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Article

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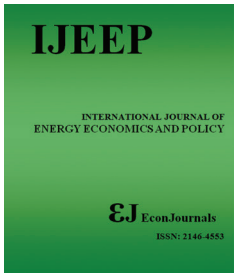
International Journal of Energy Economics and Policy

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Ahmadov, Baghish (2022). The impact of oil prices on the capital expenditures of the state budget in Azerbaijan. In: International Journal of Energy Economics and Policy 12 (6), S. 383 - 388. https://econjournals.com/index.php/ijeep/article/download/13656/7038/31664. doi:10.32479/ijeep.13656.



International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2022, 12(6), 383-388.

The Impact of Oil Prices on the Capital Expenditures of the State Budget in Azerbaijan

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Received: 13 August 2022 **Accepted:** 05 November 2022 **DOI:** https://doi.org/10.32479/ijeep.13656

ABSTRACT

The article studies the theoretical and practical approaches related to the allocation of oil revenues for public investment. Based on the two-step Engel-Granger procedure for cointegration analysis, the relationship between the ratio of the capital expenditures of the state budget to non-oil GDP and the logarithm of real oil prices in Azerbaijan is investigated. It has been determined that public investment in Azerbaijan is highly dependent on the oil price, and the volatility of the oil price also affects the volatility of these expenditures. So, it was proposed that the capital expenditures of the state budget should be determined based on the goals of economic development, and not depending on changes in oil prices.

Keywords: Oil Price, Capital Expenditure, State Budget, Error Correction Model
JEL Classifications: H54, O13, Q31, Q32

1. INTRODUCTION

Oil revenues play an important role in financing the development of Azerbaijan's economy. Thus, in 2000-2021, the share of the oil and gas sector in GDP varied between 29.5% and 55.4%, and the share of oil revenues in the state budget revenues varied between 29.6% and 73.8%. Under such conditions, determining the direction of spending oil revenues has become one of the main strategic decisions affecting all aspects of society.

Optimal decisions are required regarding the allocation of this revenue between consumption and savings, taking into account the principles of sustainable development, the volatility of oil prices, the possibility of the appearance of symptoms of "Dutch disease" as a result of an appreciation of the national currency and the principles of sustainable development. One of the important issues in making such decisions is how to allocate savings from oil revenues between domestic investment and foreign investment. Investments in the non-oil sector due to oil revenues allow to increase the country's non-oil wealth and thereby follow the principles of sustainable development. However, the increase in domestic public investments financing by oil revenues rises the likelihood of a decrease efficiency of these investments. Thus, limited production capacity may lead to the creation of bottlenecks in the economy, which may reduce the benefits of increased public investment (Berg et al., 2013; van der Ploeg, 2012). According to Berg et al. (2013), the gradual and careful increase of public investments can lead to long-term growth of production, in addition to ensuring macroeconomic stability. Collier et al. (2010) put forward a similar approach and notes that as natural resources are depleted, the government should use sovereign funds, which retain part of the revenue from natural resources, for equal investments over many years.

At the same time, the country's low level of infrastructure, limited human capital, low level of decent employment, limited financial capacity of the private sector make it necessary to spend most of the oil revenues on public investment. Sachs and Warner (1997)

considered appropriate to keep some of the revenue from natural resources and invest the rest in the development of basic public infrastructure that accelerates economic development, promotes growth and reduces poverty. Collier et al. (2010) suggest that in resource-rich developing countries, priority should be given to investments in fixed capital after creating a reserve of sufficient financial resources to limit the negative effects of external shocks. According to van der Ploeg (2012), in order to reduce the level of poverty, a larger share of income from resources should be given to the current generations than in the permanent income approach in resource-rich developing countries and by optimally managing income from natural resources, these countries can increase public investments, which will have a positive effect on current wages and consumption.

According to some empirical studies, an effective investment strategy in resource-rich countries should have the following characteristics (Collier, 2012; Gupta et al., 2014; van der Ploeg and Venables, 2011):

- Fulfillment of current development tasks by creating wealth and solving poverty problems;
- Creation of financial reserves in response to expectations of revenue inequality and resource depletion;
- Determination of the volume of budget expenditures, taking into account the effectiveness of the public investment management system and the economy's absorptive capacity to use revenues from resources.

