Fiscal policy and oil factor: Evaluation of the effects in global economic development

Tapdig Guluzada[1,*], *Esmira* Guluzada[2,*]

[1]Azerbaijan State University of Economics, Mathematics and statistics, Istiglaliyyat 6, AZ1001 Baku, Azerbaijan
[2]Azerbaijan State University of Economics, Department of Finance and financial institutions, Istiglaliyyat 6, AZ1001 Baku, Azerbaijan

Abstract.

Research background: Today, the acceptance of fiscal policy decisions necessitates the analysis of policy efficiency with the help of optimization issues, the study of cause-and-effect relationships between budget expenditures and macroeconomic indicators such as economic growth, revenues, and the evaluation of a number of econometric models among all. The need for these areas makes it important to study and analyze the effects of fiscal policy on the economy, which allows to justify the relevance of the topic of the article.

Purpose of the article: The article is devoted to the assessment of the fiscal and economic consequences of changes in oil prices in the world market, as well as the study of the relationship between state budget revenues and government expenditure in Azerbaijan. It was revealed that a 1% increase in oil prices, in the long run, increased Azerbaijan's GDP by 0.52% and state budget expenditures by 0.88%. The calculations allow to conclude that there is a high correlation between government spending and state budget revenues in Azerbaijan. The obtained result indicates a positive relationship between the aforementioned economic variables.

Methods: The most common method of analyzing the possible causal relationship between macroeconomic indicators is the causality test proposed by Granger in 1969. However, from a methodological point of view, the application of this test to study the causal relationship between economic indicators requires these indicators to be stationary. This statistical feature can be violated in the case of the economic indicator having the single root elements. To do this, we tested the Unit root problem of the variable using the Augmented Dickey-Fuller test. Simultaneously, a number of other important features of the evaluated models were tested and the adequacy of the models was confirmed.

Findings & Value added: As a result of the research, it was determined that there is a short-term and long-term causal relationship between world oil prices and Azerbaijan's GDP and state budget expenditures. According to the results, a 1 percent increase in oil prices leads to the increase of the current level of GDP growth in Azerbaijan by 0.20 percent in the short

* Corresponding author: tapdig_guluzada@unec.edu.az, esmira_guluzada@unec.edu.az

term, and by 0.52 percent in the long term. Parallelly, it was revealed that a 1 percent increase in world oil prices leads to a 0.88 percent increase in Azerbaijan's state budget expenditures in the long run. The correlation between Azerbaijan's government expenditures and state budget revenues was analyzed, and a high correlation between these two macroeconomic indicators was identified.

Key words: *Government spending; GDP; budget revenues; economic revival; long term period; macroeconomic variables*

JEL Classification: *C1; C1; H5*

1 Introduction

The main areas of attention for the Azerbaijani economy over the past decade are the significant oil inflows into the budget of the country and other development trends in the economy due to these funds. As we have noted, the use of oil revenues for the development of the non-oil sector is one of the priorities of the state's economic policy. The state mainly uses fiscal policy to carry out this process. In Azerbaijan, certain steps are being done to analyze the effectiveness of budget expenditures in various areas and the impact of budget expenditures on economic growth. Today, the analysis of the effectiveness of fiscal policy with the help of optimization issues, the study of cause-and-effect relationships between budget expenditures, macroeconomic indicators such as economic growth, revenues and the evaluation of a number of econometric models are necessary factors in policy decision making. The importance of the above-mentioned areas makes it necessary to study and analyze the effects of fiscal policy on the economy, which allows to justify the relevance of the topic of the article. It is no coincidence that the initial indicators of the "2008 global financial crisis", which caused overwhelming losses in the world economy, began to manifest themselves in the banking system, but also led to significant losses in fiscal structures. The next global economic crisis, which began with the problems in the political relations of the world's leading countries and formed in late 2014, has also created very difficult conditions in the fiscal environment of the states. These negative shocks on the world oil market have also affected the Azerbaijani economy.

