

PUBLIC DEBT AND THE CENTRAL BANK IN THE CONDITIONS OF THE CURRENCY BOARD

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Abstract: *The subject and purpose of the research in this paper is based on the analysis of the influence of the central bank on public debt in the conditions of the currency board in Bosnia and Herzegovina. The structure of the work was set up through a dynamic analysis of the ratio of public debt variables, the supply of money, the state of the budget of the governments of Bosnia and Herzegovina, the current account and the nominal exchange rate. The research covers the period from 2000 to 2016. The research methodology is based on the use of empirical data and the application of the vector autoregression model (VAR). On the basis of an analysis of the function of impulse and response, it is possible to indicate the reactions of the variable variables with one another. On the other hand, the decomposition of variance through the model proves the mutual variability and interaction of the variables for the observed period of research. The practical implications of the work are reflected in the answer to the extent to which monetary authorities, in the conditions of the currency board, due to the endogenous supply of money, contribute to the creation of a budget deficit and public debt.*

Keywords: *public debt, money supply, public revenue, current account, nominal exchange rate.*

1. INTRODUCTON

Developing and transition countries are lured into debt by a number of reasons that can range from

economic growth and development to maintaining the liquidity of government budgets. Public debt as an extraordinary non-fiscal revenue of the state often serves to finance public spending, and is most often a consequence of the budget deficit. The main generators of the budget deficit arise from the existence of a gap between public revenues and expenditures that are most often manifested through increase of pensions, increase of spending on health and social insurance, increase of public sector revenues that are unproductive, decline of economic activity, reduction of personal spending, increase of fiscal pressure, and so on. The issue of public debt is gaining weight by taking into account the fact that the imbalance in the budget balance and the escalating public debt of countries in recent decades is a headache both for developed and developing countries. State apparatus in most countries is extremely large, for this reason some governments have taxed and spend almost half of their GDP, which means that a large part of the budget expenditures is intended to redistribute income. Public debt growth in the long run should be lower than the rate of economic growth if the country's illiquidity problems are to be avoided. Practically all economic movements in the economy depend on the size and structure of the public debt, therefore, the public debt management becomes an important part of the country's overall economic policy and, consequently, monetary policy. The starting points of the research on the topic of public debt and the central bank arise from the goals and policies pursued by monetary

authorities in a given period. For the sake of recall, the basic goals of monetary policy are based on achieving full employment, price stability, balance of payments stability and sustainable economic growth and development. In practice, achieving these goals depends on a number of circumstances that monetary authorities can influence directly or indirectly. On the other hand, it is clear that these goals are not achieved equally in different monetary systems, that is, in a fixed and variable exchange rate system. Therefore, the object and purpose of the research in this paper is to examine the role of the central bank in the conditions of the currency board in achieving a balance of payments balance that directly or indirectly can affect the state of public debt.

2. Forms of public debt financing

Budget deficits are not rare in the world, most governments in such cases seek salvation by borrowing from the private sector or abroad, so internal or external debt is formed. In order for the government to remain within the intertemporal budget constraint it must cover the deficit or borrow money on the other side, that is, increase its public debt. The options that stand before the government in order to stabilize the budget, then reduce the public debt, that is, the share of public debt in GDP, is reduced to three alternatives that include:

- Reduction of the deficit with the possible creation of a primary surplus through tax growth or a reduction in public spending,
- Financing through money emission (printing or monetization),
- The publication of a moratorium on a part or all of the public debt.

Reducing the deficit is the most effective method of stabilizing indebtedness, but it is also the heaviest, since the reduction in public spending, as a rule, causes protests from interest groups (civil servants, etc.), and tax growth is largely unpopular. The publication of a moratorium on a part or all of the public debt is carried out at the expense of the creditors of the state and is certainly not popular as a model. What is of particular interest in this paper is the financing and stabilization of public debt by the activation of monetary authorities. Although the link between macroeconomic stability and economic growth is clear there still remains an open question: can the monetary authority and its policy be used as an instrument for macroeconomic stabilization in developing countries? The experiences of many developing countries have shown that the use of monetary policy itself can be a source of macroeconomic instability. The main indicator of this instability is

reflected in the financing of the budget deficit through money emission, that is, inflation where the financing of a permanent deficit by creating money leads to lasting inflation. Thus, considering the data on money and inflation indicates that the budget deficit is a possible cause of inflationary monetary policy.

What should be emphasized is that a one-time increase in money supply due to a temporary deficit leads only to a one-time increase in prices, but not to inflation. Another way of financing the budget deficit of the government can be done by monetizing debt. In many countries governments have no right to issue cash to pay their bills, in which case the government finances its obligations by issuing bonds to the public in order to provide additional funds to pay its obligations. In the event that these bonds do not reach the public, the only alternative for the government to get to the necessary funds is to buy them from the central bank.

