



## How Does the Budget Deficit Affect Inflation Rate- Evidence from Western Balkans

### Esat Durguti

Corresponding Author: Finance, Banking, and Accounting- Economic Faculty, University of Mitrovica- Isa Boletini, Mitrovica, Kosovo

ORCID ID: <https://orcid.org/0000-0001-5673-2284>

### Nexhat Kryeziu

Department of Economics, University of Prishtina, Prishtina, Kosovo

ORCID ID: <https://orcid.org/0000-0001-5673-2284>

### Emine Gashi

Finance Department, College for International Management, Prishtina, Kosovo

ORCID ID: <https://orcid.org/0000-0003-1752-9085>

### Abstract

*The main objective of this study is to find out if factors that we selected in our analysis have any effect on the Western Balkan Countries inflation rate, with the use of panel data from in the period of 2001-2017, yearly in a total of 102 observations. Two types of analysis used are secondary data and quantitative analysis by use of vector error correction model (VECM) and the multivariate time series, respectively. Multivariate time series is used to investigate if budget deficit and other explanatory variables have an impact on the inflation rate. The results from our analysis show that three of four determinates that we used are significant in the inflation rate. Used data were obtained from Eurostat and the World Bank. We used the augmented Dickey-Fuller test for data stationing as well as some diagnostic tests on model strength. From the analysis, it is true to say that budget deficit, GDP, government debt, and exchange rates have an impact that influences the inflation rate positively. While the unemployment rate does not have a significant effect on the inflation rate. The overall conclusion is that the reports we have selected have a significant impact on the level of inflation in the Western Balkan countries. In conclusion, the factors that we have studied have a great impact on inflation in Western Balkan Countries.*

**Key Words:** Budget deficit; Government debt to GDP; Inflation; Real exchange rate;

Unemployment rate

**JEL Classifications:** H62; H63; E31; E43; E24

## **Introduction**

The budget deficit plays a very crucial role in fiscal policy in a given country. During hard times in the economy, especially during the recession, the government normally uses fiscal and economic mechanisms to enable budget deficit to strengthen the economy. The budget surplus is the opposite of budget deficit, which is the excess of income compared with expenses in a fiscal year. When there is a budget surplus, government revenues exceed its overall expenses, and this is usually the case when the economy of a certain country suffers from excess inflation. As per this fact, the budget deficit has always been the core interest of various economists to investigate how inflation is affected budget deficit. Policymakers are very keen on the budget deficit, because of its size and ways of financing it as it will determine fiscal constraint factors that a country will undergo in the long term. Recently budget deficit has increased and worsened in developing countries, calling for attention for its long sustainability. Increased cases of public debt and budget deficit have major issues of concern for developing and developed countries.

The main objective of the paper is to find out effects of the budget deficit and its impact on inflation rate in Western Balkan countries such as Albania, Kosovo, Serbia, North Macedonia, Bosnia, Montenegro, Hercegovina. Based on the literature review in the field of finance, we have noticed that there are analyses and empirical studies from different authors regarding budget deficit effects on the inflation rate. Ideally, there are mixed results from the studies. Different authors have not reached a common agreement on the impact that budget deficit has on the inflation rate (Darrat, 1985). Effect of budget deficit on inflation rate has been observed and concluded by (Surgent and Wallace, 1981) that there is enough evidence to support the hypothesis that budget deficit has an impact on the inflation rate. From statistics, it has been found that different authors have found out that there is a strong correlation in countries with high inflation levels, such authors include (De Ilaan and Zelhorst, 1990) ; (Edwards and Tabellini, 1991); (Fischer et al., 2002). One of the main hypothesis is that budget deficit influence inflation rate positively. To ascertain, the results were real; other data variables apart from inflation rate and budget deficit include unemployment rate, gross domestic product, government debt, and real exchange rate. The structure of the paper will comprise of an introduction, Literature review, empirical data analysis, methodology and data, conclusion, and references.

## **Literature Review**

In the review of literature, a considerable number of empirical and theoretical studies focusing on macroeconomic factors that influence dictates the inflation rate. A number of researchers have utilized a cross-sectional dimension and time of data (panel data) to find out the relationship between inflation and budget deficit. Milo (2012) states that monetary financing has a positive relationship with money base growth in the cases of Romania, Albania, and Bulgaria. The key cause of inflation and money creation in different countries is public finance imbalances. According to Ekanayake (2012), it suggests in empirical research in the first group that there is a weak correlation between budget deficit and inflation while in the second group it suggests that budget deficit does not cause inflation and in the third group, there are some economist and policymakers who thinks that budget deficit and inflation have strong relationship during times when inflation is high. Moreover, (Lin and Chu, 2013) investigated the relationship between budget deficit and inflation across 91 countries from 1960 to 2006, under autoregressive distributional lag (ARDL) specification, they used a dynamic panel quantile regression model.

