DOI: https://doi.org/10.32782/2524-0072/2022-45-25

UDC 336.7:330(477)

ASSESSMENT OF THE EFFECTIVENESS OF FISCAL AND MONETARY LEVERS OF ECONOMIC DEVELOPMENT IN UKRAINE

ОЦІНКА ЕФЕКТИВНОСТІ ФІСКАЛЬНО-МОНЕТАРНИХ ВАЖЕЛІВ ЕКОНОМІЧНОГО РОЗВИТКУ УКРАЇНИ

Kriuchkova Nataliia
PhD in Economics, Associate Professor,
Odesa I.I. Mechnikov National University
ORCID: https://orcid.org/0000-0003-3790-4399

Paramonova Yuliana
Student,
Odesa I.I. Mechnikov National University
ORCID: https://orcid.org/ 0000-0001-8311-9979

Крючкова Наталія Михайлівна
кандидат економічних наук, доцент,
Одеський національний університет імені І.І. Мечникова

Парамонова Юліана Вадимівна
студентка,
Одеський національний університет імені І.І. Мечникова

This article is devoted to topical issues of studying the operation of fiscal and monetary levers of economic development of the country, the peculiarities of their implementation in modern transformational conditions in relation to macroeconomic indicators. Monetary policy in combination with fiscal regulation instruments forms the basis of the country's stabilization policy. Monetary impulses, passing through a number of transmission channels, contribute to the achievement of the main general economic goals: sustainable economic growth, a moderate level of inflation and balance of payments. The study of existing and the search for new effective tools and forms of implementation of fiscal and monetary policy, changing the basic conditions of the functioning of the national economy of Ukraine becomes a challenge for improving the effectiveness of fiscal and monetary regulation. The main indicators for assessing the effectiveness of fiscal and monetary instruments of Ukraine are determined. The importance of monetary and fiscal instruments for macroeconomic stability is analysed, in particular by indicators: GDP, budget expenditures, tax revenues, discount rate and money supply. An economic and mathematical model for analysing the effectiveness of fiscal and monetary levers on the economic development of Ukraine is constructed. Ways to improve the effectiveness of fiscal and monetary levers of economic development in Ukraine are proposed based on the obtained main modelling results.

Keywords: fiscal and monetary levers, GDP, budget expenditures, tax revenues, discount rate, money supply.

Дана стаття присвячена актуальним питанням дослідження дії фіскально-монетарних важелів економічного розвитку країни, особливостям їх реалізації у сучасних трансформаційних умовах у взаємозв'язку з макроекономічними показниками. Ключовим елементом національної економіки кожної країни є фінансовий сектор, від ефективного функціонування якого залежить створення сприятливих умов для економічного зростання, формування і розподілу фінансових ресурсів та послуг, нагромадження інвестиційного капіталу, а також динаміки позитивних змін інших макроекономічних та фіскально-монетарних показників. Монетарна політика у поєднанні з інструментами фіскального регулювання формує основу стабілізаційної політики країни. Монетарні імпульси, проходячи через низку трансмісійних каналів, сприяють досягненню головних загальноекономічних цілей: сталого економічного зростання, помірного рівня інфляції та рівноваги платіжного балансу. Враховуючи складні реалії сьогодення, а саме підвищення рівня інфляції, збільшення дефіциту державного бюджету, війна з Росією, пандемія COVID-19, надмірне зростання грошової маси в обігу, внаслідок грошової

емісії, зменшення золотовалютних резервів, особливої актуальності набувають питання щодо ефективного використання фіскально-монетарних важелів та їх регулюючого впливу економічний розвитку. Дослідження існуючих та пошук нових дієвих інструментів та форм реалізації фіскально-монетарної політики, зміна базових умов функціонування національної економіки України стає викликом для удосконалення ефективності фіскально-монетарного регулювання. Визначено основні показники оцінки ефективності дії фіскально-монетарних інструментів України. Проаналізовано значення монетарних та фіскальних інструментів для макроекономічної стабільності, зокрема за показниками: ВВП, бюджетні видатки, податкові надходження, облікова ставка та грошова маса. Побудовано економіко-математичну модель аналізу ефективності дії фіскально-монетарних важелів на економічний розвиток України. На основні отриманих результатів моделювання запропоновано шляхи підвищення ефективності дії фіскально-монетарних важелів економічного розвитку України.