By purchasing short-term government bonds in the open market, the central bank increases the monetary base and money supply. Methods of financing public spending through the intertemporal budget constraint of a government that specifies the budget deficit (DEF), which is equal to the surplus of public spending G in relation to tax revenue T , must be equal to the sum of changes in the monetary base ΔMB and changes in government bonds which the public has at its disposal of ΔB (Mishkin, 2006. pp.643).

$$DEF = G - T = \Delta MB + \Delta B$$

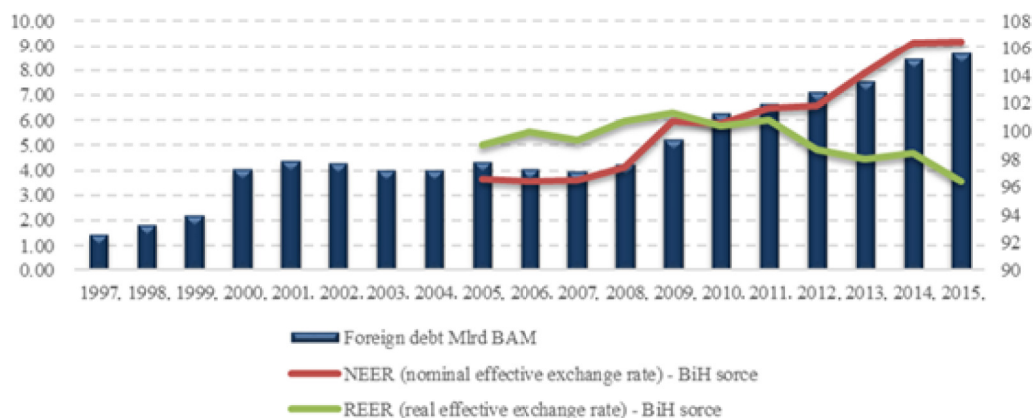
From the above, if the budget deficit is financed by an increase in bonds held by the public, it does not have any effect on the monetary base and money supply. However, if the deficit is not financed by the increase of bonds held by the public but the central bank takes over the burden on itself, then the monetary base and money supply increase. What is the situation with regard to the public debt and the central bank in Bosnia and Herzegovina?

In the case of Bosnia and Herzegovina, due to the currency board regime, the financing of the government's budget deficit by monetization and printing of money is not allowed. Thus, in this case, the only solution is the issuance of short-term government bonds that the public has and the increase in fiscal pressure, whereby there are no consequences for the changes in the monetary base and money supply. As previously mentioned, due to the poor economic performance, government borrowing in Bosnia and Herzegovina through bond issue is limited and the state is forced to borrow abroad. The final result of the continuous increase in external debt leads to the appreciation

of the nominal exchange rate and depreciation of the real exchange rate, Graph 1. On the left side are the external debt values in billions of BAM (Bosnian convertible mark) , and on the right side

of the chart are the index points of the appreciation of the nominal and the depreciation of the real exchange rate.

Graph 1. Foreign debt, nominal and real exchange rate.



Source: <http://www.cbbh.ba>

Under these circumstances, Bosnia and Herzegovina is a country with a significantly faster growth of public debt than the rate of economic growth, which will eventually put into question its liquidity. Although indicators of the public debt ratio towards GDP still rank Bosnia and Herzegovina among middle indebted countries, somewhere around 44% of GDP by the end of 2016, it is necessary to emphasize that this is a high debt compared to the development of the economy of Bosnia and Herzegovina.

Public debt enters the spiral if we take into account the fact that the fiscal pressure in Bosnia and Herzegovina is at the margin of resilience of the real economic sector and population, as well as the constraints imposed by the central bank because of the strict rules of the currency board.

The situation in which monetary policy is completely passive, in which the budget deficit leads to the increase of public debt, the appreciation of the nominal exchange rate and the current account deficit does not suit the state of the macroeconomic balance. This statement corresponds to the research hypothesis which states that the currency board does not contribute to achieving the balance of the balance of payments. In the continuation of the example of Bosnia and Herzegovina, the ratio of the budget deficit, the current account, public debt and monetary policy conducted by the central bank is reflected in several questions: Whether and to what

extent, the central bank, in the conditions of the currency board, contributes to maintaining the balance of payments through the balance of the current account? What are the functions of the central bank in the event of a budget deficit or surplus of government? Does the central bank, in the event of a budget deficit, contribute to increasing the state of public debt of the state? Analyzing the previous issues, the link between the state debt and the central bank is indicative. In order to provide answers to the questions posed below, appropriate qualitative and quantitative methods have been applied.