On the other hand (Catao and Terrones, 2005) researched developed and developing countries and concluded that budget deficit and inflation have a positive relationship in developing countries, but in developed countries, there is no such relationship. Based on (Kryeziu and Durguti, 2019) conducted research across 17 Eurozone states from 1997 to 2017. They found out that the unemployment rate and fiscal rate shows that there is no direct impact on the inflation rate. In regards to the effect of budget deficit on inflation, there are two dimensions explaining them. The first one is based on budget deficit inflation called strong-form of fiscal theory, based on Carlstrom and Fuerst (2000), which was introduced by the work of Leeper

(1991), Sims(1994), and Woodford(1994,1995). From the inception of research, we had earlier mentioned that the main aim is to focus on investigating the effect of budget deficit on inflation. But to elaborate more on the analysis, other explanatory variables (Kwon et al., 2006) empirically investigate how inflation rate and government debt with panel data in 71 countries from 1963 to 2004 by use of VAR model and OLS estimation.

According to the results of the study, it is estimated that the relationship is very strong in indebted developing countries, whereas the relationship is weak in developing countries but not in developed countries. (Dornbusch, 1976). The relationship between exchange rate and inflation rate. According to the Dornbusch, the exchange rate is the rate of exchange between different countries, especially the two countries' currencies, an increase in the exchange rate will affect overall prices. Phillips (1958) first documented the relationship between inflation and unemployment, and they found out that there is a negative relationship between wage inflation and unemployment in the UK from 1861 to 1957. According to (Kryeziu and Durguti,2019) they stated that there is a positive correlation between the unemployment rate and inflation but are not have significance in statistics.

## Research and Methodology

The methodology used in this study is panel data, which analyzes the behavior of each determinant over a given time (Baltagi, 2005); (Gurajati, 2004). Economic data is also used for six Western Balkan countries for the inflation rate, budget deficit, government debt to GDP, real exchange rate, and the rate of unemployment. Panel data is used in the study for a specific period. During that period, timer series format is defined by institutions of statistics, for example, the World Bank and International Monetary Fund. In Empirical studies, analysis, and results, data used are on a yearly basis, and the time period is from 2001 to 2017 with 102 observations for a total span of 18-year periods. The inflation rate is the dependent period, while real exchange rate, government debt to GDP, the budget deficit to GDP, and  $n$  is the error term capturing the impact that the selected variables have on the inflation rate. While data on the real sector are used for Western Balkans Countries development of indicators from the World Bank and Eurostat.

The whole dataset is yearly data for the time span between 2001 and 2017 expressed in percentage (%). Table 1 shows the definition and description of the variables studied.

**Table 1:** Data description

Variable	Definition	Description
INF <sub>rate</sub>	Inflation rate	Annual inflation rate (%)
BD <sub>rate</sub>	Budget deficit to GDP	Annual BD to GDP (%)
GDG <sub>rate</sub>	Government debt to GDP	Annual GD to GDP (%)
RER <sub>rate</sub>	Real exchange rate	Annual real exchange rate (%)
UR <sub>rate</sub>	Unemployment rate	Annual unemployment rate (%)

Source: Authors' calculations

The study employs Vector Error Correction Model (VECM), as per Akcay, Alper, and Ozmucur (2011), Romer (1993), and Catão and Terrones (2005), Perrotti (2004) and Lane (1995) and Magbabcola and Adelokun (2003). The model for the budget deficit is expressed as follows:

$$INF = f(BD, GBG, RER, UER)$$

Based on the variables selected and the general model, the model used in the study is as follows:

$$IR_t = C + \beta_1 BD_t + \beta_2 GBG_t + \beta_3 RER_t + \beta_4 UR_t + \varepsilon_t$$

In the model, C is the intercept, while  $\beta_1, \beta_2, \beta_3, \beta_4$ , coefficients that are estimated, and  $\varepsilon_t$  is the error term. The elasticity (degree of responsiveness) of inflation rate in relation to government debt to GDP, real exchange rate, unemployment rate, the budget deficit to GDP, and it is estimated by the use of the log-log model.

$$LogIR_t = C + \beta_1 LogBD_t + \beta_2 LogGBG_t + \beta_3 LogRER_t + \beta_4 LogUR_t + \varepsilon_t$$

As per the model above C is kept constant, while  $\beta_1, \beta_2, \beta_3, \beta_4$ , are features to be estimated and  $\varepsilon_t$  is the error term. The model is estimated using STATA15.1 software. Non-stationary time series, which were considered co-integrated, is estimated by the use of the Vector error Correction Model (VECM), which is a restrictive vector autoregressive (VAR).

