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# PUBLIC DEBT AND ECONOMIC GROWTH – THE CASE OF THE REPUBLIC OF NORTH MACEDONIA

## JAVNI DUG I EKONOMSKI RAZVOJ - SLUČAJ REPUBLIKE SJEVERNE MAKEDONIJE

**Summary:** *Establishing and maintaining macroeconomic stability and fiscal discipline on the one hand, and stimulating economic activity, by enhancing the quality of public finances, increasing capital expenditures, and enhancing competitiveness in the Macedonian economy, on the other hand, are two opposing objectives that should be pursued by policymakers. Government borrowing, especially foreign borrowing, is an important source of fixed assets to cover public expenditure. However, the sustainability of public debt depends not only on the level of public debt, but also on the structure and successful implementation of policies to boost economic growth. Borrowing for a country with low economic potential and a constant shortage of capital is inevitable, especially external borrowing. However, the structure, purpose of the assets and their multiplier effect on the overall economy are the main criteria for assessing the impact of public debt on the economy. This paper attempts to apply the econometric VAR analysis to examine the correlation and causal relationship between public debt and economic growth rate of the case of the Republic of North Macedonia for the period 2002 - 2017. The variables to be analyzed are: GDP growth per capita, Public debt as a proportion of GDP, Gross Domestic Investment, Interest Rate and Government Spending. For the purpose of this analysis, a Granger causality test has been conducted. The test results indicate that the impact of public debt growth in North Macedonia does not have a significant impact on GDP growth per capita. The other test that is being conducted is a Vector Error Correction Model which shows that public debt is negatively correlated with short run and long run economic growth.*

**Keywords:** *economic growth; GDP per capita; Granger causality; North Macedonia; public debt*

**JEL classification:** *O4,H63*

**Резиме:** *Успостављање и одржавање макроекономске стабилности и фискалне дисциплине с једне стране, и подстицање економских активности, унапређењем квалитета јавних финансија, повећањем капиталних издатака и јачањем конкурентности у Македонској економији, с друге стране су два супротстављена циља којима би требало да се баве они који су на власти. Задуживање државе, посебно инострано задуживање, је важан извор основних средстава за покривање јавних трошкова. Међутим, одрживост јавног дуга не зависи само од његовог нивоа, већ и од структуре и успјешне примјене политика за јачање економског раста. Позајмљивање за земљу са малим економским потенцијалом и сталним недостатком капитала је неизбежно, посебно спољно задуживање. Међутим, структура, сврха имовине и њихов умноживачки утицај на цијелокупну економију главни су критеријуми за процјену утицаја јавног дуга на исту. Овај рад покушава примјенити економетријску VAR анализу како би испитао повезаност и узрочно-последичну везу између јавног дуга и стопе економског раста у случају Републике Сјеверне Македоније у периоду 2002 - 2017. Промјенљиве варијабле које се анализирају су: раст БДП-а по глави становника, јавни дуг у односу на БДП, бруто домаће инвестиције, каматне стопе и државна потрошња. За потребе ове анализе, спроведен је Грејнџеров тест узрочности. Резултати теста показују да утицај раста јавног дуга у Сјеверној Македонији нема значајан утицај на раст БДП по глави становника. Други тест који се проводи је Модел корекције векторских грешака који показује да је јавни дуг негативно повезан са краткорочним и дугорочним економским развојем.*

**Кључне ријечи:** *економски развој; БДП по глави становника; Грејнџеров тест узрочности; Сјеверна Македонија; јавни дуг*