Ключові слова: фіскально-монетарні важелі, ВВП, бюджетні видатки, податкові надходження, облікова ставка, грошова маса.

Problem definition and its relationship with important scientific and practical tasks. Today, fiscal and monetary policy occupies a key place in the mechanism of state regulation of the economy. The success of implementing these policies and ensuring their positive impact on the development of the national economy depends on the availability of an effective system of state regulation and management, coordination of actions of state regulators both at the level of developing common strategies and at the level of making tactical operational decisions.

Through the system of state regulation, using certain tools, which include fiscal and monetary levers, the state regulates the national economy, ensuring its development. Therefore, there is a need to assess the effectiveness of fiscal and monetary levers of economic development.

Analysis of recent research and publications. The problem of fiscal and monetary levers are not new, but it does not lose its relevance, as the transformation of the Ukrainian fiscal and monetary policy is currently in active stage. That is why the research in this direction is ongoing. However, it should be noted, that researchers focus mainly on the general benefits of fiscal and monetary levers. From recent scholars we can mention Bilyk O. [1], Barannyk L. [2], Bidiuk V. [3], Vdovychenko A. [4], Honcharenko O. [5], Hrytsyuk O. [6], Hashchyshchyn A. [7], Zakharchenko V. [8], Krukovets O. [9], Pasichnyi M. [10] and others occupy a proper place in the study of fiscal and monetary levers.

Setting objectives. The main task of the article is analyse the effect of fiscal and monetary levers of economic development in modern transformational conditions.

Main results of the study. Based on the analysis of literary sources [1; 3; 4; 5; 6] it is revealed that the generally accepted approach is to interpret the definition of "lever" as a set of appropriate tools and methods for managing the national economy using a certain set of tools; and as tools for managing the economy, which are an integral part of the economic mechanism. In other words, in this study, we will consider fiscal and monetary levers of economic development as a set of tools for fiscal and monetary policy in their mutual connection. Therefore, before studying the essence of fiscal and monetary levers, it is advisable to determine what monetary and fiscal policy is, the implementation of which occurs at the expense of monetary and fiscal instruments, which, in turn, are activated by the corresponding fiscal and monetary levers.

Given the variety of existing interpretations of "monetary policy" in works of theoretical and applied significance [7; 8; 9], we have summarized the following definition: monetary policy is a set of coordinated and interrelated measures that are aimed at regulating the money market and are carried out in order to achieve pre-defined socio-economic goals. This policy is implemented through the National Bank of Ukraine.

Based on this, monetary policy levers are a set of measures and methods used by the NBU to regulate bank reserves, money supply in circulation and lending volumes to the economy, in order to ensure economic growth, reduce inflation and unemployment, and equalize the balance of payments.

In turn, the generalization of numerous literature sources and scientific developments on the study of "fiscal policy" [2; 4], allows us to determine that fiscal policy is a set of measures aimed at ensuring full employment and producing non-inflationary GDP by changing public spending, the tax system and approaches to the formation of the state budget as a whole. After analysing different scientists' approaches we can say that fiscal levers are a set of budget and tax instruments in their content.

Taking into account the theoretical provisions outlined above, Figure 1 reflects the set of

fiscal and monetary levers used in the process of regulating the economic development of the country.

World experience shows that the selection of effective monetary policy instruments affects the economic growth of the country as a whole, the growth of competitiveness of business entities and overcoming structural imbalances in the state economy.