2 Methods

The article is devoted to the assessment of the fiscal and economic consequences of changes in oil prices in the world market, as well as the study of the relationship between state budget revenues and government expenditure in Azerbaijan. This work has employed the qualitative research methods, precisely, investigating, and analyzing secondary sources. The macroeconomic indicators and econometric models were used during the research. The most common method of analyzing the possible causal relationship between macroeconomic indicators is the causality test proposed by Granger in 1969. However, from a methodological point of view, the application of this test to study the causal relationship between economic indicators requires these indicators to be stationary. This statistical feature can be violated in the case of the economic indicator having the single root elements. To do this, we tested the Unit root problem of the variable using the Augmented Dickey-Fuller test. Simultaneously, a number of other important features of the evaluated models were tested and the adequacy of the models was confirmed.

The quantitative techniques such as statistical analysis or numerical measurements were used during the research too. One of the methods of such initial statistical analysis is to determine the correlation, which is carried out by means of a correlation coefficient, which is one of the quantities of statistical measurement. It is more appropriate not to include extensive explanations of the correlation coefficient in order to avoid overloading the article with additional theoretical material. Extensive information on this ratio is given in the cited literature. Here, concrete calculations were made, noting several key points.

3 Results and Discussions

During the first decade after independence, Azerbaijan's economic policy was remembered as the years of preparing the foundation for future economic development. *"The Contract of the Century"* was signed and an independent oil strategy began to be implemented. Azerbaijan has been witnessed low level of macroeconomic indicators during this decade. At the end of the first decade, or more precisely in 2003, the GDP per capita in Azerbaijan was 872.7 manat, and the state budget amounted to 1.2 billion. manat. The current account (balance of payments) deficit rose to 28 percent of GDP. However, starting from 2004, in the second decade (2004-2013), the Azerbaijani economy entered a high stage of development and received large amounts of revenues from oil. [1, 2]. During this period, the economy grew almost 3 times and had an average growth rate of 13.3%. In the second decade, oil exports increased by more than 400% and foreign exchange reserves by 33 times, and Azerbaijan was among the top 20 countries in the world in terms of the share of strategic foreign exchange reserves in GDP (70%). In 2003, only 8.2% of the state budget was formed through transfers from the oil fund, while in 2013 this figure rose to 58.2%. In the second decade, the share of state budget expenditures in GDP increased almost 13 times, from 17.3% in 2003 to 33.1% in 2013, including capital expenditures, which increased by about 50 times [3]. Significant increases in state budget expenditures has played a locomotive role in terms of the development of a number of important indicators, including modernization of the physical and technological infrastructure of the economy, improvement of living standards, etc. In the second decade, significant development trends were also observed in the banking sector. It is no coincidence that the ratio for the assets of banking sector to non-oil GDP (financial depth) has increased to 77%. The loan portfolio of banks has expanded almost 30 times in the second decade. However, along with the country's high development rates, a number of worrying signs are beginning to emerge. Thus, 94% of Azerbaijan's exports and 65% of budget revenues were formed by the inflows from oil sector. This economic background has further increased the potential threat of foreign economic shocks to the country's economy. From this point of view, the sharp decline in world oil prices towards the end of 2014 caused serious problems in the Azerbaijani economy [4]. In a three-year period (2014-2016) after the second decade, the economy was in recession and suffered significant losses. In 2015, 222 mln. dollar deficit on the current account (balance of payments) was arisen, strategic foreign exchange reserves decreased to $38 bln dollar [5]. Due to the weak development of the non-oil sector, the overall economic growth rate began to slow down in 2014 and led to a 3.8 percent recession in 2016. Such dependence on oil funds has led to the formation of overdue loans in the banking sector, which account for 22% of the loan portfolio. Within a year, the level of dollarization of household deposits increased by 85%. Only in 2017, the economy began to leave recession phase and had certain development trends [6].

