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Macroeconomic dynamics and the deficit of the consolidated budget in Ukraine: theoretical aspects and empirical verification

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Abstract. The article analyzes the relationship between real GDP (the main indicator of the macroeconomic dynamics) and the condition of the state budget. Carried brief overview of the theoretical propositions that characterize the nature and extent of this dependence. The empirical verification of theoretical positions on static data in Ukraine are implemented. The results of empirical research show that the deficit of consolidated budget is formed in Ukraine irrespective of the stage of economic cycle. Moreover, the free term of the obtained regression equation is statistically significant and has positive value; it means the budget deficit is formed in the conditions of economic growth too. An interpretation of the obtained results can be the formulation of rather logical, in modern terms, suggestion about the availability of high-level political populism in decision-making in the field of state finances as a long-term feature of Ukraine's development, which predetermines a high statistically significant positive value of the free term in the obtained regression equations.

Keywords: macroeconomic dynamics, budget deficits, a balanced budget, the rate of real GDP, the Keynesian concept of functional finance.

Formulas: 0; fig.: 2; tabl.: 1; bibl.: 10.

Макроекономічна динаміка і дефіцит консолідованого бюджету в Україні: теоретичні аспекти і емпірична верифікація

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Анотація. Проаналізовано взаємозв'язок між реальним ВВП (основним показником, що характеризує макроекономічну динаміку) і станом державного бюджету. Проведено короткий огляд основних теоретичних положень, що характеризують характер і ступінь цієї залежності. Здійснено емпіричну перевірку теоретичних положень на статичних даних в Україні.

Ключові слова: макроекономічна динаміка, дефіцит бюджету, збалансованість бюджету, темп реального ВВП, кейнсіанська концепція функціональних фінансів.

Формул: 0; рис.: 2; табл.: 1; бібл.: 10.



Макроэкономическая динамика и дефицит консолидированного бюджета в Украине: теоретические аспекты и эмпирическая верификация

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Аннотация. Проанализирована взаимосвязь между реальным ВВП (основным показателем, который характеризует макроэкономическую динамику) и состоянием государственного бюджета. Проведен короткий обзор основных теоретических положений, которые характеризуют характер и степень этой зависимости. Осуществлена эмпирическая проверка теоретических положений на статичных данных по Украине.

Ключевые слова: макроэкономическая динамика, дефицит бюджета, сбалансированность бюджета, темп реального ВВП, кейнсианская концепция функциональных финансов.

Формул: 0; рис.: 2; табл.: 1; библи.: 10.

Introduction. There is a definite correlation between the indicators of macroeconomic dynamics, the main of which is the index of real GDP change, and the deficit of state budget; this correlation is the result of impact upon the formation of budget revenues and expenditures of both objective and subjective processes. The impact of objective processes is shown through the formation of budget revenues, the value of which is directly proportional to the gross domestic product; therefore, real budget revenues increase in the period of economic growth and decrease in the period of recession. Subjective processes are associated with the impact on budget expenditures and as a consequence of the deficit, the state stabilization policy reflected in the change of tax laws, policies, social transfers and public procurement. The theoretical problems associated with the investigation of the character, the degree of correlation between the changes of gross domestic product and the state budget deficit have been studied by the following economists: Keynes... [1–9]. In addition, this issue has become one of the stumbling blocks in the long scientific debate between the representatives of the Keynesian and classical macroeconomic theory.

The **goal** of the research is to conduct a brief review of the major theoretical positions characterizing the nature and the degree of dependence between the real GDP (the major indicator characterizing macroeconomic dynamics) and the state of state budget, as well as empirical testing of theoretical positions on static data in Ukraine.

Discussion and Results. To achieve the goal set and the systematization of the research course, the main part of the work involves three items: the first one includes the review of theoretical approaches to the definition of the nature and the degree of correlation between the gross domestic product and the deficit of state budget according to the Keynesian and classical macroeconomic theory; in the second item, the obtained findings are transformed into clear criteria used consequently for the interpretation of the results

of empirical testing; the third item involves the empirical testing of the nature and the degree of correlation between the change rate of real GDP and the deficit of consolidated budget (% of GDP), and the interpretation of its results.