As you know, most economic indicators are formed under the influence of not one, but many factors. To assess the effectiveness of fiscal and monetary levers, we construct an economic and mathematical model based on multivariate correlation and regression analysis, based on the multiple linear regression equation. In this case, the effective feature (Y) is associated using the multiple regression equation with two or more factor features (X_1, X_2, X_3, . . . , X_m). The multiple linear regression equation has the form:

$$Y_x = a_0 + a_1X_1 + a_2X_2 + a_3X_3 + \ldots + a_mX_m + e, \quad (1)$$

whee a_0, a_1, a_2, ... , a_m – parameters of the multiple regression equation, and X_1, X_2, X_3, ... , X_m – variable models, e – model error.

Denote: dependent variable Y – gross domestic product (GDP); explicative variables: X_1 – budget expenditures; X_2 – tax revenues to the state budget; X_3 – discount rate; X_4 – money supply.

Array of variables for constructing a model based on statistical data for the Ukrainian economy for 2008-2021 is presented in Table 1.

To estimate the parameters of a linear multiple regression equation, the least squares method is used, i.e. a system of normal equations is constructed, the solution of which allows us to obtain estimates of regression parameters.

The economic and mathematical model will be built using GRETL software.

The results of the multiple regression model are presented in Table 2.

Based on the modelling results, the multiple regression equation has the form:

$$Y = 186{,}528 + 3{,}196X_1 + 1{,}180X_2 - 7{,}978X_3 - 0{,}316X_4 + e. \quad (2)$$

Analysis of the economic content of the model proves the existence of an inverse relationship between the regressor X_3 (average annual discount rate value), X_4 (money supply volumes) and the dependent variable Y (nominal GDP), that is, an increase in the values of these variables leads to a decrease in Y; and

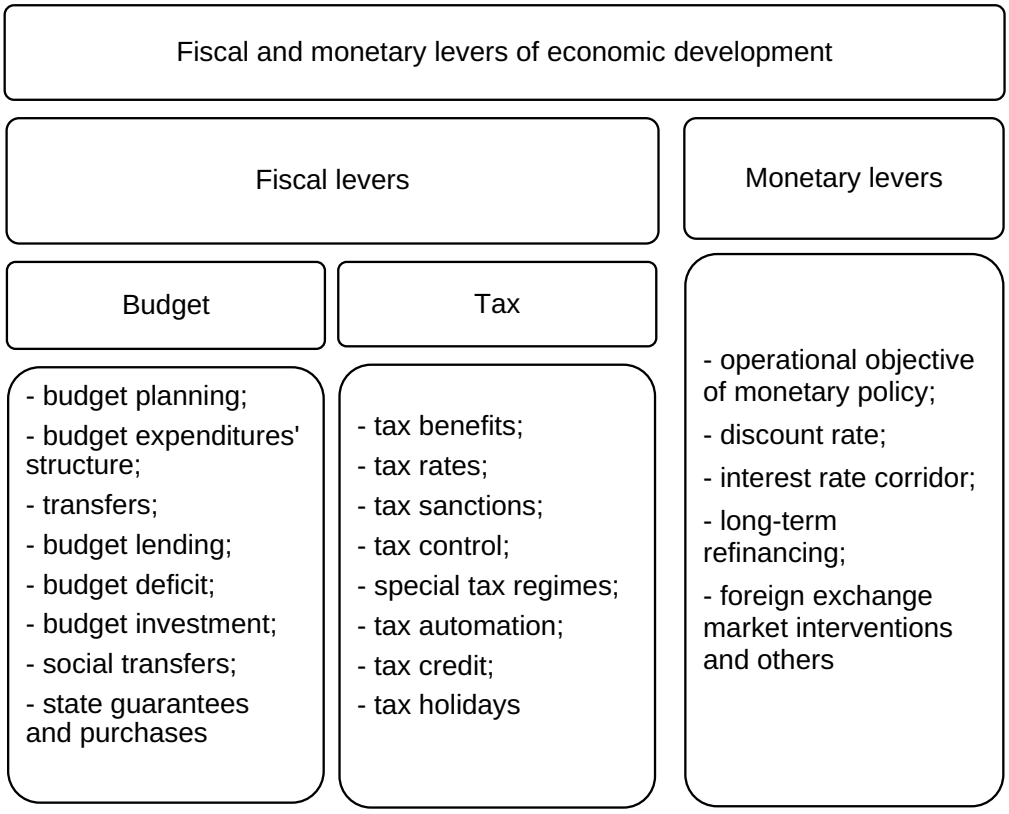

Figure 1. Fiscal and monetary levers of economic development

Source: Built by the author on the basis of data [1–3; 6]