3.1 Fiscal and economic effects of changes in oil prices

The impact of changes in oil prices on fiscal indicators and GDP was assessed here. The statistical indicators of these economic variables are given in Table A1 (see Appendix A). Figure 1 shows graphical representations of these variables.
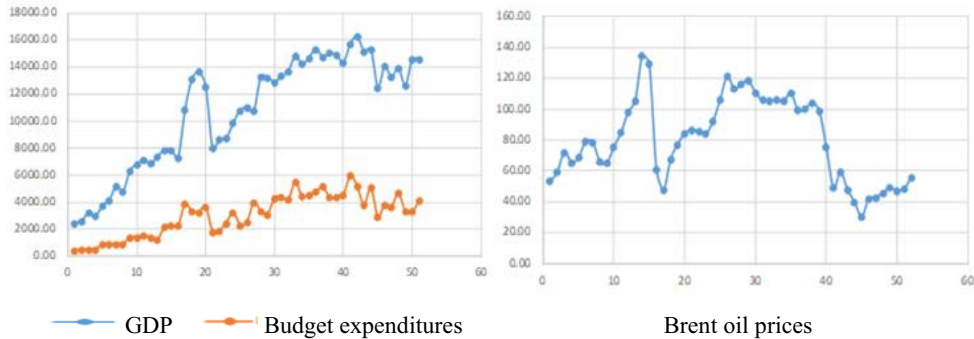

Fig. 1. GDP, budget expenditures and oil prices

Figure 1 clearly shows the corresponding trend between the world market price of oil and Azerbaijan's GDP and state budget expenditures. As can be seen from Table A1 (see Appendix A), the statistics on GDP, state budget expenditures and world market prices for Brent oil are on a quarterly basis. It is known that statistical indicators of economic variables collected on a quarterly basis are very sensitive to seasonal factors. In this regard, first of all, the variables were cleared of seasonal factors. After that, Azerbaijan's GDP and state budget expenditure statistics became real value in the prices of the second quarter of 2007 through the deflator (2007Q2 = 100). The world market price of oil is given in real terms in the Short-Term Energy Bulletin of the US Energy Information Administration in 1982-84.

Thus, we can examine the causal link between world oil prices and both Azerbaijan's GDP and state budget expenditures. That is, we can learn whether the oil factor can lead to changes in Azerbaijan's GDP and state budget expenditures? It will also allow us to determine what changes in oil prices have led to these macroeconomic variables. The most common method of analyzing the possible causal relationship between macroeconomic indicators is the causality test proposed by Granger in 1969. However, from a methodological point of view, the application of this test to study the causal relationship between economic indicators requires that these economic indicators be stationary [7]. This statistical feature can be violated due to the fact, that the economic indicator has a unit root element. To do this, we tested the Unit root problem of the variable using the Augmented Dickey-Fuller test [8,9]. At the same time, a number of other important features of the evaluated models were tested and the adequacy of the models was confirmed [10-14] .

It should be noted that the econometric models of the relationship between economic variables presented in the article allowed to achieve adequate results with the above-mentioned statistical features. The results of the assessment of the long-term impact model of oil prices on Azerbaijan's GDP and state budget expenditures are given in (1) and (2).

$$ln(Y_t) = 6.44 + 0.52\, ln(O_t) + 0.02 trend \qquad (1)$$
$$\quad\ (0.00)\quad\ (0.00)\qquad (0.00)$$

$$ln(X_t) = 3.35 + 0.88\, ln(O_t) + 0.03 trend \qquad (2)$$
$$\quad\ (0.00)\quad\ (0.00)\qquad (0.00)$$

Here, the numbers in parentheses () indicate the corresponding probabilities. Y represents Azerbaijan's GDP, X represents state budget expenditures, and O represents the world market price of Brent oil. Based on the results obtained, it is possible to interpret the long-term impact of the 1% increase in the price of Brent oil during the observation period, 2005Q1-2017Q4, on the current level of GDP and state budget expenditures in Azerbaijan. It should be noted that short-term relationships between economic variables are not important in practice. As a rule, long-term relationships between economic variables are considered more important. Thus, it was determined that a 1% increase in oil prices in the long run increased Azerbaijan's GDP by 0.52% and state budget expenditures by 0.88%.