Designation of the model is done effectively in such a way that it allows for short pan correction and limits long term effects of the independent variable when interacting to meet their co-integrating relationship.

The above phenomena can also be explained by the use of the equation below:

$$\Delta X_t = Y_0 + Y_1 + \Delta Y_t + \lambda V_{t-1} + \varepsilon_t$$

The whole form of the vector error correction model (VECM) in the equation is, therefore expressed as follows:

$$\begin{aligned} \Delta \ln INF_t = & \sum_{k=1}^r C_{1,k} V_{k,t-p} + \sum_{s=1}^p \beta_{1,s} \Delta \ln BD_{t-s} + \sum_{s=1}^p \beta_{2,s} \Delta \ln GDG_{t-s} + \sum_{s=1}^p \beta_{3,s} \Delta \ln RER_{t-s} \\ & + \sum_{s=1}^p \beta_{4,s} \Delta \ln UR_{t-s} + \varepsilon_t \end{aligned}$$

Where:

$L_n$ : - the optimal lag length of the VAR

$C_{i,k}$ : the adjustment coefficients

$V_{k,t-p}$ : the co-integrating vector

$\varepsilon_t$ : - intercepts

## Data Analysis and Results

The most relevant econometric means should be used when estimating the model. Stationary of data in the study and estimation of the model. To evade problems, time series data should be investigated in stationary properties. To find the unit root, Augmented Dickey-Fuller (ADF) is used. Table 2 gives the results of ADF tests and identifies the unit root of data.

**Table 2:** Augmented Dickey-Fuller (ADF) unit root test

Data series	Levels			Lag difference		
	Test Statistics	5% Critical value	P >   t	Test Statistics	5% Critical value	P >   t
INF <sub>rate</sub>	-8.3190	-3.4500	0.0000	-3.0770	-3.4550	0.1119
BD <sub>rate</sub>	-4.9410	-3.4500	0.0003	-3.2160	-3.4550	0.0377
GDG <sub>rate</sub>	-4.0550	-3.4500	0.0073	-2.9500	-3.4550	0.6285
RER <sub>rate</sub>	-5.2620	-3.4500	0.0001	-3.1190	-3.4550	0.1019
UR <sub>rate</sub>	-3.5210	-3.4500	0.0084	-2.1640	-3.4550	0.5102

Source: Authors' calculations

Five percent significance level is used to conduct tests with the use of Mckinnon Critical Values. The results from tests indicate that it does not have unit root levels, nor do they have variables that are non-stationary. This implies that budget deficit, government debt, exchange rate, inflation rate, and unemployment rate does not have unit root in levels and are non-stationary.

Despite that, all variables become stationary after we use them for four different factors. This means that all the variables are placed in order of four. The results are then reported in table 3, which confirms the long-run relationship between explanatory variables and the inflation rate.

**Table 3:** Diagnostic tests

Problem	Test statistics	Results/ Probability	Inference
Normality	Jarque-Bera	0.0000	Normality Exists
Serial correlation	Durbin Watson	1.841284	No serial correlation
Heteroskedasticity	Breusch-Pagan / Cook-Weisberg	188.94 [0.0000]	No Heteroskedasticity
Homoscedasticity	White's test	43.70 [0.0010]	No Homoskedasticity
Model specification	VECM	0.0025	Correctly Specified

Source: Authors' calculations

From table 3, results indicate that the model is proper and fit because the null hypothesis of no serial correlation, no homoscedasticity, and no heteroscedasticity is not rejected. To add to the model test, it indicates that it is well specified. Moreover, the normality test indicates that residuals are distributed normally to make it impossible to reject the null hypothesis of normality at 5% using Jacque Bera. From the results of the (ADF) test and another test in table 3, the Vector error correlation model(VECM) is seen to play a significant role.VECM is advantageous because it identifies system errors considered as linear phenomena of shocks as compared to identification of autoregressive coefficients(1981), Shapiro and Watson (1988), and Bernanke (1986).

To ascertain the variables' properties, the researcher performed descriptive analysis. The estimation model of the descriptive statistics is present in table 4. This study presents descriptive statistics that show the results for standard deviation, mean, maximum, minimum value, and a number of observations for the total period of data.