Table 1

Array of statistical data for building a model, 2008–2021

Year	Nominal GDP (billion UAH, Y)	Budget expenditures (billion UAH, X_1)	Tax revenues (billion UAH, X_2)	Discount rate (% per annum, X_3)	Money supply (billion UAH, X_4)
2008	948.056	241.4545	170.652	12	515.72
2009	913.345	242.4372	161.578	10.3	487.29
2010	1082.569	303.5887	180.209	7.8	597.87
2011	1316.600	333.4595	243.485	7.8	685.51
2012	1408.889	395.6815	258.298	7.6	773.19
2013	1454.931	403.4032	254.341	6.5	908.99
2014	1566.728	430.2178	277.807	14	956.72
2015	1979.458	576.9114	397.985	22	994.06
2016	2383.182	684.7434	484.130	14	1102.7
2017	2982.920	839.2437	605.269	14.5	1208.86
2018	3558.706	985.842	708.370	18	1277.64
2019	3974.564	1072.891.5	582.736	13.5	1438.31
2020	4194.102	1288.0167	574.250	6	1850.01
2021	5459.574	1490.2589	959.283	9	2047.25

Source: Built by the author on the basis of data [11; 12; 13]

Table 2

Multiple regression model results

Variables	Coefficient	Statistical error	t-statistics	P-value	Significance of the regression coefficient
const	186.528	175.698	1.062	0.3161	
X_1	3.19645	0.578837	5.522	0.0004	***
X_2	1.18013	0.526848	2.240	0.0518	*
X_3	−7.97870	8.54831	−0.9334	0.3750	
X_4	−0.315953	0.393346	−0.8032	0.4425	

Average dependent variables	2373.116	Standard deviation of dependent variables	1433.284
Sum of squares error	131343.0	Standard model error	120.8043
R-square	0.995082	Normalized R-square	0.992896
F (4, 9)	455.2415	P-value (F)	0.000225
Log likelihood	−83.89071	Akaike Criterion	177.7814
Schwarz Criterion	180.9767	Hannan-Quinn Criterion	177.4856
rho parameter	−0.427983	Durbin-Watson Statistic	2.708717

Calculated and constructed by the author based on the results of the study

the existence of a direct relationship between the regressor X_1 (budget expenditures) and X_2 (tax revenues to the state budget and the dependent variable Y – their increase has a direct impact on the growth of nominal GDP.

Coefficient of determination R^2 = 0.995 indicates that the variation Y (GDP) is by 99.5% explained by the variation in the model variables. This connexion is quite strong, since the multiple correlation coefficient *R* = 0.992896.

To check the quality of regression, we use Fisher exact test to check the insignificance of the regression as a whole and Student's test to check the insignificance of an individual coefficient in the regression. If P is the value (F) < 0.01, the model is significant at the significance level α=0.01. For our model, P (F) = 0.000225 < 0.01. Therefore, the null hypothesis about the insignificance of regression is generally rejected at the significance level α=0.05, that is, the coefficients for all regressors at the same time are not zero, which confirms the combined influence of factors on the dependent variable.

One of the problems that makes it difficult to obtain reliable modelling results and analyse functional relationships is the presence of multicollinearity. Multicollinearity occurs when more than two factors are connected by a linear relationship, that is, there is an influence of factors on each other. Let us check the model for collinearity using the inflationary factors method using the VIF criterion (*variance inflation factor*). Parameter VIF_j for j-regressor shows how many times the standard deviation estimate for the coefficient for the regressor will increase compared to the situation if there were no multicollinearity. If $VIF_j > 10$, then the presence of multicollinearity for the j-regressor is confirmed.

