2 Measurement of Variables

For this paper study aim, the Inflation Rate is the dependent variable. The lending interest, as determined by the GDP deflator and adjusted for inflation, is determined by the real interest rate. Terms and conditions associated with loan rates vary by country, however, limiting their comparability. The relationship between inflation and interest rates, including the use of monetary policies in order to stabilize the inflation rate, are measures that are considered depending on each country. In some cases, central bank policies can use interest rates to influence the level of inflation and vice versa by showing how much can realistically be gained or lost from an investment or loan taking inflation into account.

The demand for electricity and the generation of electricity that was caused after the Covid 19 pandemic, by households, consumers and industries affected its relationship with the increase in prices and the rate of inflation (Gründler, 2023). Also, the Russia-Ukraine war, the ban on gas production and its export, disrupted the global energy market, causing the increase in prices of energy and increase of the inflation rate. Even the author Morana, (2023) in a research found that there are currently significant risks to price stability from cyclical and residual inflation that are connected to certain supply chains, energy markets, and geopolitical tensions. The Imported Goods Price Index (IGPI) is a tool that reflects the average change in the imported goods prices over a period of time, measuring the ratio of imports to total imports of commodities (Ratio of Imports to Total Commodity Imports). Specifically, IGPI shows that the index is constructed taking into account the relative importance of each individual commodity in the total baskets (Carluccio et al., 2023). The purpose of using this weighting methodology is to ensure that the index reflects changes in commodity prices in proportion to their importance in the total import composite. This approach recognizes that some goods can have a more pronounced impact on the overall dynamics of imported

prices due to their greater participation in total imports (Sokhanvar & Bouri, 2023).

Commodity Export Price Index, Individual Commodity Weighted by Export Ratio to GDP index is a tool for measuring changes in the prices of exported goods, and contains an additional characteristic in its methodology, using commodity weights individual determined by the ratio of export to Gross Domestic Product (GDP). The use of this methodology is designed to reflect the most direct impact of changes in export prices on the domestic economy (WB6), taking in consideration the weight of each product into the GDP. This helps to determine the most significant and rapid changes in export prices for certain products, and can be an important instrument for assessing the economic impact of such developments in the international market (Sokhanvar et al., 2024).

The findings of this paper aim to investigate the relationship between independent variables on the one hand and dependent variables on the other using the data on the increase in the inflation rate, realized for the period 2000-2023 for WB6 countries.

### 4.3 Model Specification

The research relies on panel cross-country data (n) observed over time (t). Fixed-effects estimation, which exclusively utilizes data from individuals with multiple observations and estimates effects for variables that vary across these observations, is considered. However, given the intention off controlling variables that remain constant across entities but vary over time, the inclusion of time fixed effects is deemed appropriate.

Hence, for testing hypotheses and achieving a comprehensive estimation and prediction of events, a fixed estimation model is employed, drawing inspiration from the works of Bell and Jones (2015) and Bajra et al. (2020). As outlined in the hypothesis development section, the primary emphasis of the study is on estimating the impact of interest rates and other test variables on the inflation rate.

Consequently, the comprehensive model takes the form:

$$CPI_{it} = b_0 + b_1 IR_{it} + b_2 ED_{it} + b_3 EG_{it} + b_4 EGPI_{it} + b_5 EGPI_{it} + b_6 IGPI_{it} + b_7 IGPI_{it} + e_{it}$$

In the given context, variables and expressions are defined as follows:

CPI represents the inflation variable, Consumer Prices Index by country (i) at time (t). IR represents the variable of interest rate by country (i) at time (t). ED stands for the electricity demand variable by place (i) at time (t). EG represents the electricity generation variable by location (i) at time (t). EGPI represents the export price index of individual goods, by country (i) at time (t). EGPIIT represents the export price index of total goods by country (i) at time (t). IGPI represents the import price index of individual goods by country (i) at time (t). IGPIIT represents the import price index of total goods by country (i) at time (t).  $e_{it}$  represents the error term in the regression model.

These variables and expressions are used to model and analyse the effect of various factors on the inflation variable for country (i) at a given time (t). The regression coefficients show how changes in the values of these variables affect inflation changes for country (i) at time (t).

## 5. Results

A correlation matrix is useful for understanding the relationships of variables and for identifying variables that may be correlated. Table one (1) shows the connection matrix between the variables in this study as a portion of the correlation between two variables, where the possible values are from -1 to 1. A value of 1 specifies a complete and positive correlation, while a value of -1 indicates a complete and negative correlation, otherwise 0 indicates a lack of correlation between variables. Moreover, Table 1 show that there is a high correlation between the generation of electricity in the value of 0.6973, showing an impact with the electricity demand. Also, the Import price of individual goods (IGPI) has a significant positive correlation with the Import price of total goods (IGPTI) within the value of 0.8258 and a low correlation with Inflation at -0.0552.