3. Empirical Analysis

In the interaction of theoretical and empirical values using EViews-10 Software, a Vector Autoregressive model was used - VAR. All the variables monitored in this paper: money supply as monetary aggregate M1, nominal exchange rate, public revenues, current account balance and the public debt of Bosnia and Herzegovina are endogenous.

Starting from this paragraph, the basic conditions for using the vector autoregressive model are fulfilled. All variables were observed in the period from Q1 / 2000 until Q4 / 2016.

The supply of money in Bosnia and Herzegovina in this paper is monitored within the monetary aggregate M1 which is made up of cash and sight

deposits. Nominal effective exchange rate - NEER is the weighted average of bilateral nominal exchange rates in relation to the currencies chosen according to the most important foreign trade partners of Bosnia and Herzegovina. The nominal effective exchange rate is calculated on a multilateral basis according to the propositions of the central bank of Bosnia and Herzegovina. Current account balance represents a balance of exchange of goods and services with a balance sheet of transfers that do not belong to commercial or financial transactions (public transfers, foreign aid, payments and payments from the EU budget, remittances sent by associates to their country).

Balance of payments is compiled with the application of the IMF methodology for the compilation of balance of payments statistics and international investment positions, the fifth edition - BPM5. Public debt in the work is presented as the sum of external and internal debt.

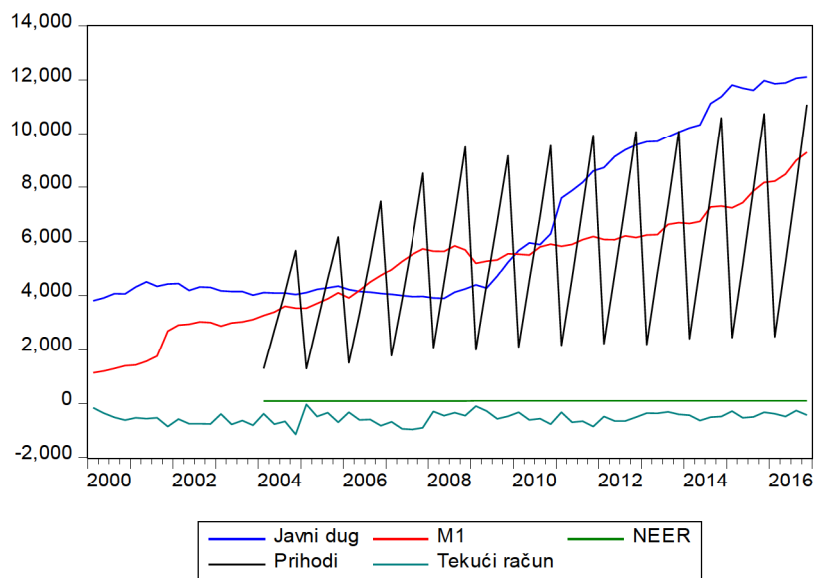
The external debt is obtained by the budget of the currency in which the loan is contracted in KM according to the CBBH's exchange rate valid for the observed date. This debt includes a debt that arose before 1992, a debt to the OPEC Fund, a

direct indebtedness of the Entities' governments, debt to foreign banks and governments. Since 2011, the statistical definition of debt has been adapted to the propositions as it is defined in the Maastricht Treaty.

The balance of debt at the end of the quarter was calculated at a nominal value on an aggregate basis. Data on public revenues include revenues of the Entities and Brcko District. The data do not include the local level of government (municipalities and cities), SOE Roads and SOE Highways as well as Funds for professional rehabilitation and employment of disabled persons at all levels of government. The source used for all listed variables is the site of the Central Bank of Bosnia and Herzegovina.

Starting from the conditions of model stability and the quality of econometric analysis, each series was observed separately in the defined period in terms of stationarity. As can be seen from Graph 2, all series are non-stationary, have random movements with or without a constant, with a slow or steady change, apart from the nominal exchange rate..