Checking the model for multicollinearity using the toolkit in GRETL yielded the following VIF values for regressors: $VIF_{X1} = 49.85$; $VIF_{X2} = 4.35$; $VIF_{X3} = 1.42$; $VIF_{X4} = 30.86$. As you can see, value VIF_{X1} and $VIF_{X4} > 10$, i.e. there is multicollinearity between variables X_1 and X_4. In addition, according to Belsley-Kuh-Welsch collinearity diagnosis, conditionality index (cond) and variance proportions, which express the fractions of variance, are given. Each value from variance proportions corresponds to its own conditionality index (cond). The sum of elements in variance proportions columns is always equal to one. We select the row with the highest conditionality index (cond), we find the largest values of the variance fractions in this row. In our case, the largest fractions of the variables X_1 and X_4, which means that between the variables X_1 and X_4 multicollinearity is observed. This means that one of these variables must be removed from the model. Since according to Table 2. variable X_1 is significant, then we will remove X_4 from the model. The adjusted model is shown in Table 3.

A linear three-factor regression model has the following form:

$$Y = 73,369 + 2,798X_1 + 1,247X_2 - 6,780X_3 + e. \quad (3)$$

Normalized $R^2 = 0.993148$.

Thus, with an increase in budget expenditures by UAH 1 billion, nominal GDP is growing by an average of UAH 2.798 billion with constant

Table 3

Results of the adjusted multiple regression model

Variables	Coefficient	Statistical error	t-statistics	P-value	Significance of the regression coefficient
const	73.2693	102.948	0.7117	0.4929	
X_1	2.79846	0.293893	9.522	<0,0001	***
X_2	1.24787	0.510746	2.443	0.0347	**
X_3	−6.78012	8.26640	−0.8202	0.4312	

Average dependent variables	2373.116	Standard deviation of dependent variables	1433.284
Sum of squares error	140758.9	Standard model error	118.6419
R-square	0.994729	Normalized R-square	0.993148
F (4, 9)	629.0937	P-value (F)	1.10e-11
Log likelihood	−84.37537	Akaike Criterion	176.7507
Schwarz Criterion	179.3070	Hannan-Quinn Criterion	176.5141
rho parameter	−0.347634	Durbin–Watson Statistic	2.586134

Calculated and constructed by the author based on the results of the study

amounts of tax revenues to the state budget at the level of the discount rate; with an increase in tax revenues by UAH 1 billion, nominal GDP increases by UAH 1.24 billion if other variables remain unchanged; an increase in the discount rate by 1 percentage point leads to a decrease in nominal GDP by UAH 6.78 billion. The model explains 99.3% of the variation in nominal GDP.

GRETL also allows you to plot confidence intervals for regression coefficients. We get a result with 95% confidence intervals for the coefficients of the regression equation (Table 4).

The values of coefficients that are within the upper and lower limits of the confidence interval are considered normal. In our case, the coefficients are within confidence intervals, so their values are acceptable. True value of the coefficient for X_1 – budget expenditures with a probability of 95% are covered by the interval [2.14362; 3.45329] billion UAH; at X_2 – tax revenues to the state budget with a probability of 95% are covered by the interval [0.109854; 2.38588] billion UAH; at X_3 – the discount rate with a probability of 95% is covered by the interval [-25.1988; 11.6386] %.

Given the complex realities of today, namely the increase in the level of inflation, the increase in the state budget deficit, the war with Russia, the COVID-19 pandemic, excessive growth of the money supply in circulation, as a result of monetary issuance, the reduction of gold and foreign exchange reserves, the issues of effective use of fiscal and monetary levers and their regulatory impact on economic development become particularly relevant. Research of existing and search for new effective tools and forms of implementation of fiscal and monetary policy, changing the basic conditions for the functioning of the national economy of Ukraine becomes a challenge for improving the effectiveness of fiscal and monetary regulation.

World experience shows that the selection of effective monetary policy instruments affects the economic growth of the country as a whole, the growth of competitiveness of business entities and overcoming structural imbalances in the state economy.