**ЈЕЛ класификација:** *O4,H63*

## 1. INTRODUCTION

Establishing and maintaining macroeconomic stability and fiscal discipline on the one hand, and stimulating economic activity, by enhancing the quality of public finances, increasing capital expenditures, and enhancing competitiveness in the Macedonian economy, on the other hand, are two opposing objectives that should be pursued by policymakers. The only alternative to find an additional source of capital for small and open economies with fixed exchange rates (including North Macedonia) which have enormous shortages of capital, low levels of domestic savings and investments is to be exposed to the international capital market. On the other hand, public debt should not be aim for itself, the level of public debt should not be the focus of the analysis, public debt structure and the purpose of the borrowed funds are determinants that give clear signals about the state of debt in the country public debt structure and the purpose of the borrowed funds. In this regard, it should be emphasized that, if the funds are used efficiently, they will contribute to value added in the Macedonian economy with productive investments. If these assumptions are fulfilled, debt servicing should not be the issue for the Macedonian economy. However, if we look at GDP per capita as an indicator of the growth of the economy of North Macedonia, it can be noticed that the average GDP growth per capita in North Macedonia for the period 2005 - 2017 is 2.9%, with certain cyclical movements. The average growth rate of GDP per capita of 2.9% is considered insufficient to service the public debt, which reaches 48% of GDP. In this respect, it should be noted that although the so-called Maastricht Criteria for the upper limit of public debt are adhered to, nevertheless, according to certain estimates of the debt sustainability of the Macedonian economy, it must not exceed 45% of GDP. For the purpose of this research, an econometric VAR analysis was conducted to examine the relationship between economic growth represented by GDP per capita, and public debt as a proportion of GDP. This analysis also includes Gross Domestic Investment, Interest Rate, and Government Spending. The data are taken from the database of the World Bank and the Ministry of Finance of the Republic of North Macedonia for the period 2002 to 2017. For this research, some tests have been conducted to obtain credible results for the short and long term relationship between the mentioned variables. Single root test, Granger Causality test, Impulse - response function, Johansen cointegration technique, and VECM error correction model are applied.

The results of the Granger Causality test indicate that the impact of public debt growth in Macedonia does not have a significant impact on GDP growth per capita. From this point of view, it can be concluded that the public debt does not cause significant effects on the Macedonian economy, i.e. the use of public debt is for investments which do not produce a positive multiplier effect, thus adding no additional value to the Macedonian economy. Therefore, it can be concluded that such a pace of public debt and its insignificant impact on GDP growth per capita is suboptimal and unsustainable.

The results of the Estimation of Error Correction Model (VECM) indicate that public debt is negatively correlated with short-run and long-run correlations with economic growth, as shown by GDP per capita. From this relation, it can be concluded that the increase of public debt in the Republic of Macedonia has no positive effects on the growth of GDP per capita. It should also be noted that this model of vector error estimation leads to unsatisfactory results for the effect of gross domestic investment on GDP per capita growth.

The paper is structured as follows. Following the introduction, a brief overview of some studies related to the relationship between economic growth and public debt will be made. Furthermore, a brief analysis of the main variables is provided, explaining the determinants and the methodology used in this research. The main part is the econometric VAR analysis, which uses modern methods to analyze the short-term and long-term relationship between the mentioned variables. The conclusions are contained in the last part of the paper.

## 2. LITERATURE REVIEW

The link between the size of public debt and economic growth is a field of interest and analysis for both the academic community and economic policymakers. The implications of such a link are different, in some cases public debt has a positive impact on economic growth, while in others public debt is an obstacle to the economic growth of individual economies. Some empirical research