Graph 2. Value of M1, nominal exchange rate, current account, budget revenues and public debt of Bosnia and Herzegovina in Q1 / 2000-Q4 / 2016-billion BAM

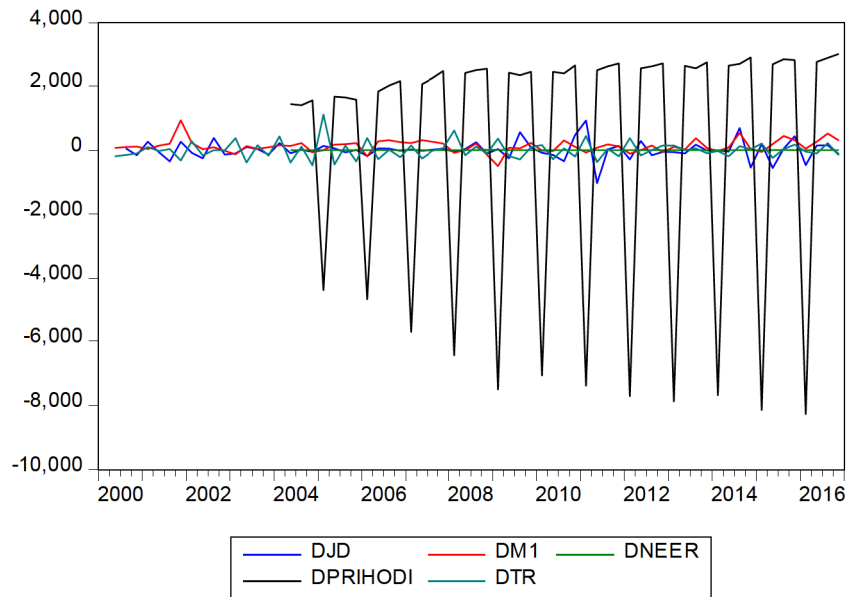


Source: <http://www.cbbh.ba>

In other words, all batches during the observed period have a variable variance and a middle value of random motion with or without a constant ($Y_t = \alpha + Y_{t-1} + \epsilon_t$). Since non-stationary data are, as a rule, unpredictable and cannot be modeled or

forecasted, non-stationary series are transformed into stationary differentiation in the software itself. After the test, all the variables were differentiated (DM1, DNEER, DPRIHODI, DTR and DJD) to achieve the stability of the model, Graph 3.

Graph 3. Stationary series of observed variables

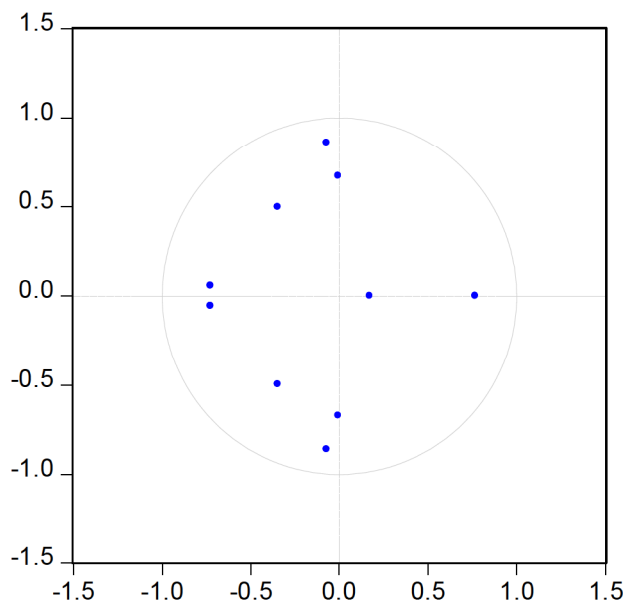


Source: author's review

The stability testing of the VAR model was carried out through the tests of single-root of the variables. The stability of the VAR model in this case is satisfied because the roots of the polynomial are within the unit circle Graph 4.

Graph 4. Characteristic of unit roots

Inverse Roots of AR Characteristic Polynomial



Source: author's review

In order to satisfy the conditions from the econometric point of view in the VAR model, residual heteroskedasticity was tested. The obtained results confirm that H0 is homoscedasticity of the residuals according to which the values of χ^2 are 318.4353, p value is 0.2222, thus fulfilling another condition for the stability of the model of the table1.

Table 1. Test of the heteroskedasticity of the residual in the VAR model

Date: 04/14/18 Time: 23:32
 Sample: 2000Q1 2016Q4
 Included observations: 49

Joint test					
Chi-sq	df	Prob.			
318.4353	300	0.2222			
Individual components:					
Dependent	R-squared	F(20,28)	Prob.	Chi-sq(20)	Prob.
res1*res1	0.282670	0.551683	0.9140	13.85085	0.8380
res2*res2	0.427813	1.046751	0.4473	20.96282	0.3993
res3*res3	0.677672	2.943403	0.0444	23.20593	0.0820
res4*res4	0.488798	1.338646	0.2343	23.95113	0.2445
res5*res5	0.380757	0.860826	0.6306	18.65711	0.5442
res2*res1	0.676989	2.781268	0.6082	17.19150	0.5413
res3*res1	0.413083	0.985346	0.5048	20.24107	0.4429
res3*res2	0.591034	2.023267	0.0424	28.96068	0.0885
res4*res1	0.328081	0.683523	0.8090	16.07499	0.7120
res4*res2	0.538559	1.633977	0.1137	26.38941	0.1533
res4*res3	0.347688	0.746212	0.7485	17.03670	0.6506
res5*res1	0.229186	0.416261	0.9769	11.23010	0.9400
res5*res2	0.287809	0.565764	0.9047	14.10263	0.8253
res5*res3	0.231491	0.421709	0.9753	11.34304	0.9368
res5*res4	0.377176	0.847826	0.6441	18.48162	0.5557