The decline in the effectiveness of market instruments and high uncertainty in the context of full-scale military operations made it impossible to implement monetary policy in the traditional format of inflation targeting. In order to preserve macroeconomic stability in Ukraine, contain panic moods and prevent the unwinding of the inflationary spiral, the NBU at the beginning of the war was forced to fix the exchange rate of UAH to USD and imposed some administrative restrictions, in particular on currency transactions and capital movements. In addition, in accordance with the amendments made to the legislation of Ukraine, the NBU received a temporary opportunity for the period of martial law to purchase government bonds to finance critical expenditures of the Government of Ukraine in limited volumes, primarily to ensure the country's defence capability [13].

Economic collapse, significant budget needs and adjustments of the hryvnia exchange rate led to a rapid increase in the level of public debt relative to GDP. However, this ratio will remain less than 90% on the forecast horizon due to significant amounts of grants [13].

Aware of the potential risks of monetization of the state budget deficit, the National Bank will finance only critical government expenditures in limited amounts and only by purchasing Government securities on the primary market. The National Bank will also maintain maximum transparency in covering such operations. Together, limiting the volume of monetization of the budget deficit and transparent communications will prevent the threat of increased fiscal dominance and, accordingly, the effect of "fiscal displacement" and high inflation; weakening confidence in monetary policy and unbalanced expectations, as well as complicating the process of Ukraine's European integration and cooperation with international financial donors.

Table 4

Confidence intervals for coefficients of the regression equation of the corrected model

Variables	Coefficients	95% confidence intervals
const	73.2693	(-156.113, 302.651)
X_1	2.79846	(2.14362, 3.45329)
X_2	1.24787	(0.109854, 2.38588)
X_3	-6.78012	(-25.1988, 11.6386)

Calculated and constructed by the author based on the results of the study

International support will remain a key source of funding for budget needs. Together with the increase in market participation, this will allow us to completely stop monetizing the budget deficit from 2023.

The results of this study and further research in this area. Based on the developed and evaluated model, it is argued that monetary and fiscal policies jointly affect one of the key macroeconomic indicators, in particular GDP. At the same time, an additional analysis of the dynamics of the main instruments of fiscal and monetary policy suggests that, on average, coordinated policies have a greater stimulating effect on maintaining macroeconomic stability and non-inflationary economic growth than uncoordinated ones. The analysis of the calculation results based on the developed data model confirmed the importance of mutual coordination of fiscal and monetary policies. In addition, monetary policy can increase the effectiveness of fiscal policy, despite the fact that it may not be influential.

Thus, taking into account the current risks of macro-financial instability and the balanced application of appropriate fiscal and monetary levers to overcome it are necessary in the near future, along with the continuation of in-depth research and analysis of improving the effectiveness of fiscal and monetary levers in the Ukrainian economy under martial law.

REFERENCES:

1. Bilyk, O. (2009), "Modernization of the economy of Ukraine in the conditions of globalization: problems and contradictions", *Visnyk Kyivskoho natsionalnoho universytetu imeni Tarasa Shevchenka. Seriia: Ekonomika,* vol. 89. pp. 30–33.

2. Barannyk, L. B., Datsenko, V. V. (2017), "Fiscal tools for stimulating innovation and investment activities of enterprises", *Naukovyi pohliad: ekonomika ta upravlinnia,* vol. 1(57), pp. 29–39.

3. Bidiuk, O. O. (2012), "Tax administration: international experience and Ukrainian realities", *Materialy naukovo-praktychnoho kruhloho stolu «Reformuvannia systemy splaty podatkiv ta zboriv z urakhuvanniam mizhnarodnoho dosvidu»*. K.: Alerta. pp. 25–29.

4. Vdovychenko, A. (2018), "How fiscal policy affects GDP and inflation in Ukraine", *Visnyk NBU,* vol. 244, pp. 26–45.

5. Honcharenko, O. M., Svitlichnyi, O. S. (2017), *"Stabilization of the financial and economic system of Ukraine: the latest models and development prospects",* monograph. Odesa: Atlant. 271 p.