**Table 4:** Summary of descriptive statistics

Variable	Obs	Mean	Std.Dev	Min	Max
INF <sub>rate</sub>	102	0.0379	0.0990	-0.0242	0.9500
BD <sub>rate</sub>	102	-0.0237	0.0287	-0.0684	0.0843
GDG <sub>rate</sub>	102	0.3818	0.2150	0.0003	0.8445
RER <sub>rate</sub>	102	0.0512	0.0638	-0.2663	0.1740
UR <sub>rate</sub>	102	0.2278	0.0670	0.1140	0.3725

Source: Authors' calculations

The table above reveals that the mean value of the inflation rate is 0.0379 (3.79%), while the standard deviation is 9.9%, this value is moderate when it is compared to mean average variability. On the other hand, the maximum value is 95%, which was achieved by Serbia in 2001, while the minimum value is -2.42 from Kosovo in 2009. The standard deviation of the independent variable budget deficit is 8.43%, while the average is -2.37. The minimum value of fiscal deficit is -6.84 percent achieved in 2001 from Albania, while the maximum value is 8.43 percent was achieved from Montenegro in 2007. The government debt to GDP ratio has a mean value of 38.18%. The maximum and the minimum value is 84.45 and 0.00%, respectively (Montenegro, 2002).

The standard deviation of the real exchange rate is 6.38%, while the mean value is 5.12%. Kosovo in 2005 achieved the maximum value of 17.4%, and Serbia (2002) achieved the minimum value of the real exchange rate of 26.63%. Lastly, the standard deviation of the independent variable unemployment is 6.70%, while the mean value is 6.70%. The minimum value of unemployment rate is achieved by Kosovo in 2012 in value of 11.40 percent, while the maximum rate of unemployment is in value of 37.25 percent achieved by North Macedonia in 2008.

The results from the table below about the correlation between explanatory variables and inflation reveal that only budget deficit has a positive coefficient of 0.078\*\*. Whereas, negative correlation to the inflation rate have: unemployment, real exchange rate, government debt to GDP of -0.234\*, -.265\*, and -.155.

**Table 5:** Summary of correlation

Correlations					
	INF <sub>rate</sub>	BD <sub>rate</sub>	GDG <sub>rate</sub>	RER <sub>rate</sub>	UR <sub>rate</sub>
INF <sub>rate</sub>	1				
BD <sub>rate</sub>	.078**	1			
GDG <sub>rate</sub>	-.155	-.401**	1		
RER <sub>rate</sub>	-.265**	-.279**	.040	1	
UR <sub>rate</sub>	-.234*	.271**	-.311**	0.168	1

\*\* . Correlation is significant at the 0.01 level

\* . Correlation is significant at the 0.05 level

Source: Authors' calculations

From the results, there is a negative correlation between real exchange rate and government debt to GDP ratio with coefficients of -.279\*\* and -.401\*\*, respectively, and a significant interval of 99.9%. On the other hand, there is a positive correlation of .271\*\* with the unemployment rate and a significant interval of 99.9%. Also, there is a significant negative correlation between government debt to GDP and the rate of unemployment with coefficient -3.11\*\*, and other results from correlation analysis are not significant.

**Table 6:** Vector error correction model

Variable	Coefficient	Standard error	t-statistics	Probability
BD <sub>rate</sub>	0.0934379	0.0262064	3.5711234	0.000
GDG <sub>rate</sub>	0.5524111	0.1616790	3.4200012	0.001
RER <sub>rate</sub>	-0.1057567	0.0399651	-2.6510034	0.080
UR <sub>rate</sub>	-0.0058764	0.0399597	-0.1500092	0.883
Observation	102	102	102	102
R-squared	0.4545	Akaike information criteria AIC		-15.37001
Adjusted R square	0.4197	Schwartz information criteria SBIC		-14.35399
SE of the estimate	0.9286	Hannan-Quinn information HQIC		-14.95881
Log likelihood	807.500	Durbin – Watson test		1.841
F-statistic	4.4301			
Probability	0.0025			

Source: Authors' calculations

From the estimates of the co-integration inflation rate model, it is evident that the explanatory variable included in the model is responsible for approximately 45.45% of the inflation rate variations. The F-statistics of 4.43 has helped in obtaining these estimates. The statistics reject the null hypothesis of equating all the explanatory variables to zero. In addition, the researcher used the Durbin-Watson test to verify the serial correlation. Comparing the theories that explain the model's sustainability using Durbin Watson gives a value of 1.841; the results also give a standard interval that ranges from 1.5 to 2.5, which indicates there is no autocorrelation or serial correlation between the residual values. Hence, the findings in this study indicate a value of 1.841 from Durbin-Watson - the value is almost within the interval value; therefore, we can safely conclude that there is no serial correlation. As mentioned earlier, the purpose of this study was to examine the impacts of the budget deficit and other explanatory variables on the inflation rates.