on the impact of public debt on economic growth, such as the research conducted by Korseh Hindowa (2005) on the Sierra Leone case, has used macroeconomic aggregates for the period 1970 to 2001. In this study, the estimation was done with the VAR model in the form of Bivariate and Multivariate (VAR) models. The highlighted models use data on variables such as Gross Domestic Investment and, Foreign Trade. The vector model results show the Granger causal link between public debt and GDP per capita growth, while on the other hand there is a long-term significant relationship between public debt, growth in domestic investment and growth in foreign trade. Also in the Karagoz and Caglar (2016) survey of 17 OECD countries, the panel analysis method was used. The results of this research show a significant positive relationship between public debt and economic growth in the case of these countries. However, to get a broader picture of the effects of public debt on countries' economic growth, the research by Ajayi and Oke (2012) should also be noted as it gives the example of Nigeria clearly showing the negative relationship between public debt and exchange rate sustainability of the currency, the weakening of the education system, the negative growth of the industry, and the general level of development of the country. Baum et al. (2012) investigated the impact of public debt on annual real GDP growth rates in 12 European countries using the dynamic threshold panel methodology for the period from 1990 to 2010. The results showed that the impact of public debt on real GDP growth in the short run is positive and highly statistically significant. In the same research paper the authors found that as the public debt as ratio to GDP approaches 67%, this relationship decreases to zero. When this ratio goes up to 95%, public debt was found to have an adverse impact on annual real GDP growth rates. In the paper from Reinhart and Rogoff (2010b), authors used a sample of 44 countries, 20 advanced economies and 24 emerging economies for the period 1946 to 2009, and the results showed that higher levels of public debt have a proportionately larger negative impact on GDP growth and inflation rate. Szabó (2013) has conducted a research in 27 EU countries to investigate the relationship between public debt to GDP ratio and GDP growth rate. The results show that in the short run public debt has detrimental effects on GDP growth rate. The results from the econometric estimation show that 1% increase in debt/GDP ratio results in 0.027% decrease in annual GDP growth rate.

Minea and Parent (2012), studied the relationship between public debt and real GDP growth rate, using the panel smooth threshold regression model, and found strong support for the threshold theory. In this study, the authors found that public debt is negatively related to real GDP growth rate when the government debt-to-GDP ratio is between 90% and 115%. The authors, however, found that the relationship between public debt and real GDP growth rate becomes positive when debt exceeds 115%, of GDP, and that there is no statistically significant relationship between the two variables when the public debt to GDP ratio is below 90%. Ahlborn and Schweickert (2018), while testing the relationship between public debt and GDP growth using a sample of 111 OECD and developing countries for eight 5-year periods from 1970 to 2010, concluded that the link between public debt and GDP growth varies considerably across countries due to the degree of fiscal uncertainty brought about by each economic system. The empirical findings of Ahlborn and Schweickert (2018) suggest that public debt has a stronger negative impact on GDP growth in continental countries than in liberal countries. Égert (2012) also found evidence supporting the existence of a negative relationship between public debt and GDP growth rate in 20 advanced economies over the period from 1946 to 2009. Finally, Afonso and Jalles (2011) assessed the effect of government debt on GDP per capita growth and productivity in 155 developing and developed countries from 1970 to 2008. Using both pooled OLS and cross-section time series regressions, the authors found a statistically significant negative relationship between government debt and GDP per capita growth in all studied economies.

### 3. RESEARCH METHODOLOGY AND DATA COLLECTION

In order to analyze the degree of correlation and causality between public debt and economic growth, a vector linear regression (VAR) of this relation has been conducted on the case of the Republic of North Macedonia for the period from 2002 to 2017. The time series covered by this analysis are GDP growth per capita, public debt as a proportion of GDP, the interest rate on loans, government spending and Gross Domestic Investment. The data is retrieved from the World Bank database and the Ministry

of Finance of the Republic of North Macedonia. To determine the stationarity of the series, for aim of further analysis, it is important to determine the integrative characteristics of the individual variables in the model. Such tests attempt to determine whether time series are characterized by a particular trend or seasonal component in their movement, i.e. are unstable at their level. The Unit root test determines the level of differentiation in order to remove the trend or seasonal component, i.e. time series, to obtain examples of stationarity. In this regard, it should be noted that for determining the level of stationarity of time series it is best to use Augmented Dickey-Fuller (ADF - test) and PP test. Once a co-integration relation is established between two variables, at least one causal link between the variables appears. The next step is to apply the Granger causality test. This type of test applies only to cointegrated variables to find the causal link between them. The Granger method seeks to determine the extent to which changes in the dependent variable Y can be explained by past values of the variable itself, but also by the values of other independent variables, both separately and as joint effects. Furthermore, the appropriate economic specification for two or more nonstationary variables that are inter-integrated, that is, have basic stochastic trends along which they move along a nonstationary path is the Vector Error Correction Model (VECM). The Engle and Granger test showed that when variables are integrated by degree I (1) and co-integrated, then one-way or two-way causality must exist in at least I (0) of the variables. If the variables are co-integrated, then the error correction must be present. Vector Error Correction Model (VECM) is a special case of VAR for variables that are not stationary in their natural form (i.e. in the level) but become stationary in their differences. VECM will be used in situations where cointegration links of this type are a real occurrence.