3.2 The relationship between state budget revenues and government expenditures

The second part of the article has covered an analysis of the relationship between state budget revenues and government fiscal policy, especially government spending. For this purpose, traditional graphic representations play a special role in the formation of the first impression. Graphical descriptions were prepared using indicators of state budget revenues and government expenditures.
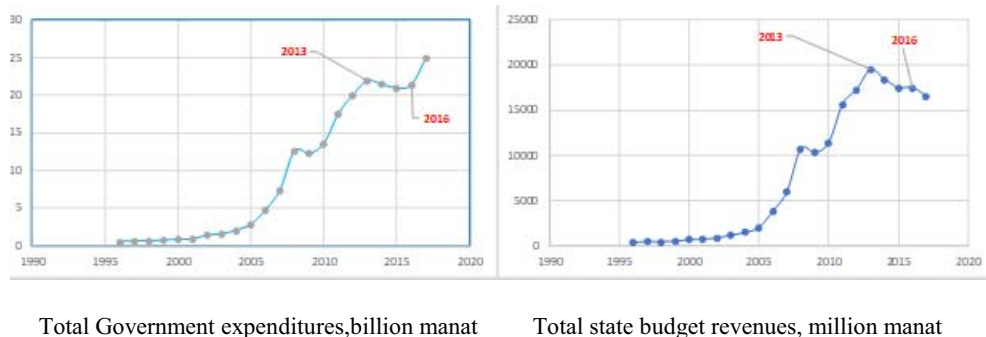

Total Government expenditures,billion manat   Total state budget revenues, million manat

Fig. 2. Government expenditures and state budget revenues

From the Figure 2, it can be easily observed that until 2013, there was an overlapping trend between government spending and state budget revenues. Even the trend is so similar that the relationship between these two variables can be assessed by simple linear regression. However, in 2013 the situation changed. Thus, in 2013 the state budget revenues witnessed a sharp decrease which was relatively mild in government spending. Such a severe decline in government revenues after 2013 is due to a sharp decrease in world oil prices which is caused by the global crisis. The relatively weak decline in government spending was driven by the government's goal of economic recovery, and the government appears to have sought to prevent a sharp decline in spending from sources other than the state budget. In 2016, the situation was quite the opposite. As can be seen in Figure 2, while government budget revenues continued to decline in 2016, government expenditures tended to increase. It should be noted that one of the reasons for achieving economic growth in Azerbaijan in 2017 can be considered the government's fiscal expansion policy [15].

After a simple graphical analysis, it may be useful to draw some conclusions through preliminary statistical analysis. One of the methods of such initial statistical analysis is to determine the correlation, which is carried out by means of a correlation coefficient, which is one of the quantities of statistical measurement. It is more appropriate not to include extensive explanations of the correlation coefficient in order to avoid overloading the article

with additional theoretical material. Extensive information on this ratio is given in the cited literature.[†] Here, concrete calculations will be made, noting a few key points. This coefficient, which has a minimum value of -1 and a maximum value of +1, allows us to judge the linear relationship between the variables [16]. When this coefficient is equal to +1, it can be concluded that there is a completely linear relationship between the variables, in the increase of one variable will be followed by the increase of the other variable. Conversely, a coefficient of -1 allows us to say that there is a completely inverse relationship, that is, the decrease of one variable occurs simultaneously with the increase of the other variable. The fact that the ratio is zero means that there is no linear relationship between them. That is, it is possible that there is any nonlinear relationship between these variables. The calculation formula for the correlation coefficient is as follows [17].

$$corr_{xy} = \frac{cov(x,y)}{S_x S_y} \qquad (3)$$

Here, y and x represent the expenditures of the Azerbaijani government and state budget revenues, respectively, $corr_{xy}$ and $cov(x,y)$ stands for the correlation and covariance coefficients between the variables x and y, and respectively, S_x and S_y shows the standard errors of x and y.