This approach does not reduce the ability to effectively manage investments and allows the government to close gaps in public investment management and gain time to reduce the limits on allocations of funds through to investing-in-investing (Collier, 2012). The process of "investing in investing" is associated with the formation of investment potential, which does not allow a decrease in the return on investment. Since, the economic entities should determine the products and services, which they will produce, the supply of raw materials and materials for their production, sales markets, issues of production organization, the volume of production and the type of technology, the financing scheme, etc. in the investment process. The lack of experience in this field limits the investments and the effective absorption of savings as investments in the country. A country's efforts to "investin in investing" can be critical to achieving the expected benefits of increased investment by improving the efficiency of public and private investment, as well as financial and debt stability (Collier, 2008).

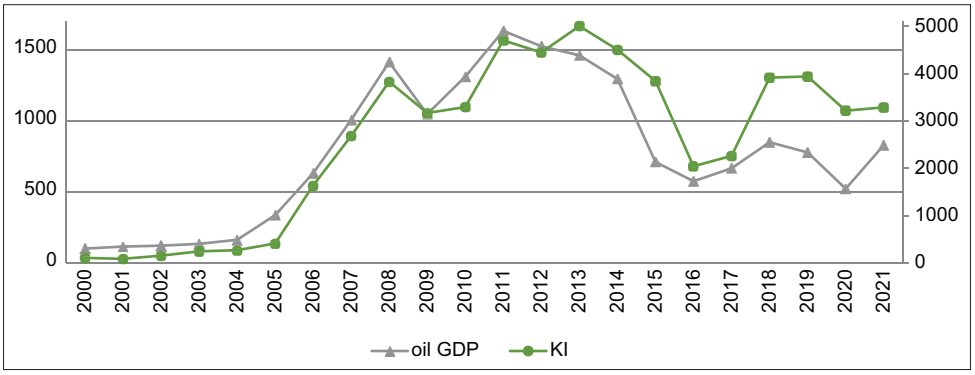
In general, in order to increase the well-being of the population and influence economic growth, a part of the oil revenues should be directed to savings for the purpose of achieving macroeconomic stability and to the reduction of taxes, and a part of this savings to investment, especially to investment in the development of infrastructure and human capital, and the other part can be spent on citizens, especially on the poor population.

Oil revenue created opportunities to provide investment resources for the development of the national economy in Azerbaijan. Since 2006, the increase in real US dollar oil GDP has led to a significant increase in investment in Azerbaijan. Thus, in 2013, the capital expenditures of the state budget increased by 50.1 times compared to 2000 (Figure 1). At the same time, the share of the government's oil revenues directed to capital expenditures varied between 11.1% and 74.6%. As it can be seen, both the volume of the capital expenditures of the state budget and its share in oil revenues have been variable. In Azerbaijan, the ratio of non-oil revenues of the state budget to non-oil GDP increased from 15.2% in 2000 to 22.3% in 2021. But the non-oil tax base in Azerbaijan largely depends on budget oil revenues (Ahmadov, 2022).

2. LITERATURE REVIEW

According to some studies, dependence on natural resources (their abundance) has an inhibitory effect on economic growth, weakening institutions and stimulating rent seeking (Collier, 2000; Torvik, 2002). For example, Sachs and Warner (2001) note that the average economic growth rate in resource-rich countries is lower than in resource-poor countries. Auty (1994) called it the "resource curse." At the same time, many economists explain this not by the availability of resources, but by the weakness of institutions. Azeki et al. (2011) using panel data from more than 100 countries, concluded that the quality of economic institutions

Figure 1: The capital expenditure of the state budget (KI) and oil GDP in Azerbaijan*



Source: stat.gov.az, maliyye.gov.az, www.worldbank.org/en/research/commodity-markets. Real dynamics of the capital expenditures of the state budget (it was calculated as the ratio of capital expenditure to the deflator of non-oil GDP) and real dynamics of oil GDP in US dollars (it was calculated using annual nominal and real oil prices from the World Bank). *The left vertical axis reflects changes in oil GDP, and the right vertical axis reflects changes in the capital expenditures of the state budget

in resource-exporting countries was one of the main determinants of the impact of public spending on non-commodity development. According to Albino-War et al. (2014), the quality of institutions (i.e. governance structure) plays a key role in achieving desired growth and development outcomes. Karimu et al. (2016) using a two-step system generalized method of moment (GMM) estimator determined that the rent obtained from the resources increased the public investments, and that the quality of the institutions affected this increase. Ilzetzki and Vegh (2008) studied a sample of 81 developing countries and found that an increase in public investment causes an increase in real GDP.