*Table 1. Analysis of the variables*

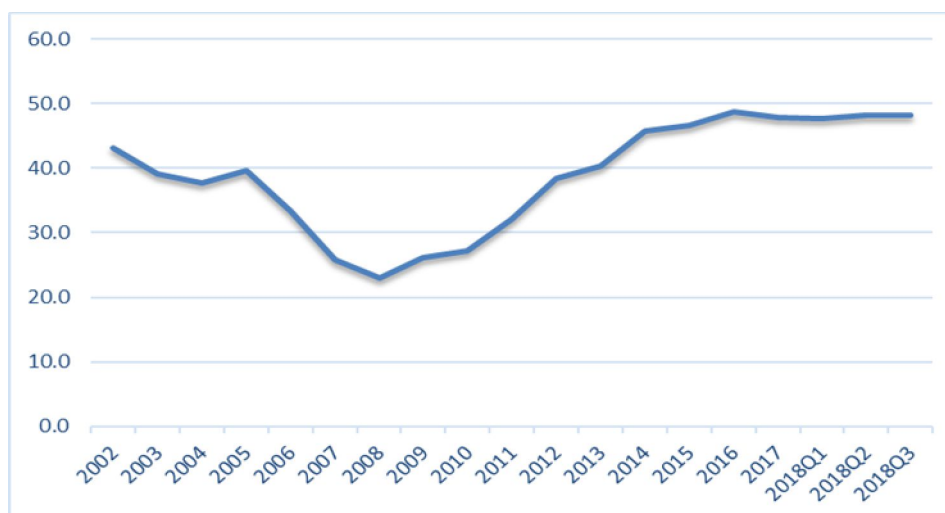
Variable	Shortcut	Description	Source
GDP growth per capita	GDP_GROWTH	GDP growth per capita rate. Based on the value of GDP per capita in 2010 in USD dollars.	World Bank
Public debt	PUBLIC_DEBT	Public debt, expressed in proportion to GDP. Methodologically, the public debt does not include the debt of the National Bank of the Republic of Macedonia.	Ministry of Finance
Interest rate	INT_RATE	Interest rate on loans in the Republic of Macedonia	World Bank
Domestic Investment	DOMESTIC_INVESTMENT	Expressed as a percentage of GDP, this variable comprises the value of total domestic investment in Macedonia.	World Bank
Government Spending	GOVERNMENT_SPENDING	Current government spending on goods and services, employee benefits, etc.	World Bank

Source: Author's calculation

### 3.1. Description of the Public Debt in the Republic of North Macedonia

Maintaining stable economic growth is largely determined by the structure and level of indebtedness of individual economies, primarily those in developing economies. Macedonia as a developing country with an enormous lack of capital, low level of domestic savings and investments has almost no option but alternative sources of funding. External sources of the capital with the inflow of capital in the form of FDI, and external market debt are daily occurrence for the Macedonian economy. In this respect, it should be emphasized that the level of public debt should not be put first, i.e. it is not an aim in itself. The analysis of the public debt should focus on the structure of the public debt, which primarily refers to the currency in which the country borrows and the interest rate at which it does so, as well as the purpose of the borrowed funds. It is up to these three factors whether the country will be able to utilize the borrowed funds optimally, to create higher added value in its economy, as well as the possibility of timely servicing its debt. Chart 1 presents the public debt movement of the Republic of North Macedonia as a proportion of GDP in the period from 2002 to 2018.