1. The representatives of the classical and neoclassical theory support the ideas of economic (and not only) liberalism and highly critically perceive the idea of large-scale state intervention into economics and the ability of a state to produce economic benefits efficiently at the expense of budget funds [10]. At the same time, the following theses are used:

- a state (government) and a market are competitors in the production of different economic benefits;
- there are specific types of benefits called public and mixed, which can be theoretically produced by the state with more economic efficiency for the society;
- higher efficiency of producing public and mixed benefits by the state in comparison with the market is not an axiom; it depends on the quality of economic activity of the state itself;
- in cases when the state produces public and mixed economic benefits inefficiently, they can be produced by the market both legally and illegally;
- the state can produce public and mixed benefits with high costs which is the reflection of «depersonalization» of the state property and, as a consequence, the lack of internal financial control;
- the state can create budget deficit, threatening for economics, realizing definite (often political) goals being questionable from the point of view of social welfare;
- in terms of weak inefficient state, often acting for the benefit of special interest groups and not society, its activity must have constitutional borders including the sphere of budget deficit.

Therefore, the availability of budget deficit and state debt is considered as negative characteristics of state social and



economic development. So, it is expedient to use the concept of annually balanced budget, resulting in the implementation of the policy of restricting the growth of state debt.

The representatives of the Keynesian theory consider the state regulation of economics to be an efficient and effective mechanism for smoothing cyclical fluctuations and, at the same time, an essential tool for the anti-crisis policy. In this case, the following theses are used:

- fiscal policy is a key instrument for affecting the level of total expenditure, and, thus, determining the amount of aggregate demand;
- the implementation of fiscal policy can result in the efficient management of economic development in the cycle course that eliminates the problems and consequences of fluctuations in business activity, employment and inflation;
- the periodic variations of budget deficit and state debt within the economic cycle are possible; and besides, they can increase at the stage of recession and decrease at the stage of growth;
- there should be a feedback between the budget deficit and economic growth;
- the built-in stabilizers of fiscal policy allow to implement the policy of macroeconomic regulation rapidly and cost-effectively and, thus, providing a direct impact on the formation of budget revenues and expenditures.

Two concepts are considered in the Keynesian theory; they describe the nature and degree of correlation between macroeconomic dynamics and budget deficit: functional finance and cyclically balanced budget. The budget deficit plays the role of the functional regulator of macroeconomic processes while implementing the former; the very purpose of ensuring full budget balance is not even raised.

2. To conduct an empirical test of the character and degree of dependence between the dynamics of real GDP and the deficit of the consolidated budget, the method of correlation and regression analysis is used. Before direct conducting of correlation and regression analysis, we interpret the presented theoretical positions characterizing the nature and degree of correlation between the dynamics of real GDP (regressor) and the deficit of consolidated budget (regress and) in statistical terms.

The neoclassical approach of annually balanced budget is interpreted with the lack of statistically significant dependence between regress and regressor resulting in low values of correlation and reliable approximation (R^2) coefficients, as well as in the lack of statistic significance and the adequacy of the regression model.

The Keynesian concept of cyclically balanced budget is interpreted with the availability of statistically significant dependence between regressant and regressor resulting in the high values of correlation and R^2 coefficients, statistical correlation and adequacy of regression model, as well as in the statistical significance of regression coefficient with regressor and insignificance of the free term. In this case, the correlation coefficient should have negative value. The concept of functional finance is interpreted as the previous one, except for the availability of statistical significance of the free term; here, the mark, positive or negative, is important at it. The positive mark means the availability (not

explained with the regression model) of middle- and long-term tendency to the decrease of the consolidated budget deficit, the negative one – to its increase.