**Table 1.** Correlation matrix.

Variables	Inflation (CPI)	IR	E D	E G	EGPI	EGPIT	IGPI	IGPTI
Inflation (CPI)	1							
Interest Rates IR	-0.1892	1						
Electricity demand ED	-0.0114	0.3346	1					
Electricity generation	0.0813	0.2593	0.6973	1				
Export price of individual goods	-0.2969	0.0789	0.0813	0.1197	1			
Export price of total goods	-0.2772	-0.0743	-0.1461	-0.0386	0.5651	1		
Import price of individual goods	-0.0286	-0.0712	0.0299	0.1293	0.4015	0.2316	1	
Import price of total goods	-0.0552	-0.1379	-0.0046	0.1095	0.2667	0.1316	0.8258	1

**Source:** Prepared by authors

To address the issues surrounding multicollinearity concerns, further, we employed the so-called Variance Inflation Factor (VIF), which serves as an indicative measure of the correlation between one variable with another in the model. So, the VIF is distributed over a different range to estimate how much variability can be increased in the use of a dependent variable compared to other independent variables. Table 2 shows that the problem of multicollinearity is not a problem in our case (i.e., the maximum VIF is 10), therefore we have ignored the possibility that our data are not fit to be used in the model.

**Table 2.** Variance Inflation Factor.

Variables	VIF	1/VIF
Inflation	3.56	0.281143
Import price of total goods	3.28	0.304787
Electricity demand	2.13	0.468803
Electricity generation	2.01	0.496441
Export price of individual goods	1.75	0.571205
Import price of total goods	1.58	0.634858
Interest rate	1.17	0.851289
Mean VIF	2.21	

**Source:** Prepared by authors

The higher the VIF, the more correlated the variables are with others, and 1/VIF indicates how much of a variable's variance is independent of its correlation with other variables. Mean VIF: It is the average value of all VIF of all variables which is a general indicator of the levels of multicollinearity in the model. In our case, the Mean VIF is 2.21, which can be interpreted as a sign of a moderate degree of multicollinearity.

## 6. Discussion

The findings from the regression are shown in Table 3. According to the regression analysis, the data on the influence of the variables that have correlation and influence on the inflation rate and those that have not shown any correlation are presented. This is a linear regression model (Simple Linear Regression) showing the independent variables on one side which is Inflation and the dependent variables that can influence Inflation.

Model 1 of Table 3 shows that the interest rate (IR) is -0.203 with statistical significance of 99% (p - value 0.05), there is a significant negative relationship between Interest Rate and Inflation. The higher the negative coefficient, the more inflation is expected to decrease, when the interest rate

increases, the inflation rate falls, but the unemployment rate must also be taken into account.

The result in the electricity generation (EG) variable is at a value of 0.263 in a confidence interval of (p - value of 0.1), which shows a significant positive relationship between EG and Inflation. The larger the positive coefficient, the more Inflation is expected to increase when electricity generation increases. In the variable Export price of individual goods (EGPI), the value -0.211 is presented in a confidence interval of (p - value 0.05), which shows a significant negative relationship between EGPI and Inflation. The higher this value is, the higher the inflation rate will be. The dependent variable Export price of total goods (EGPIT) is presented -0.191, in a confidence interval of (p - value 0.05) which shows a significant negative relationship between EGPIT and Inflation. The higher this negative value is, the higher the inflation rate will be. While the dependent variable of the Index of Import Prices of Goods (IGPI) is presented the value 0.311, in a confidence interval of (p - value of 0.1), suggests a significant positive relationship between IGPI and Inflation. The higher this value is, the higher the inflation rate will be.

**Table 3.** Regression model.

VARIABLES	Model (1)
Interest rate IR	-0.203** (0.0885)
Electricity Demand ED	-0.141 (0.151)
Electricity generation EG	0.263* (0.142)
Export price of individual goods EGPI	-0.211* (0.111)
Export price of total goods EGPIT	-0.191* (0.104)
Import price of individual goods IGPI	0.311* (0.191)
Import price of total goods IGPIT	-0.278 (0.178)
Constant	90.36*** (10.63)
Observations	109
R- squared	0.192

Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Source: prepared by authors.