6. Hrytsyuk, O. (2014), "Budgetary and tax instruments for regulating the budget deficit", *Ekonomichnyi analiz,* vol. 2. pp. 146–152.

7. Hashchyshchyn, A. (2020), "How the interest rate affects the exchange rate", *Visnyk NBU,* vol. 250, pp. 4–14.

8. Zakharchenko, V. I. (2021), "Stages and institutional foundations of the development of the monetary and credit system of Ukraine", *Ukrainskyi zhurnal prykladnoi ekonomiky,* vol. 6 (1), pp. 109–117.

9. Krukovets, O. (2019), "Short-term forecasting of core inflation in Ukraine: an approach with a combined ARMA model", *Visnyk NBU,* vol. 248, pp. 12–22.

10. Pasichniy, M. D. (2019), "Monetary policy in the transformational economy. Foreign trade: economy, finance, law", *Zovnishnia torhivlia: ekonomika, finansy, pravo,* vol. 2, pp. 135–150.

11. Official site of State Tax Service (2022), available at: https://tax.gov.ua/pro-sts-ukraini/misiya-ta-strategichni-tsili/ (accessed 26 November 2022).

12. Official site of State Statistics Service of Ukraine (2022), available at: http://www.ukrstat.gov.ua/ (accessed 26 November 2022).

13. Official site of the National Bank of Ukraine (2022), available at: https://bank.gov.ua. URL: https://bank.gov.ua/ (accessed 26 November 2022).

СПИСОК ВИКОРИСТАНИХ ДЖЕРЕЛ:

1. Білик О. Модернізація економіки України в умовах глобалізації: проблеми та протиріччя. *Вісник Київського національного університету імені Тараса Шевченка.* Серія: Економіка. 2009. № 89. С. 30–33.

2. Баранник Л. Б., Даценко В. В. Фіскальні інструменти стимулювання інноваційно-інвестиційної діяльності підприємств. *Науковий погляд: економіка та управління*. 2017. № 1 (57). С. 29–39.

3. Бідюк О. О. Адміністрування податків: міжнародний досвід та українські реалії. Матеріали науково-практичного круглого столу «Реформування системи сплати податків та зборів з урахуванням міжнародного досвіду». Київ : Алерта, 2012. С. 25–29.

4. Вдовиченко А. Як фіскальна політика впливає на ВВП та інфляцію в Україні. *Вісник НБУ.* 2018. № 244. С. 26–45.

5. Гончаренко О. М., Світличний О. С. Стабілізація фінансово-економічної системи України: новітні моделі та перспективи розвитку : монографія. Одеса : Атлант, 2017. 271 с.

6. Грицюк І.В. Бюджетно-податкові інструменти регулювання дефіциту бюджету. *Економічний аналіз*. 2014. № 2. С. 146–152.

7. Гащишин А. Як процентна ставка впливає на валютний курс. *Вісник НБУ.* 2020. № 250. С. 4–14.

8. Захарченко В. І. Етапи та інституційні засади розвитку грошово-кредитної системи України: *Український журнал прикладної економіки*. 2021. Том 6. № 1. С. 109–117.

9. Круковець Д. Короткострокове прогнозування базової інфляції в Україні: підхід із комбінованою ARMA-моделлю. *Вісник НБУ.* 2019. № 248. С. 12–22.

10. Пасічний М. Д. Монетарна політика в трансформаційній економіці. *Зовнішня торгівля: економіка, фінанси, право.* 2019. № 2. С. 135–150.

11.Офіційний сайт Державної податкової служби України: веб-сайт. URL: https://tax.gov.ua/pro-sts-ukraini/misiya-ta-strategichni-tsili/ (дата звернення: 26.11.2022).

12. Офіційний сайт Державної служби статистики України: веб-сайт. URL: http://www.ukrstat.gov.ua/ (дата звернення: 26.11.2022).

13. Офіційний сайт Національного банку України. URL: https://bank.gov.ua/ (дата звернення: 26.11.2022).