3. Two sets of data are used in the process of correlation and regression analysis:

1) the first set of data is the calculated values of the change rate of real GDP (%) and the deficit of the consolidated budget of Ukraine (% GDP) in 1992–2014;

2) the second set of data is the transformed data of the first set on the basis of smoothing with the use of moving averages (smoothing period for 3 years) in 1994–2014; despite the reduction of time series on 2 measurements caused by the procedure of smoothing, the number of freedom degrees is 15 that allows to conduct qualitative statistical analysis.

The use of preliminary statistic smoothing of time series data on the basis of moving averages allows correcting the available time series and considering medium-term trends and the availability of definite statistic errors related to the change in calculation methodology and the impact of other factors. Speaking the language of statistics, it reveals the systematic component and reduces the level of statistic noise. Since we use annual data, it is not quite appropriate to speak about their definite regular season character, and the period of three years is accepted as the «window width» of smoothing for the decrease of statistic noise level.

The *table* gives the data characterizing the first and the second set obtained by the calculations on the basis of official statistic data.

Table

The Rate of Real GDP Change (%) and the Deficit of Consolidated Budget (GDP%) in Ukraine in 1992–2014

Year	Rate of Real GDP Change (%)	Deficit of Consolidated Budget (GDP %)	Smoothed Values of Real GDP Change Index, %	Smoothed Values of Consolidated Budget Deficit, GDP %
1992	-9,9	14,0	-	-
1993	-14,2	5,3	-	-
1994	-22,9	9,6	-15,7	9,6
1995	-12,2	8,3	-16,4	7,7
1996	-12,2	5,4	-15,8	7,8
1997	-3,0	6,9	-9,1	6,9
1998	-1,9	2,8	-5,7	5,0
1999	-0,2	2,1	-1,7	4,0
2000	5,9	0,8	1,3	1,9
2001	9,2	1,4	5,0	1,5
2002	5,2	-0,7	6,8	0,5
2003	9,6	0,2	8,0	0,3
2004	12,1	3,2	9,0	0,9
2005	2,7	1,8	8,1	1,7
2006	7,3	0,6	7,4	1,9
2007	7,3	0,8	5,8	1,1
2008	2,1	1,2	5,6	0,9
2009	-14,8	3,8	-1,8	1,9
2010	4,1	6,0	-2,9	3,6
2011	5,2	1,8	-1,8	3,8
2012	0,3	3,6	3,2	3,8
2013	0	4,2	1,8	3,2
2014	-6,8	4,6	-2,2	4,2

Source: composed and calculated by the author based on the data of the State Statistics Service of Ukraine, Finance Ministry of Ukraine, the National Bank of Ukraine.



We form the first and the second set described above on the basis of the data presented in the table. Further, in *Fig. 1*, we present the first set characterizing the value combination of real GDP change rate (%) and the deficit of the consolidated budget (%) in 1992–2004.

In addition to the set in *Fig. 1*, regression equation is presented in which the deficit of the consolidated budget (%) serves as the explained variable (y) and the index of real GDP change (%) and regression line as an explaining variable (x). The calculated value of correlation coefficient between

regressand and regressor is (-0,736) indicating a high correlation between them. However, the determination coefficient value of 0.50 regression model does not allow to conclude that the regressor (the rate of real GDP change) is a reliable and significant indicator for the explanation of regressand behaviour (the deficit of the consolidated budget). The negative meaning of regression coefficient at regressor, the statistical significance of it and the free term of the equation allow to make a conclusion that the Keynesian concept of functional finances is implemented in Ukraine.

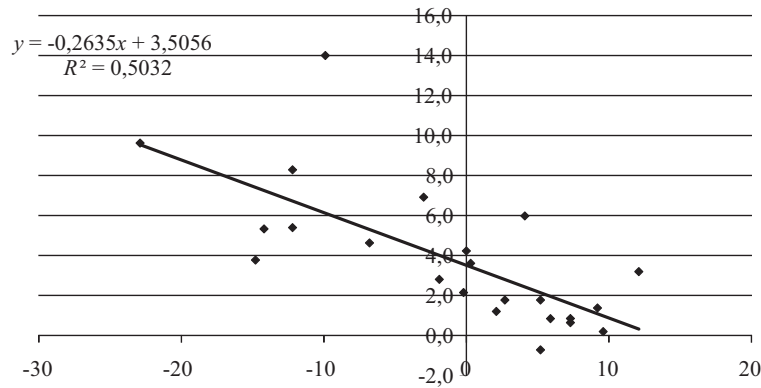


Fig. 1. The set characterizing the index values of real GDP change (%) and the deficit of the consolidated budget (%) in 1992–2012