## 7. Conclusions

This study has undertaken a comprehensive analysis of the effects of monetary policies, specifically interest rates, on inflation in the Western Balkans. Consistent with our hypothesis, the findings reveal significant negative relationships between interest rates and inflation. These results underscore the importance of carefully calibrated monetary policies in effectively managing inflationary pressures, as even minor fluctuations in interest rates can lead to discernible changes.

Beyond interest rates, the examination of additional variables such as Electricity Generation, Export Goods Price Index, and Import Goods Price Index has provided further insights into the multifaceted nature of inflation dynamics. These variables deepen our understanding while also highlighting the challenges in forecasting, given the influence of unpredictable elements and external factors.

The study has also identified the COVID-19 pandemic and the crisis in Ukraine as substantial contributors to inflation, emphasizing the necessity for a comprehensive and multifaceted approach to addressing inflationary pressures. The research carries far-reaching policy implications, stressing

the importance of effective monetary and fiscal measures. Recommendations, particularly those centered on enhancing the efficiency of the Central Bank in determining interest rates, offer actionable pathways for policy refinement.

While this study significantly contributes to the existing body of literature, it's important to acknowledge its limitations. Firstly, by focusing solely on a specific region, it may overlook broader global dynamics of inflation. Secondly, the choice of employing a fixed effect estimator raises questions about its applicability in addressing issues of stationarity. While our sample did not exhibit such concerns, future research might explore alternative methodologies to provide a more comprehensive understanding.

In essence, this study significantly contributes to the discourse on inflation, urging policymakers to adopt a holistic approach that addresses the intricacies of various influencing factors. In this context, energy emerges as a primary driver of inflation incidents, which policymakers in WB6 countries must consider. As nations navigate economic uncertainties, the findings presented here serve as crucial tools for steering effective and adaptive policies to manage and mitigate the challenges posed by inflation. The results and insights gained will not only contribute to furthering knowledge on factors influencing regional inflation but will also play a pivotal role in formulating appropriate economic policies for the countries of the Western Balkans.

## References

- Aharon, D. Y., Azman Aziz, M. I., & Kallir, I. (2023). Oil price shocks and inflation: A cross-national examination in the ASEAN5+3 countries. *Resources Policy*, 82, 103573. <https://doi.org/https://doi.org/10.1016/j.resourpol.2023.103573>
- Ahmed, R., Chen, X. H., Kumpamool, C., & Nguyen, D. T. K. (2023). Inflation, oil prices, and economic activity in recent crisis: Evidence from the UK. *Energy Economics*, 106918. <https://doi.org/https://doi.org/10.1016/j.eneco.2023.106918>
- Banna, H., Alam, A., Chen, X. H., & Alam, A. W. (2023). Energy security and economic stability: The role of inflation and war. *Energy Economics*, 126, 106949. <https://doi.org/https://doi.org/10.1016/j.eneco.2023.106949>
- Bajra, U. Q., Halili, Z., & Berisha, N. (2020). Frontier economies and economic growth: Evidence from European and Central Asian Countries. *Borsa Istanbul Review*, 20(3), 279–291. <https://doi.org/10.1016/j.bir.2020.04.002>
- Batten, J. A., Mo, D., & Pourkhanali, A. (2024). Can inflation predict energy price volatility? *Energy Economics*, 129, 107158. <https://doi.org/https://doi.org/10.1016/j.eneco.2023.107158>
- Bednář, O., Čerčrdlová, A., Kadeřábková, B., & Řežábek, P. (2022). Energy Prices Impact on Inflationary Spiral. *Energies*, 15(9). <https://doi.org/10.3390/en15093443>
- Bell, A., & Jones, K. (2015). Explaining Fixed Effects: Random Effects Modeling of Time-Series Cross-Sectional and Panel Data. *Political Science Research and Methods*, 3(01), 133–153. <https://doi.org/10.1017/psrm.2014.7>
- Benk, S., & Gillman, M. (2023). Identifying money and inflation expectation shocks to real oil prices. *Energy Economics*, 126, 106878. <https://doi.org/https://doi.org/10.1016/j.eneco.2023.106878>
- Bojaj, M. M., Djurovic, G., Fabris, N., & Milovic, N. (2023). Top 1% and inequality connectedness in the EMU and WB. *International Review of Economics & Finance*, 83, 139–155. <https://doi.org/https://doi.org/10.1016/j.iref.2022.08.023>
- Carluccio, J., Gautier, E., & Guilloux-Nefussi, S. (2023). Dissecting the impact of imports from low-wage countries on inflation. *European Economic Review*, 160, 104613. <https://doi.org/https://doi.org/10.1016/j.euroecorev.2023.104613>
- Castle, J. L., Hendry, D. F., & Martinez, A. B. (2023). The historical role of energy in UK inflation and productivity with implications for price inflation. *Energy Economics*, 106947. <https://doi.org/https://doi.org/10.1016/j.eneco.2023.106947>
- Coletti, D., Lalonde, R., Masson, P., Muir, D., & Snudden, S. (2021). Commodities and monetary policy: Implications for inflation and price level targeting. *Journal of Policy Modeling*, 43(5), 982–999. <https://doi.org/https://doi.org/10.1016/j.jpolmod.2021.02.013>
- Combes, J.-L., & Lesuisse, P. (2022). Inflation and unemployment, new insights during the EMU accession. *International Economics*, 172, 124–142. <https://doi.org/https://doi.org/10.1016/j.inteco.2022.09.004>