According to van der Ploeg and Venables (2011), in a capital-scarce developing economy, if the interest rate exceeds the time preference rate and there is increased consumption, then this country should invest the windfall revenue from resources into fixed capital, which increases the growth rate of consumption. In order to increase the investment activity in the country, they propose to invest windfall revenue from resources into public capital or to direct it to the financing of decreasing budget revenues through tax incentives that increase private investment.

Bhattacharyya and Collier (2014) based on panel data on public capital and resource rents for 45 developed and developing countries covering the years 1970-2005, using the Fuller version of Limited Information Maximum Likelihood (LIML) instrumental variable (IV) method and the Arellano-Bond GMM estimation method test the impact of resource rent on public investment by estimating a dynamic model. Their calculations found a negative relationship between public capital and resource rents in resource-rich countries. However, in their opinion, although the impact of natural resource abundance on economic growth and income levels is ambiguous, but some of the revenue from resource depletion should be used to accumulate public capital. Also, according to them, it is a wrong policy for low-income countries to prioritize the investment of resource revenues into foreign financial assets through Sovereign Wealth Funds rather than domestic investments.

According to Ross (2012) economies have a limited ability to absorb new investments, which are typically constrained by diminishing returns. So, if a government tries to build too much infrastructure too quickly, it will lead to poor planning, lax oversight, and shoddy construction at inflated prices. Richmond et al. (2013) propose in the case of Angola gradual scaling-up spending oil revenue to achieve the policy objectives of both economic growth and stability.

According to Ramey and Ramey (1995), the unpredictability of economic policy, according to Fatas and Mihov (2007), variability in budget policy, according to Guillaumont et al. (1999), variability in the volume of investment has a negative effect on economic growth. In addition, Hausmann et al. (1993) note that sharp fluctuations in government spending negatively affect private investments and growth in the non-oil economy.

Table 1: Descriptive statistics of the variables

	k	lpo
Mean	0.161312	3.869165
Median	0.175140	3.940586
Maximum	0.313823	4.328396
Minimum	0.014893	3.253079
Std. Dev.	0.098581	0.361935
Skewness	−0.197699	−0.335118
Kurtosis	1.715085	1.892622
Jarque-Bera	1.656733	1.535876
Probability	0.436762	0.463969
Sum	3.548870	85.12163
Sum Sq. Dev.	0.204081	2.750936
Observations	22	22

3. DATA AND METHODOLOGY

3.1. Data Descriptions

The study examines the relationship between the ratio of the capital expenditures of the state budget to non-oil GDP (k) and the logarithm of Azeri light oil real price (lpo)). At present, the capital expenditures of the state budget are mainly allocated to the non-oil sector. At the same time, since the main investment projects in the oil and gas sector have been implemented, the volume of production does not depend on the capital expenditures of the state budget and the price of oil. Also, the nominal volume of added value in the oil and gas sector directly depends on the price of oil. So, since the production

Table 2: Result of ADF and PP unit root test (at level form)

Model	Variable	ADF	PP	Stationarity	I
With Intercept only	K	−2.106449	−1.64291	N/S	I(1)
	Lpo	−1.86438	−1.834356	N/S	I(1)
	Δk	−3.230717**	−3.132781**	S	I(0)
	Δlpo	−4.025081*	−3.961779*	S	I(0)
With Intercept and Trend	K	−1.151936	−1.308833	N/S	I(1)
	Lpo	−1.730129	−1.708778	N/S	I(1)
	Δk	−3.418358***	−3.306718***	S	I(0)
	Δlpo	−4.087935**	−4.08867**	S	I(0)
No Intercept and No Trend	K	−0.34829	−0.348290	N/S	I(1)
	Lpo	0.379273	0.470185	N/S	I(1)
	Δk	−3.274955*	−3.191196*	S	I(0)
	Δlpo	−4.064174*	−4.027165*	S	I(0)
With Intercept only		−3.553149**^{s1}	−3.568706**	S	
With Intercept and Trend	$\hat{u}_t$	−3.4489898***^{s2}	−3.507293***	S	
No Intercept and No Trend		−3.645878*^{s0}	−3.660281*	S	

*, ** and *** indicate rejection a unit root at the 1%, 5% and 10% significance levels respectively (MacKinnon, 1996). s0, s1, s2 - indicate confirmation of stationarity at the 1%, 5% and 10% significance levels respectively critical values of t-Statistics for cointegration (MacKinnon, 1991).

and transportation costs of 1 ton of crude oil are relatively stable, the change in the price of oil affects the change in income. Therefore, the oil GDP was not taken account in order to avoid distortions when calculating the impact of oil prices on the capital expenditures of the state budget. The non-oil GDP covering the years 2000-2021, the capital expenditures of the state budget and the nominal price of Azeri light oil were obtained from the state budget documents, and the price index used to calculate the real price of oil (in US dollars) was obtained from the data of the World Bank (www.maliyye.gov.az, www.worldbank.org/en/research/commodity-markets). Descriptive statistics of k and lpo time series are given in Table 1.