We represent the second set in *Fig. 2*; it characterizes the combination of smoothed values of real GDP change

rate (%) and the deficit of the consolidated budget (%) in 1994–2014.

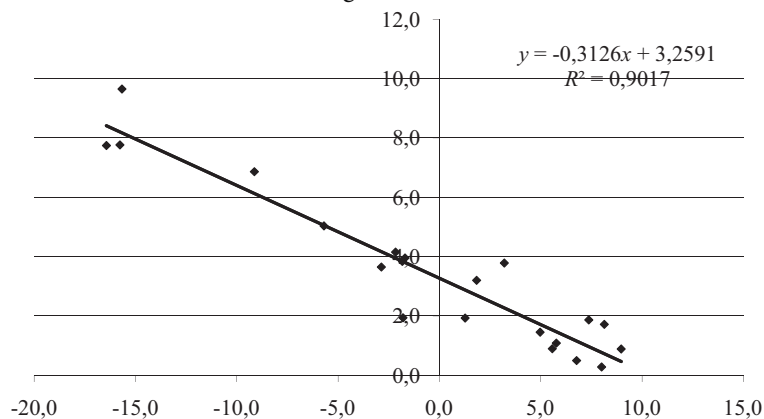


Fig. 2. The smoothed indexes of real GDP change (horizontal scale) and the deficit of the consolidated budget (vertical scale) in 1994–2014

Source: composed by the author.

The calculated value of correlation coefficient between regressand and regressor is (-0,961) which indicates very high correlation between them; wherein, in contrast to the previous model, the coefficient of determination is also very high (0,90) that leads to the conclusion that the rate of real GDP change is the reliable and significant indicator in order to explain the behaviour of the consolidated budget deficit. Smoothing of the time series based on the use of moving averages significantly strengthen the allegation that in Ukraine there is a statistically significant empirical correlation between the rates of economic growth and the deficit of the consolidated budget.

The negative value of regression coefficient at regressor, high statistical significance of it and the free term of the equation, the adequacy of regression equation allow

to strengthen and confirm the earlier conclusion that in Ukraine the Keynesian conception of functional finances is implemented. At the same time, the positive value of the free term indicates the availability of long-term trend, unexplained only with macroeconomic dynamics, to the formation of the consolidated budget deficit.

Conclusions. Macroeconomic dynamics directly affects the state of public finances and the size of the budget deficit. In the case of neo-classical concept, the decrease of budget revenues due to the economic recession must be accompanied with the reduction of costs, and the budget should be balanced. The Keynesian concepts of the budget balance consider its deficit in the conditions of economic recession as not only an objectivity but a significant tool of implementing the police of macroeconomic regulation.



The results of empirical research show that the deficit of consolidated budget is formed in Ukraine irrespective of the stage of economic cycle. Moreover, the free term of the obtained regression equation is statistically significant and has positive value; it means the budget deficit is formed in the conditions of economic growth too. If, on the basis of regression presented in Fig. 2, to determine at what rate of the real GDP change the consolidated budget is deficit-free, we get 10,42%. Such rates of economic growth are characteristic rather for the economics of China than for Ukraine.

An interpretation of the obtained results can be the formulation of rather logical, in modern terms, suggestion about the availability of high-level political populism in decision-making in the field of state finances as a long-term feature of Ukraine's development, which predetermines a high statistically significant positive value of the free term in the obtained regression equations. However, to confirm or deny this suggestion is possible only on the basis of further investigations of the problem; and the main difficulty here is the identification and quantitative interpretation of political populism level in order to build a time series and the subsequent empirical verification.

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