Other statistical quantities used in the calculation of correlation in (3) are determined by the following formulas:

$$cov(x,y) = \frac{\sum_{i=1}^{n}(x-\bar{x})(y-\bar{y})}{n-1} \qquad (4)$$

$$S_x = \sqrt{\frac{\sum_{i=1}^{n}(x-\bar{x})^2}{n-1}} \qquad (5)$$

$$S_y = \sqrt{\frac{\sum_{i=1}^{n}(y-\bar{y})^2}{n-1}} \qquad (6)$$

Thus, the application of the above formulas (3) - (6) will allow to conduct a correlation analysis between government expenditures and state budget revenues in Azerbaijan. Auxiliary data in Table A2 (see Appendix A) were used for the analysis. Taking into account the results obtained in Table A2 in equations (4) - (6), it is possible to conclude that the correlation coefficient between government expenditures and state budget revenues in Azerbaijan is approximately 0.99. This result indicates a positive relationship between these economic variables. It is also a very strong straight line. Because the calculated coefficient is very close to +1.

[†] *Website of the Statistics Committee of Azerbaijan Republic, Finance and Bank, State Budget Revenues and Expenditures, https://www.stat.gov.az/source/finance/, World Economic Outlook Database, April 2018 (http://www.imf.org, DATA, World Economic Outlook Databases, http://www.imf.org/external/ns/cs.aspx?id=28)*

4 Conclusion

As a result of the research, it was determined that there is a short-term and long-term causal relationship between world oil prices and Azerbaijan's GDP and state budget expenditures. According to the results, a 1 percent increase in oil prices in the short term will increase the current level of GDP growth in Azerbaijan by 0.20 percent, and a 1 percent increase in oil prices in the long term will increase the current level of GDP growth in Azerbaijan by 0.52 percent. At the same time, it was found that a 1 percent increase in world oil prices leads to a 0.88 percent increase in Azerbaijan's state budget expenditures in the long run. The correlation between Azerbaijan's government expenditures and state budget revenues was analyzed, and a high correlation between these two macroeconomic indicators was identified.

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Appendix A

Table A1. Quarterly statistics of Azerbaijan's GDP and state budget expenditures

Tarix	Y	X	O	Tarix	Y	X	O
2005Q1	2440.61	450.60	53.55	2011Q3	10802.74	4001.23	113.24
2005Q2	2614.45	462.67	59.47	2011Q4	13295.31	3328.75	116.36
2005Q3	3208.98	511.19	72.27	2012Q1	13234.20	3118.79	118.79
2005Q4	2980.26	470.78	65.71	2012Q2	12895.89	4321.18	110.91
2006Q1	3710.04	871.93	68.78	2012Q3	13333.18	4401.24	106.04
2006Q2	4157.01	885.24	79.20	2012Q4	13696.90	4211.66	105.84
2006Q3	5196.85	910.35	78.89	2013Q1	14812.36	5500.06	106.57
2006Q4	4809.36	902.46	66.24	2013Q2	14214.15	4424.78	105.26
2007Q1	6339.77	1373.23	65.29	2013Q3	14689.71	4547.72	110.80
2007Q2	6794.00	1420.22	75.72	2013Q4	15334.91	4760.09	99.56
2007Q3	7123.40	1553.95	84.95	2014Q1	14768.04	5171.72	100.25
2007Q4	6872.38	1347.52	98.23	2014Q2	15020.81	4370.09	104.46
2008Q1	7352.99	1193.79	105.73	2014Q3	14909.62	4369.08	99.13
2008Q2	7890.10	2156.14	134.79	2014Q4	14358.62	4531.35	75.62
2008Q3	7849.80	2276.06	129.31	2015Q1	15680.95	6012.36	49.42
2008Q4	7325.97	2283.99	61.29	2015Q2	16298.34	5186.34	59.36
2009Q1	10868.29	3868.91	47.81	2015Q3	15142.66	3779.53	48.08
2009Q2	13115.33	3313.69	67.54	2015Q4	15342.15	5087.76	39.93
2009Q3	13663.13	3278.92	77.30	2016Q1	12509.18	2918.90	30.43
2009Q4	12551.46	3683.50	84.41	2016Q2	14049.26	3843.88	42.23
2010Q1	7999.93	1786.71	86.85	2016Q3	13263.55	3670.63	42.95
2010Q2	8645.41	1889.48	85.78	2016Q4	13948.90	4664.84	46.03
2010Q3	8733.55	2472.27	84.37	2017Q1	12625.87	3329.35	49.29
2010Q4	9844.53	3247.19	92.28	2017Q2	14565.37	3309.11	47.41
2011Q1	10807.29	2291.29	106.17	2017Q3	14577.58	4099.59	48.55
2011Q2	11009.69	2542.70	121.43	2017Q4			56.07