Chart 1. Public debt as % of GDP for the period 2002-2018



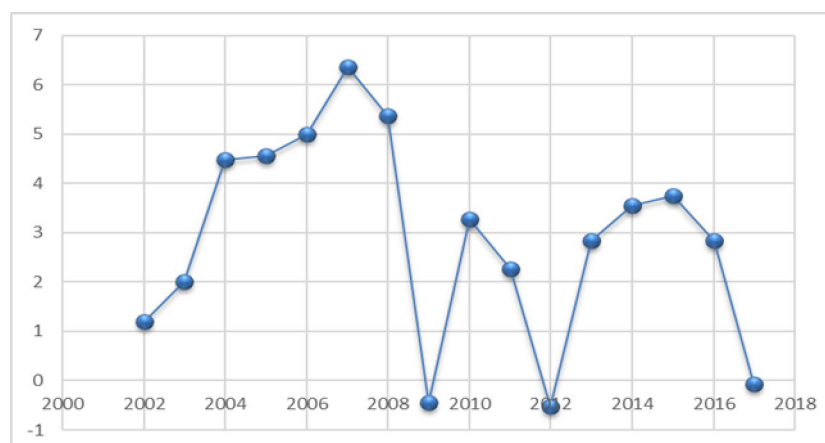
Source: Ministry of Finance North Macedonia 2019

From the graph, it can be concluded that in the period 2002-2008 in North Macedonia the public debt is continuously decreasing reaching 23% in 2008. During this period, on the one hand, economic growth rates were characterized by positive trends, while on the other hand, fiscal discipline policy was implemented. However, since 2008, the Republic of North Macedonia has abandoned its low-indebtedness strategy, i.e. has stopped maintaining its fiscal discipline and began to borrow in the foreign capital market. As a result of the deteriorating economic conditions and the expansive fiscal policy of the government, public debt has started to rise. Government borrowing, especially foreign borrowing, has become an important source of fixed assets to cover public expenditure. The proportion of public debt to GDP in 2008 was 28%, while the same proportion in 2017 reached 48%, marking an increase of 20 p.p. of public debt in the Republic of North Macedonia. Whereas, if the so-called Maastricht criteria are consulted, public debt is considered sustainable up to 60% of GDP, but according to the performance of the North Macedonian economy, it is considered that the proportion of public debt must not exceed 40 - 45% of GDP. In this regard, it can be concluded that economic growth in terms of borrowing is not sustainable and current growth rates do not contribute to improving the living standard of the average citizen. The intergenerational problem of servicing public debt, especially long-term public debt, should also be considered. It is important to keep in mind that funds for future debt servicing should be provided from the budget, automatically reducing some public expenditure (primarily capital expenditure) or raising taxes or generating additional debt. However, it should be noted that all of these alternatives seem restrictive in terms of the future economic development of the country, which means that the burden of today's borrowing will be borne by future generations.

### 3.2. Description of the Growth of GDP per capita

GDP per capita with all its disadvantages in terms of averaging and leveling the differences between economic agents is considered a suitable indicator for analyzing the economic performance of an economy. This indicator can be used to compare the average standard of living between separate economies, as well as to analyze the standard of living over time in a certain economy. Of course, in such analyses, GDP per capita may suffer some distortions caused by exchange rate fluctuations, and it also does not give a true picture of the country's income distribution. However, with all its weaknesses in this analysis, the GDP per capita indicator is used to determine the level of economic growth of the North Macedonian economy. Graph 2 shows the movement of this variable for the period 2002 - 2017.

Chart 2. GDP per capita movement for the period 2002 - 2017



Source: The World Bank 2019

From Chart 2, it can be concluded that GDP per capita in the analyzed period reached as many as three times negative growth rate. In 2009, as a result of the financial and debt crisis, GDP per capita experienced negative growth.<sup>1</sup> Furthermore, it can be concluded that inconsistent government policies, political instability, the halt of certain construction activities financed primarily by the government budget contribute to fluctuations in North Macedonia's GDP per capita in the analyzed period.