The VECM results show that Western Balkan Countries have a budget deficit, with 99.9% statistically significant value, and a positive significance ( $P=0.000$ ) on the rate of inflation. These results indicate that a budget deficit rate positively impacts the rate of inflation. The findings of this study are in accordance with the previous research by Catão and Terrones (2005), which found that the inflation rate and budget deficits have a strong correlation in countries with moderately high inflation. In their findings, to introduce non-linearity to the model, they use narrow money to scale budget deficit. According to (Kryeziu and Durguti, 2019), there is a positive impact of budget deficit on the rate of inflation in the Eurozone Countries, but the relationship is not statistically significant. Another study by Hamburger and Zwick (1981); Grossman (1982) found that the inflation rate and budget deficit have a significant link between them in the US; conversely, the findings by McMillin and Beard (1982), which examined the situation of USA, show that there is no evidence to support that there is a relationship between money growth and inflation. Furthermore, various empirical studies have examined Greece to uncover the link between inflation rate and budget deficit. A study by Hondroyiannis and Papapetrou (1997) claimed that the inflation rate of Greece is not affected by the rise of budget deficits. In contrary to these findings, Darrat (2002) argued that the inflation rate in Greece and budget deficit have a significant relationship, the study used a vector error correction mechanism. This analysis also used another explanatory variable, which found that GDP ratio and Government debt have a positive statistically significant, with 99.9 percent in the inflation rate ( $P=0.0010$ ). The results show that there is a positive impact between the growth of the inflation rate and the growth of government debt to GDP ratio. The findings of our study are contrariwise with those of Mustafa *et al.*, (2008), who found that well-developed financial markets have less inflationary debts. Also, Taghavi (2000) found that there is a reverse attitude between inflation and

public debt, which includes economic growth and investment in major economies in Europe from 1970 to 1997.

The variable Real exchange rate has a negative sign ( $P=0.0080$ ) and a statistically significant level of 99.9%. The results show that there is when the real exchange rate grows, it has negative impacts on the rate of inflation. The results of our study are in line with the findings of the authors such as Albuquerque and Portugal (2005), who investigated the relationship between inflation rates and exchange rates. The study used a bivariate GARCH model to test the relationship between the variances of inflation and the exchange rate. The findings by Berument (2002) also reveal that inflation is affected by foreign exchange rates. This study's empirical study indicates that there is a negative correlation between inflation rate and unemployment, but the values are not statistically significant because of a P-value of 0.8830, which is greater than 0.10.

## **Conclusion**

For decades, researchers have been investigating the relationship between inflation and budget deficit; this topic has been perennial. It is also very contentious. It is an important controversial issue among Keynesian, monetarists, and policymakers. This study has analyzed the propositions of the explanatory variables and budget deficit, and the way they impacted the rate of inflation in Western Balkans Countries for a period from 2001 to 2017. The study followed an econometric approach whereby it conducted many tests so that accurate results can be obtained. In this study, the independent variables were the unemployment rate, the real exchange rate, government debt, and budget deficit, while the dependent variable was the inflation rate. The unit root test reveals that the variable is not stationary; hence, to make them stationary, they are integrated into order four I (4). The investigation of the causal relationship in the macroeconomic variables required the use of the Vector Error Correction Model (VECM).

Based on the generated results of VECM, the independent variables have a statistically significant relationship with the rate of inflation. According to the results obtained from the long-run relationship reveal the inflation rate positively and significantly relates to government debt and budget deficit, while in Western Balkans Countries, the inflation rate negatively and significantly relates to the real exchange rate. From the estimated results, approximately 9.34% of inflation in Western Balkans Countries results from an increasing budget deficit to GDP ratio by a one percentage point. As we mention above, our findings are in full accordance with the study of (Catão and Terrones, 2005). It would be of policy importance to modify the empirical analysis so that it can include other variables that have complex interlacing with inflation. As to government debt linkage to the inflation rate, the results show that increasing the point of government debt affects inflation growth. Our outcomes are in harmony with the results of the Mustafa (2008), who find that the extension in government debt in developed countries is less inflationary. Moreover, in presumption, the unemployment rate has not fundamentally influenced inflation, and in such a manner, it is pointless to address.

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