3.2. Methodology

3.2.1. Models to be estimated

The research used Engel-Granger two-step procedure for cointegration analysis to investigate the link between the ratio of capital expenditures of the state budget to non-oil GDP and the logarithm of real oil prices (Engle and Granger, 1987).

The following regression equation is tested, reflecting the long-run relationship between variables that are themselves non-stationary, but first differences (I(1)) are stationary:

$$k_t = c + \beta * lpo_t + u_t \quad (1)$$

If $\hat{u}_t \sim I(0)$, then there is cointegration between k_t and lpo_t time series. In this case, the relationship between the variables is examined by the following regression equation based on the error correction model (ECM):

$$\Delta k_t = \acute{a} + b\Delta lpo_t + \gamma \hat{u}_{t-1} + \varepsilon_t \quad (2)$$

Here, $\hat{u}_{t-1}$ – error correction term (ECT), b – reflects the short-term effect of real oil price changes on k, γ is the error-correction coefficient, which reflects the effect of long-term disequilibrium in the previous period.

3.2.2. The unit root test

At the first stage, the unit root of the variables k and lpo is estimated using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) criteria (Table 2) (Dickey and Fuller, 1981; Phillips and Perron, 1988). As a result of these tests, if the variables k and lpo are non-stationary and have the I(1) order of integration, and u_t from the regression equation (1) also are stationary with the constant, then there are co-integration relations between them (Engle and Granger, 1987). t-Statistics in the ADF test of u_t are compared with the critical values for cointegration (Table 3) (MacKinnon, 1991).

3.2.3. Engel-Granger and Phillips-Ouliaris co-integration tests

Engle-Granger and Phillips-Qualiris cointegration tests were performed to determine cointegration between variables.

3.2.4. Diagnostics

This study checks the (2) model through Breusch-Godfrey LM test, Breusch-Pagan-Godfrey Heteroskedasticity test and Ramsey RESET test. The normal distribution of white noise error is checked by the Jarque-Bera test.

4. EMPIRICAL RESULTS

The correlation coefficient between the k and lpo time series was equal to 0.900257, the t-Statistic was equal to 9.247698, and the probability (t-Statistic) was equal to 0. These indicators show that there is a high positive correlation between k and lpo variables.

ADF and PP tests show that time series k and lpo are non-stationary, and their first differences (I(1)) are stationary (Table 2).

According to the calculations made using the ordinary least squares (OLS) method, the coefficients in the regression equation (1) were as follows.

$$k_t = -0.787422 + 0.245204 lpo_t \quad (3)$$

Here, $R^2 = 0.810462$, adjusted $R^2 = 0.810462$, t-statistic for lpo is equal 9.247698 and probability is equal 0, t-statistic for constant is equal -7.643467 and probability is equal 0. The residuals of the regression equation (3) are stationary (Tables 2 and 3). So, the critical value of the t-Statistic in the ADF test for the null hypothesis of no cointegration and no lags is approximately −3.37 at a significance level of 5% (Asterio and Hall, 2011).

Also, Engle-Granger and Phillips-Qualiris cointegration tests also show that there is a cointegration relationship between k and lpo variables (Tables 4 and 5).

Granger Causality Tests show lpo does Granger cause k (Table 6).

Table 2 shows that Δk_t, Δlpo_t and $\hat{u}_t$ (ECT) are stationary. So, using OLS method the error correction model (ECM) specification in this case can be expressed as follows:

Table 3: Critical values for the residual based ADF Tests (t-statistics) for Cointegration (22 observation)

	1% level*	5% level*	10% level*
With Intercept only	−3.76672	−3.00383	−2.64172
With Intercept and Trend	−4.4415	−3.63303	−3.25347
No Intercept and No Trend	−2.67563	−1.95739	−1.62383

*MacKinnon, J. (1991)

Table 4: Engel-Granger co-integration test

Dependent	Tau-statistic	Prob.*	z-Statistic	Prob.*
k	−3.645878	0.0497	−17.17371	0.0305

*MacKinnon (1996) P-values.