## 4.RESULTS AND DISCUSSION

### 4.1. Testing the integrative characteristics of variables

Initially, this study is testing the integrative characteristics of the series. It is common for the variables to be characterized by a seasonal component and a trend in their movement over the time. Although recent research has increasingly emphasized the fact that these features should not be a reason for the validity of the degree of the causal relationship between variables, it is thought that time series may be stationary in the trend. However, in this research, it is decided to work with a stationary time series. Only the Augmented Dickey-Fuller test (ADF test) is used in this regard, while the Phillips-Perron test is not taken into account. The results in table 2, show that at the significance level of  $\alpha = 0.05$  the time series can be stationary in their natural form, that is, in the level, in their first differentiation or their second differentiation.

Table 2. Single root testing using the ADF test

Variable	t – statistic	Critical value	p - value
PUBLIC_DEBT	-1.519173	-2.967767	0.5099
$\Delta$ PUBLIC_DEBT	-2.109811	-2.967767	0.2424
$\Delta$ PUBLIC_DEBT(-2)	-5.106062	-2.971853	0.0003
GDP_GROWTH	-1.884388	-2.986225	0.3337
$\Delta$ GDP_GROWTH	-4.915036	-2.998064	0.0007
DINT_RATE	-2.633534	-3.081002	0.1083
$\Delta$ DINT_RATE	-3.22494	-3.11991	0.0419
DOMESTIC_INV	-4.543301	-3.11991	0.0044
GOV_CONS	-2.603512	-3.081002	0.1139
$\Delta$ GOV_CONS	-3.670629	-3.098896	0.0182

Source: Authors' calculations.

<sup>1</sup> In this regard, it should be noted that, despite the decline in economic activity in the economies of the EU countries (Germany, the Netherlands, Greece, etc.) which are Macedonia's largest trading partners, the decline in incoming transfers from abroad, which methodologically enter GDP, contributed to further GDP per capita decline.

- At the significance level of  $\alpha = 0.05$ , it should be noted that the variable that represents the public debt in the Republic of North Macedonia in its natural form and its first differentiation has nonstationary time series characteristics, but in its second differentiation it becomes stationary, so, it can be concluded that this time series is integrated into second-order I (2).
- The variable representing Gross Domestic Product (GDP) per capita growth is also non-stationary in its natural form, yet it becomes stationary in its first differentiation, from which it can be concluded that this time series is integrated into first-order, I (1).
- The variable that represents the interest rate on the loan becomes stationary in its first differentiation, from which it can be concluded that this time series is also integrated in the first-order, I (1).
- The variable representing the Gross Domestic Product (GDP) in North Macedonia as a proportion of GDP can be stated to be stationary at its level, i.e. integrated by zero-order I (0).
- Government spending as a proportion of GDP is also integrated into the first-order, I (1).

It can be concluded that all the variables after the changes made in them have become stationary and as such will be subject to additional mutual analysis.

#### 4.2. Testing the Granger Causality

In this respect it should be made clear that this type of testing analyzes the cause-effect relationship between the variables. For example, if the value of Y is affected, i.e. it is the Granger equals of X, in this case the future values of Y can be predicted using the past X values. Table 3 presents the results of the Granger Causality test.