Source: author's review

The VAR model starts in a reduced form where each dependent variable is regressed with its own delay and the delay of other variables. In the vector record, the basic form of the vector autoregression model is set as:

$$X_t = \delta + A_1 X_{t-1} + A_2 X_{t-2} + \dots + A_n X_{t-n} + U_t$$

Where X_t represents $n \times 1$ endogenous variable vectors DM1, DNEER, DPRIHODI, DTR and DJD, t are quarters for the observed period from Q1 / 2000 to Q4 / 2016, δ is a constant, A_n is $n \times n$ matrix coefficients, U_t is a reduced form of conditional errors with zero value and covariance matrix Σ .

In order to monitor the influence of the central bank in the conditions of the currency board, the equity that follows the public debt in accordance with the previously made transformations into the stationary series is estimated. Thus, in the VAR specification there are five endogenous variables ($k = 5$) DM1, DNEER, DPRIHODI, DTR and DJD, exogenous intercept C ($d = 1$) and number of delays from 1 to 2 ($p = 2$) defined by the LR test

according to the AIC information criterion, which makes a total of eleven regressors ($k * p + d = 11$). The regressors are grouped by variables so that all delays are tracked from the first to the fifth variable, including in the last place and the intercept or constant.

3.1. Impuls – Response

Based on the Impulse Response function, the measurement of the size of the accumulated impact of the unit shock on the observed variables from a standard deviation through ten periods, the duration of shock absorption, and the confirmation of the impact of individual shocks on the variable (chart 5) was performed.

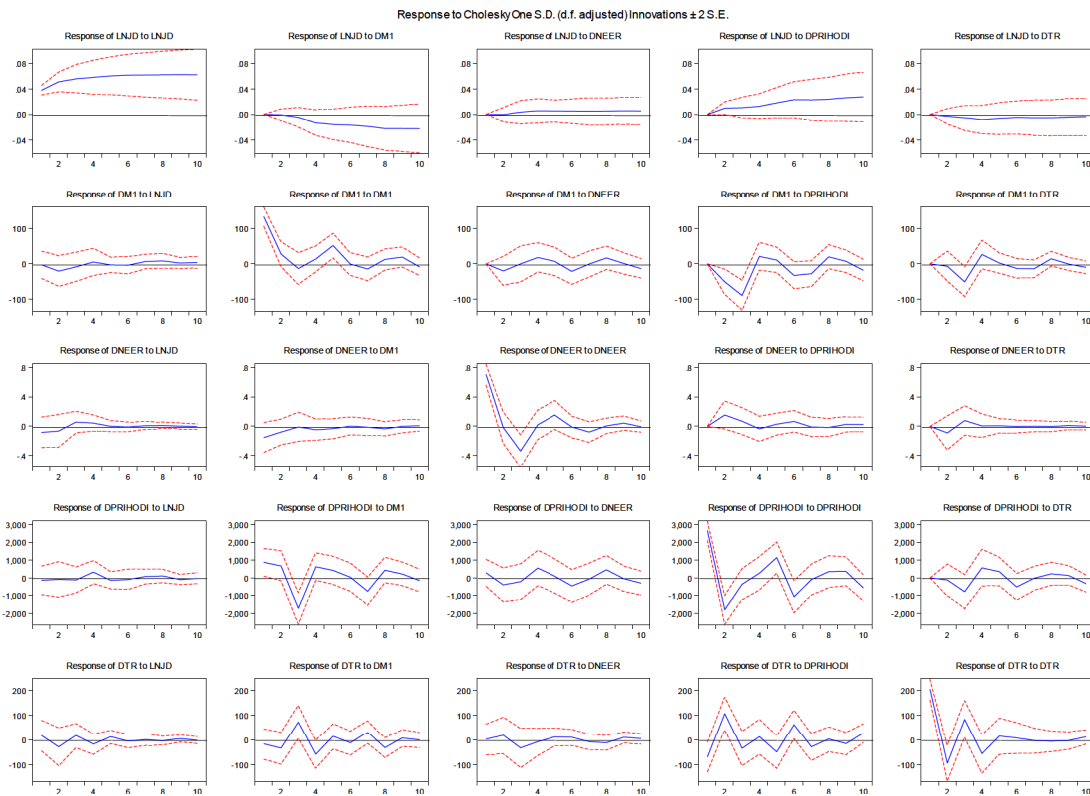
The objective of this function is to provide answers about the relationships between variables, each response represents an effect on the specific shocks of the variables in the system. For the analysis of the public debt index, the first order is relevant.