- Cusolito, A. P., Darova, O., & McKenzie, D. (2023). Capacity building as a route to export market expansion: A six-country experiment in the Western Balkans. *Journal of International Economics*, 144, 103794. <https://doi.org/https://doi.org/10.1016/j.jinteco.2023.103794>
- Durašković, J., Konatar, M., & Radović, M. (2021). Renewable energy in the Western Balkans: Policies, developments and perspectives. *Energy Reports*, 7, 481–490. <https://doi.org/https://doi.org/10.1016/j.egy.2021.07.104>
- European Union (EU). (2021). *Energy statistics*.
- Friedman, B. M., & Kuttner, K. N. (2010). Chapter 24 - Implementation of Monetary Policy: How Do Central Banks Set Interest Rates?☆☆We are grateful to Ulrich Bindseil, Francesco Papadia, and Huw Pill for thorough reviews and very helpful comments on earlier drafts; to Spence Hilton, Warren Htung, (B. M. Friedman & M. Woodford (eds.); Vol. 3, pp. 1345–1438). Elsevier. <https://doi.org/https://doi.org/10.1016/B978-0-444-53454-5.00012-8>
- Gründler, D. (2023). Expectations, structural breaks and the recent surge in inflation. *Economics Letters*, 233, 111394. <https://doi.org/https://doi.org/10.1016/j.econlet.2023.111394>
- Giri, F. (2022). The relationship between headline, core, and energy inflation: A wavelet investigation. *Economics Letters*, 210. <https://doi.org/10.1016/j.econlet.2021.110214>
- Ha, J., Kose, M. A., Ohnsorge, F., & Yilmazkuday, H. (2023). Understanding the global drivers of inflation: How important are oil prices?¶¶We would like to thank Xuguang Simon Sheng, Guest Editor, and two anonymous reviewers for their detailed feedback. We also thank Zidong An, Carlos Arteta, Menzie Chinn, Kevin Cl. *Energy Economics*, 127, 107096. <https://doi.org/https://doi.org/10.1016/j.eneco.2023.107096>
- <https://www.worldbank.org>. (2022). WESTERN BALKANS REGULAR ECONOMIC REPORT.
- <https://www.worldbank.org>. (2023). Regular Report Economic of the Western Balkans No. 23 | Spring 2023.
- Huawei, T. (2022). Does gross domestic product, inflation, total investment, and exchanges rate matter in natural resources commodity prices volatility. *Resources Policy*, 79, 103013. <https://doi.org/https://doi.org/10.1016/j.resourpol.2022.103013>
- Husaini, D. H., & Lean, H. H. (2021). Asymmetric impact of oil price and exchange rate on disaggregation price inflation. *Resources Policy*, 73, 102175. <https://doi.org/https://doi.org/10.1016/j.resourpol.2021.102175>
- Ji, Q., & Fan, Y. (2012). How does oil price volatility affect non-energy commodity markets? *Applied Energy*, 89(1). <https://doi.org/10.1016/j.apenergy.2011.07.038>
- Jawadi, F., Cheffou, A. I., & Bu, R. (2023). Revisiting the linkages between oil prices and macroeconomy for the euro area: Does energy inflation still matter? *Energy Economics*, 127. <https://doi.org/10.1016/j.eneco.2023.107058>
- Kraff, N. J., Wurm, M., & Taubenböck, H. (2022). Housing forms of poverty in Europe - A categorization based on literature research and satellite imagery. *Applied Geography*, 149, 102820. <https://doi.org/https://doi.org/10.1016/j.apgeog.2022.102820>
- Kučerová, Z., Pakši, D., & Koňářík, V. (2023). Macroeconomic fundamentals and attention: What drives european consumers' inflation expectations? *Economic Systems*, 101153. <https://doi.org/https://doi.org/10.1016/j.ecosys.2023.101153>
- Lalic, D., Popovski, K., Gecevska, V., Vasilevska, S. P., & Tesic, Z. (2011). Analysis of the opportunities and challenges for renewable energy market in the Western Balkan countries. *Renewable and Sustainable Energy Reviews*, 15(6), 3187–3195. <https://doi.org/https://doi.org/10.1016/j.rser.2011.04.011>
- Lin, C.-M. (2023). Hilltop sneutrino hybrid inflation. *Chinese Journal of Physics*. <https://doi.org/https://doi.org/10.1016/j.cjph.2023.11.019>
- Liosi, K. (2023). The sources of economic uncertainty: Evidence from eurozone markets. *Journal of Multinational Financial Management*, 69, 100811. <https://doi.org/https://doi.org/10.1016/j.mulfin.2023.100811>
- Lukmanova, E., & Rabitsch, K. (2023). Evidence on monetary transmission and the role of imperfect information: Interest rate versus inflation target shocks. *European Economic Review*, 158, 104557. <https://doi.org/https://doi.org/10.1016/j.euroecorev.2023.104557>
- Malovaná, S., Hodula, M., Gric, Z., & Bajžík, J. (2023). Macroprudential policy in central banks: Integrated or separate? Survey among academics and central bankers. *Journal of Financial Stability*, 65, 10107. <https://doi.org/https://doi.org/10.1016/j.jfs.2023.10107>
- Minasyan, G., Pinat, M., Ozturk, E., Wang, M., & Zhu, Z. (2023). Inflation Dynamics in the Western Balkans. IMF Working Papers, 2023(049). <https://doi.org/10.5089/9798400235184.001>
- Mirza, N., Naqvi, B., Rizvi, S. K. A., & Boubaker, S. (2023). Exchange rate pass-through and inflation targeting regime under energy price shocks. *Energy Economics*, 124, 106761. <https://doi.org/https://doi.org/10.1016/j.eneco.2023.106761>