Table 3. Granger Causality test results

VAR granger Causality/Block Exogeneity Wald Tests							
Sample: 2002S1 2017S2							
Included observations: 27							
Dependent variable: DGDP_GROWTH				Dependent variable: DINT_RATE			
Excluded	Chi-sq	df	Prob.	Excluded	Chi-sq	df	Prob.
DPUBLIC DEBT	0.66406	2	0.7175	DGDP_GROWTH	1.084512	2	0.5814
DINT_RATE	14.49101	2	<b>0.0007</b>	DPUBLIC DEBT	0.528579	2	0.7678
DDOM_INV	7.295248	2	<b>0.0261</b>	DDOM_INV	3.57239	2	0.1676
DGOV_CONS	5.780308	2	<b>0.0556</b>	DGOV_CONS	4.47995	2	0.1065
All	27.02764	8	<b>0.0007</b>	All	7.95583	8	0.4378
Dependent variable: DPUBLIC DEBT				Dependent variable: DDOM_INV			
Excluded	Chi-sq	df	Prob.	Excluded	Chi-sq	df	Prob.
DGDP_GROWTH	6.907068	2	<b>0.0316</b>	DGDP_GROWTH	0.093132	2	0.9545
DINT_RATE	1.231673	2	<b>0.5402</b>	DPUBLIC DEBT	1.124476	2	0.5699
DDOM_INV	5.263087	2	<b>0.072</b>	DINT_RATE	1.210448	2	0.546
DGOV_CONS	4.106985	2	<b>0.1283</b>	DGOV_CONS	6.162485	2	<b>0.0459</b>
All	19.07847	8	<b>0.0144</b>	All	10.80469	8	0.213
Dependent variable: DGOV_CONS							
Excluded	Chi - sq	df	Prob				
DGDP_GROWTH	0.034329	2	0.983				
DPUBLIC DEBT	0.143553	2	0.9307				
DINT_RATE	6.029123	2	<b>0.0491</b>				
DDOM_INV	1.9701	2	0.3734				
All	7.617481	8	0.4717				

Source: Authors' calculations

Table 3 shows the causal-effect relationships for regression estimations at significance level  $\alpha = 0.05$  and based on the results it can be concluded that:

- In the first regression estimation, where the dependent variable is GDP growth per capita, while all other variables included in the model appear as independent variables, several

significant relationships can be established. In this respect, it can be concluded that the individual impact of Gross Domestic Investment and Government consumption on GDP per capita growth is positive. Also the individual impact of the variable representing the interest rate on loans is positive and significant. In this respect, it is considered useful to point out that the impact of the increase in the public debt in North Macedonia does not have a significant impact on the GDP growth per capita. Therefore, it can be concluded that public debt does not cause significant effects on North Macedonian economy, i.e. the use of public debt is for unproductive investments and current consumption, which do not produce added value on North Macedonian economy. Lastly, it can be concluded that such a pace of public debt and its insignificant impact on GDP growth per capita is suboptimal and unsustainable.

In this regard, it should be noted that the common effect of the mentioned variables on public debt has a significant impact.

- In the second regression estimation, the variable that represents the proportion of public debt as a share of GDP is the dependent variable, while other variables appear as independent variables. It should be noted that the Gross Domestic Investment (at a significance level of  $\alpha = 0.07$ ) and GDP per capita have a significant impact on the growth of public debt in North Macedonia. In this regard, it should be noted that these two variables are directly affected by the causal relationship, however, as mentioned above, the increase in public debt does not have a significant impact on these two variables, i.e. their increase affects the increase in public debt. It should also be noted in this respect that at the significance level of  $\alpha = 0.05$ , the common impact of the variables on public debt growth is significant.
- In the third regression estimation, the interest rate on loans is the dependent variable, while all other variables included in the model appear as independent variables. From this estimation it can be concluded that the individual effects on the interest rate movements are not significant, and the overall impact of these variables does not show a statistically significant relation to the interest rate movements. Such an impact can also be justified by considering the relationship that interest rates on loans and deposits are primarily conditioned by National Bank of the Republic of North Macedonia's discount rate.
- In the fourth regression estimation, the variable that represents the proportion of Gross Domestic Investment as a share of GDP in North Macedonia appears as a dependent variable. From the Granger Causality estimation it can be concluded that only government consumption causes a statistically significant impact on the growth of Gross Domestic Investment in the Macedonian economy. In this regard, it can be concluded that the increase in public debt has no significant impact on the growth of Gross Domestic Investment in Macedonia. Again, it can be concluded that in this case the insignificant effects of public debt increase on Macedonian economy are confirmed.
- In the fifth regression estimation, the dependent variable represents the proportion of government consumption as a share of GDP. At the significance level of  $\alpha = 0.05$  it can be concluded that apart of all variables consulted in the model, the interest rate is the only variable that has a significant impact on the increase in government consumption. In this regard it should be noted that certain factors that have a major impact on the growth of government consumption are not included in this analysis for justifiable reasons. The overall impact of the consulted variables on government consumption increase is statistically insignificant at significance level  $\alpha = 0.05$ .