As can be seen from the graphics in the first place the shock of a standard deviation of public debt, money and budget revenues are confirmed by

public debt. Absorption lasts for all ten periods, with greater impact on budget revenues than money supply. Shocks on the face of the nominal exchange rate and the current account have no significant effect on the movement of public debt. The analysis of the money supply index is positioned in the second line. The shock of the standard deviation of public debt, money supply,

nominal exchange rate, budget revenues, and the state of the current account is confirmed on the money supply. Absorption lasts throughout the entire period, and the smallest impact on the supply of money has the shock on the side of the public debt that weakens over a long period of time.

Graph 5. Impulses and response variables based on a standard deviation



Source: author's review

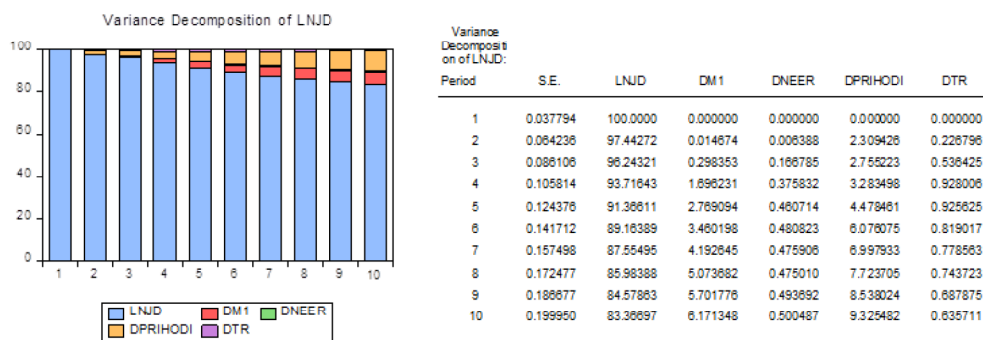
The third line is relevant for the index of the nominal exchange rate. In terms of this variable, it has the greatest impact and duration on itself. Other variables show little impact at the beginning of the period, which weakens over time. Annuity of the budget revenue index is shown in the fourth row. The shock of the standard deviation of public debt, money supply, nominal exchange rate, budgetary revenues and current account balance is confirmed on budget revenues. Absorption lasts over the entire period, and the shock, on the side of public debt that eventually disappears, has the slightest impact on budget revenues. In the analysis of the current account index in the fifth order, a shock of one standard deviation was confirmed through all observed variables. The

shock absorption is confirmed by the supply of money, budget revenues and the current account balance, while the shock on the side of the public debt and the nominal exchange rate is weak and decreases over time.

3.2. Decomposition Variance

The results obtained using the VAR model, in addition to the impulse-response function, can be represented by a decomposition of the variances through which the most important determinants of the variability of endogenous variables from the model are observed over ten periods. The results are presented graphically in tables as integrated parts.

Graph 6. Decomposition of public debt variance

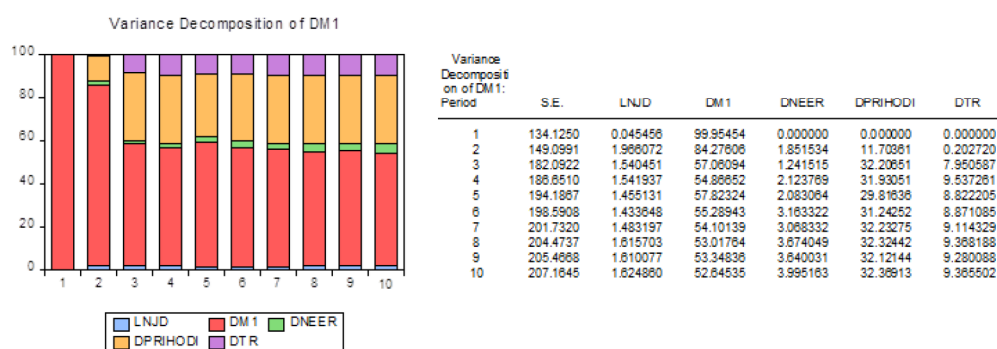


Source: author's review

Graph 6, based on the analysis and construction of the autoregressive model, the estimates of the decomposition of public debt variance show that the biggest changes are due to shocks in that very variable of about 83% at the end of the period, while the supply shocks make up about 6%, budget revenues about 9% , the nominal exchange rate

and the current account balance to a lesser extent, together with about 2%. It can be noticed that in the short run public debt is growing mostly autoregressively, but also, with the flow of time, the percentage influence of other factors grows, including significant budget revenues and money supply.