- Morana, C. (2023). Euro area inflation and a new measure of core inflation. *Research in Globalization*, 7, 100159. <https://doi.org/https://doi.org/10.1016/j.resglo.2023.100159>
- Shaukat, B., Zhu, Q., & Khan, M. I. (2019). Real interest rate and economic growth: A statistical exploration for transitory economies. *Physica A: Statistical Mechanics and Its Applications*, 534, 122193. <https://doi.org/https://doi.org/10.1016/j.physa.2019.122193>
- Sokhanvar, A., & Bouri, E. (2023). Commodity price shocks related to the war in Ukraine and exchange rates of commodity exporters and importers. *Borsa Istanbul Review*, 23(1), 44–54. <https://doi.org/https://doi.org/10.1016/j.bir.2022.09.001>
- Sokhanvar, A., Çiftçioğlu, S., & Hammoudeh, S. (2024). Comparative analysis of the exchange rates-stock returns nexus in commodity-exporters and -importers before and during the war in Ukraine. *Research in International Business and Finance*, 67, 102152. <https://doi.org/https://doi.org/10.1016/j.ribaf.2023.102152>
- Soliman, A. M., Lau, C. K., Cai, Y., Sarker, P. K., & Dastgir, S. (2023). Asymmetric Effects of Energy Inflation, Agri-inflation and CPI on Agricultural Output: Evidence from NARDL and SVAR Models for the UK. *Energy Economics*, 126, 106920. <https://doi.org/https://doi.org/10.1016/j.eneco.2023.106920>
- Spyromitros, E. (2023). Determinants of Green Innovation: The Role of Monetary Policy and Central Bank Characteristics. *Sustainability (Switzerland)*, 15(10). <https://doi.org/10.3390/su15107907>
- Suh, H. (2014). Dichotomy between macroprudential policy and monetary policy on credit and inflation. *Economics Letters*, 122(2), 144–149. <https://doi.org/https://doi.org/10.1016/j.econlet.2013.11.012>
- Yagi, M., & Managi, S. (2023). The spillover effects of rising energy prices following 2022 Russian invasion of Ukraine. *Economic Analysis and Policy*, 77, 680–695. <https://doi.org/https://doi.org/10.1016/j.eap.2022.12.025>
- Yildirim, Z., & Arifli, A. (2021). Oil price shocks, exchange rate and macroeconomic fluctuations in a small oil-exporting economy. *Energy*, 219, 119527. <https://doi.org/https://doi.org/10.1016/j.energy.2020.119527>