Note: Here Y represents the GDP of Azerbaijan in million manats, and X represents the state budget expenditures in million manats. Both variables were converted to real value in the second quarter of 2007 through a deflator (2007Q2 = 100) Source: GDP figures are taken from the National Accounts section of the State Statistics Committee (https://www.stat.gov.az/source/system_nat_accounts/) .The state budget expenditures are taken from the website of the Ministry of Finance (http://www.maliyye.gov.az/node/1551) .World oil prices are collected from the U.S. Energy Information Administration's EIA Short-Term Energy Outlook.

Table A2. Auxiliary table for calculating the correlation coefficient between government expenditures and state budget revenues

n	y	x	$(y - \bar{y})^2$	$(x - \bar{x})^2$	$(x - \bar{x})(y - \bar{y})$
1996	0.54	402.6	82.06	56280751.60	67960.39
1997	0.638	513	80.30	54636487.16	66235.90
1998	0.62	465.5	80.62	55340950.14	66795.45
1999	0.736	559.5	78.55	53951225.97	65099.40
2000	0.861	714.6	76.35	51696816.51	62826.00
2001	0.892	784.8	75.81	50692261.55	61991.89
2002	1.403	910.2	67.17	48922328.37	57325.87
2003	1.548	1220.9	64.82	44672511.74	53810.26
2004	2.066	1509.5	56.74	40897941.30	48174.08
2005	2.817	2055.214	45.99	34215897.38	39670.34
2006	4.743	3868.773	23.58	16288301.76	19597.85
2007	7.393	6006.602	4.87	3602585.93	4186.92
2008	12.619	10762.67	9.12	8168290.74	8631.49
2009	12.285	10325.94	7.22	5862622.38	6503.79
2010	13.571	11403	15.78	12238453.94	13895.76
2011	17.57	15700.7	63.54	60778398.31	62143.02
2012	20.056	17281.5	109.35	87925319.18	98054.57
2013	21.981	19496.3	153.32	134366353.75	143528.87
2014	21.466	18400.6	140.83	110164970.05	124556.39
2015	21.033	17498	130.74	92032367.55	109691.24
2016	21.392	17505.7	139.08	92180164.44	113226.06
2017	24.946	16516.7	235.53	74167408.19	132169.92
	$\bar{y} = \dfrac{\sum y}{22}$ $= 9.60$	$\bar{x} = \dfrac{\sum x}{14}$ $= 7904.65$	$\sum_{i=1}^{22}(y_i - \bar{y})^2 =$ 1740.37	$\sum_{i=1}^{22}(x_i - \bar{x})^2 =$ 1189082407.93	$\sum_{i=1}^{22}(x_i - \bar{x})(y_i - \bar{y}) = $ 1426075.47

Note: y = total government expenditures, bln. manat (Source: International Monetary Fund, World Economic Outlook Database, April 2018, http://www.imf.org/external/ns/cs.aspx?id=28), x = total state budget revenues, in million manats (source: Azerbaijan State Statistics Committee website, Finance and Bank, State budget revenues and expenditures, https://www.stat.gov.az/source/finance/)