Graph 7. Decomposition of money supply variance

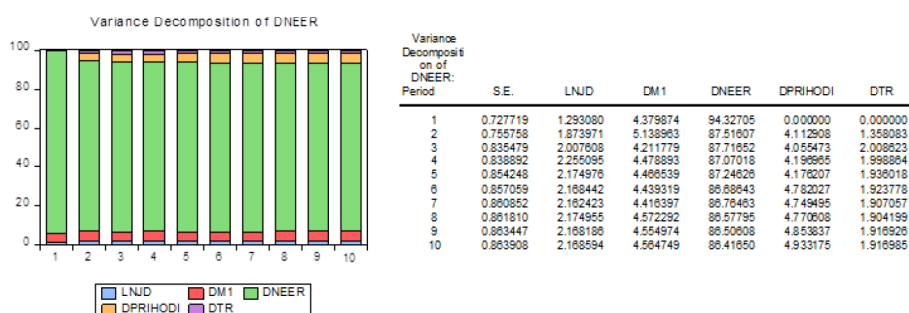


Source: author's review

In Graph 7, the decomposition of the variance of the value of money supply, the biggest shocks come from that very variable, about 53%. Budgetary revenue and current account budgets affect about 42%, while public debt has a negligible impact. Unlike the previous case, the

money supply monitored through the monetary aggregate M1, the impact of budget revenues and current account shows a constant value, especially budget revenues that affect the supply of money, about 32%, and the current account balance, of about 10%.

Graph 8. Decomposition of the variance of the nominal exchange rate

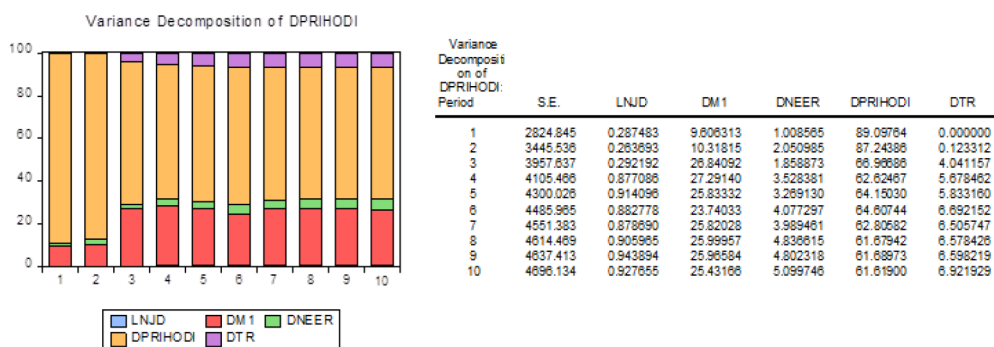


Source: author's review

In Chart 8, the decomposition of the variance of the nominal exchange rate, the biggest shocks come from that very variable, about 86%, while the shocks of money supply through M1 and budget revenues have an effect of around 5% each.

Public debt and current account balance have an almost imperceptible impact of 2%. It can be noticed that they do not show autoregressive movement, they even show one constant for the whole period.

Graph 9. Decomposition of variance of public revenue

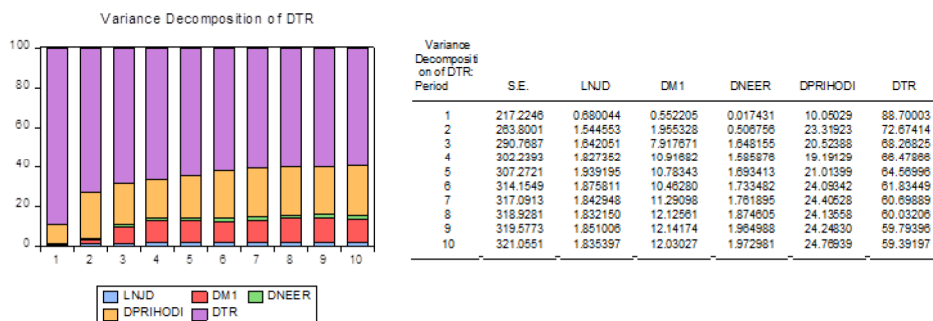


Source: author's review

In graph 9, the decomposition of the variance of budget revenue values makes the biggest shocks come from that very variable, about 62%. Shocks of money supply, current account and nominal exchange rate influence about 37%, public debt has a negligible impact. It can be noticed that in

the short run, budget revenues are growing mostly autoregressively, but also, with the flow of time, the percentage influence of other factors grows, the offer of money about 25%, the current account balance of around 7% and the nominal exchange rate with around 5%.