### 4.3. Vector Error Correction Estimate (VECM)

Table 4 gives the estimation of vector error correction model. In this regard it should be noted that vector trial and error method is applied in the research of Granger & Engle (1987). They point out that VAR regression of differentiated values of cointegrated variables can contribute to unreliable cointegration relationships. In this respect it is desirable to apply VECM in this paper in order to analyze the dynamics of the movement of these relations.



Table 4. Estimates of Vector Error Correction Model (VECM)

Variables	Coefficient	Std. Error	t-statistic
DGDP_GROWTH(-1)	1	-0.22835	[-5.63798]
DPUBLIC_DEBT(-1)	-1.28744	-0.13541	[4.36683]
DINT_RATE(-1)	0.591332	-0.05241	[-2.56535]
DDOM_INV(-1)	-0.13446	-0.67348	[4.02802]
DGOV_CONS(-1)	2.712791	-0.4741	[3.50045]
C	1.659547		
R-squared	0.867168		
Adj. R-squared	0.778613		
Sum sq. resids	13.47397		
S.E. equation	0.947768		

Source: Authors' calculations

The results of the estimated equation in Table 3 show that public debt is negatively correlated with economic growth, represented by GDP per capita, both in the long run and in the short run. From this relation, it can be concluded that the increase of the public debt in the Republic of North Macedonia has additional implications for the decrease of the GDP growth rate per capita. It should also be noted that this vector error correction model has unsatisfactory results for the effect of gross domestic investment on GDP per capita growth. Although the coefficient before the variable is low, with the low factorial value of t - statistics, it can be concluded that the Gross Domestic Investment does not have a positive impact on the GDP growth per capita on the case of North Macedonia.

## 5. CONCLUSION

This paper analyzes the impact of public debt on economic growth in the Republic of North Macedonia. Due to the lack of data, time period on which this analysis is based for 2002 - 2017. The data used are taken from the World Bank database and the Ministry of Finance of the Republic of North Macedonia. Furthermore, it can be concluded that the VAR model estimation satisfies all the stability characteristics of the model. In this regard, the results of the econometric estimation point to the following conclusions:

- The separate impact of Gross Domestic Investment and Government consumption on GDP per capita growth is positive. The separate impact of the variable representing the interest rate on loans is positive and significant, too. It is also important to emphasize that the impact of public debt growth in North Macedonia does not have a significant impact on GDP growth per capita. Therefore, it can be concluded that public debt does not cause significant effects on Macedonian economy, i.e. the use of public debt is for unproductive investments and current consumption, which do not produce added value on Macedonian economy. From this it can be concluded that such a pace of public debt and its insignificant impact on GDP per capita growth is suboptimal and unsustainable.
- The increase in public debt has not significant impact on Gross Domestic Investment growth in North Macedonia. Regarding this, it can be concluded that the insignificant effects of the public debt increase on the Macedonian economy are confirmed.

Public debt is negatively correlated with economic growth, represented by GDP per capita, both in the long run and in the short run. From this relation, it can be concluded that the increase of the public debt in the Republic of North Macedonia has additional implications for the decrease of the GDP growth rate per capita. It should also be noted that this vector error correction model has unsatisfactory results for the effect of gross domestic investment on GDP per capita growth.

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