Graph 10. Decomposition variance of current account



Source: author's review

In graph 10, the decomposition of the variance of the value of the current account of the balance of payments, makes the biggest shocks come from that very variable, about 60%.

Money supply shocks and budget revenues account for around 37%, while public debt and nominal exchange rate have a negligible impact of around 2%. It can be noticed that in the short run the balance of the current account of the balance of payments is growing mostly autoregressive, but also with the flow of time the percentage influence of other factors grows, the offer of money about 12% and budget revenues with about 25%.

CONCLUSION

The growth of public debt of Bosnia and Herzegovina, especially since the onset of the global economic crisis in 2008, deserves the status of high monitoring and attention. Public debt of Bosnia and Herzegovina in the period 2007-2008. increased from 2.7 to 5.7 billion KM, or over 100%, and from 2008 to 2016, it had been increasing by about 6% per year, which makes up about 44% of GDP. The state in which public debt is growing faster than GDP through the spiral will inevitably call in question the liquidity of Bosnia and Herzegovina. This trend anticipates the crisis scenario that struck Argentina after 2000, where

public debt rose from 44% to over 150% of GDP. In this situation, it is inevitable to examine the central bank's impact on public debt, whether it affects the amount of public debt symmetrically or asymmetrically. The fact is that public debt is made by governments primarily because of the budget deficit and that the debt is settled through various forms, including, among other things, the participation of the central bank through money emission or monetization. On the basis of the previously said, and the issues raised in the work itself, the situation in Bosnia and Herzegovina from 2000 to 2016 was analyzed on the basis of observing the time series of endogenous money supply variables through monetary aggregate M1, nominal exchange rate, current account balance, budgetary government revenue and government debt. In interaction of theoretical and empirical values, using the VAR model it can be concluded that the supply of money and public revenues have an autoregressive movement and, in time, affect one another to the greatest extent. On the level of the current account of the balance of payments, the greatest influence over time have public revenues. With regard to public debt, the model showed the influence of money supply and current account balance. This practically means that monetary policy in Bosnia and Herzegovina is completely passive, due to the endogenous supply of money, where the budget deficit and the imbalance of the balance of payments lead to an increase in public debt, an appreciation of the nominal exchange rate that does not respond to the state of the macroeconomic equilibrium. Therefore, the functioning of the central bank in terms of the currency board is asymmetrical because it does not contribute to achieving the balance of balance of payments and macroeconomic stability.

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SUMMARY

The growth of public debt of Bosnia and Herzegovina, especially since the onset of the global economic crisis in 2008, deserves the status of high monitoring and attention. Public debt of Bosnia and Herzegovina in the period 2007-2008. increased from 2.7 to 5.7 billion KM, or over 100%, from 2008 to 2016, increasing by about 6% year on year, which makes up about 44% of GDP. The state in which public debt is growing faster than GDP through the spiral will inevitably bring about the liquidity of Bosnia and Herzegovina. This trend is reflected in the crisis scenario that struck Argentina after 2000, where public debt rose from 44% to over 150% of GDP. In this situation, it is inevitable to examine the status of the central bank towards public debt, whether it affects symmetrically or asymmetrically the level of public debt. The fact is that public debt is made by governments primarily because of the budget deficit and that this debt is settled through various forms, inter alia, by the involvement of the central bank through money laundering or monetization. On the basis of the foregoing, and the issues raised during the work itself, the situation in Bosnia and Herzegovina from 2000. to 2016. was analyzed on the basis of observing the time series of endogenous money supply variables through monetary aggregate M1, nominal exchange rate, current account balance, budgetary government revenue and government debt. In the interaction of theoretical and empirical values, using the VAR model, it can be concluded that the supply of money and public revenues have an autoregressive movement and, in time, affect each other to the fullest extent. On the level of the current account of the balance of payments, the greatest influence over time has public revenues. With regard to public debt, the model showed the influence of money supply and current account balance. This practically means that monetary policy in Bosnia and Herzegovina is completely passive where the budget deficit and balance of payments imbalance leads to an increase in public debt, an appreciation of the nominal exchange rate that does not respond to the state of the macroeconomic equilibrium. Therefore, the activity of the central bank in the terms of the currency board is asymmetrical because it does not contribute to the achievement of the balance of payments and macroeconomic stability.