Table 5: Phillips-Ouliaris co-integration test

Dependent	Tau-statistic	Prob.*	z-Statistic	Prob.*
k	−3.729061	0.0425	–17.00389	0.0324

*MacKinnon (1996) P-values.

Table 6: Granger causality tests (Lags: 1)

Null hypothesis	Obs.	F-Statistic	Prob.
lpo does not Granger Cause k	21	6.86207	0.0174
k does not Granger Cause lpo		0.15028	0.7028

Table 7: Diagnostic test results

	Ramsey reset test (t-statistic)	Jarque-Bera normality test	Breusch-Pagan-Godfrey heteroskedasticity test		Breusch-Godfrey serial correlation LM Test		R^2
			F-statistic	Obs*R-squared	F-Statistic	Obs*R-squared	
Value	0.440138	0.207828	1.804997	3.508093	0.884563	1.979403	0.660898
Prob.	0.6651	0.901303	0.1930	0.1731	0.4311	0.3717	

$$\Delta k_t = 0.118959*\Delta lpo_t - 0.758562*ECT_{t-1} \quad (4)$$

Here, γ - the error-correction (adjustment) coefficient is less than 0 and more than −1.

The tests performed that the regression equation (4) is significant (Table 7). As can be seen from the regression equations (3) and (4), in the long run, a 1% change in the real price of oil will lead to a change in the ratio of the capital expenditures of the state budget to non-oil GDP by 0.25%. This effect is significant. Since, the average value of k was 16.13%, and the average annual change in the real price of Azeri light oil was 19.23% in 2000-2021 (Table 1). As you can see, the average annual deviation from the average value of k was 24.5% (or 0.04). At the same time, the change in k in the short term is significantly affected by the deviation from the equilibrium path in the previous year. Since a 1% increase in the change in the real oil price caused a 0.12% in the change in the ratio of budget capital expenditures to non-oil GDP, the impact of a 1% deviation from the equilibrium path in the previous year on the change in the current year was 0.78%. At the same time, the regression equation (4) shows that approximately 78.6% of deviations from the long-term path in the previous year are corrected in the current year. It can be concluded that the return of k to the equilibrium path in Azerbaijan is fast. This situation is related to the budget process. Since the current year's oil prices are taken as a basis for making forecasts for the next year's budget. If the actual oil price differs from the forecasted price in the budget year, it will be adjusted in the next year. For example, in 2015, the budget forecasted the price of Azerlite oil at the level of 90 dollars, and the actual price was 52.4 dollars, in 2016, it was 25 and 43.4 dollars, in 2017, it was 40 dollars and 55.1 dollars, respectively, and so on further. Thus, the revenue and corresponding budget expenditures were calculated on the basis of forecast oil prices, and if these forecasts did not come true, then when drawing up the next budget, forecasts were made on the basis of the prices of the current budget year. As a result, the deviations of the equilibrium trajectory were corrected in the next year. Sometimes, when the price of oil increased in the current year, the expendture increased due to the adjustment of the revenue of the state budget in the current year. Rauf (2021) confirms that government decisions to spend on consumption or investment is highly affected by changes in oil prices. Accoding to Nezir and Baimaganbetov (2015), after an oil price increase, the government rapidly takes up large social programs and investment projects.

5. CONCLUSION

The conducted study shows the positive dependence of the ratio of the capital expenditures of the state budget to non-oil GDP on the real price of oil in Azerbaijan. At the same time, if we take into account the relatively high volatility of the oil price, then the ratio of capital expenditures of the budget to non-oil GDP also had significant volatility (www.worldbank.org/en/research/commodity-markets). Considering that the average annual growth rate of non-oil GDP in Azerbaijan in 2000-2021 was equal to 7.4%, and the mean square deviation from this growth rate was 5.6%, but the average annual deviation from the average value of k was 24.5%, then it can be concluded that the volatility of the capital expenditures of the state budget are due to a high volatility the oil prices.

In addition, in 2006-2021, the share of capital expenditures of the state budget in domestic demand was equal to 15.0% on average and varied between 7.2% and 22.5%, and the mean square deviation of this indicator was 26.0%. Also, in 2000-2021, the average annual indicator of the ratio of capital expenditures of the state budget to domestic investments in fixed capital was 53.8%, and after 2015, the annual indicator was higher than 66.0%. As it can be seen, the capital expenditures of the state budget significantly affect both the domestic demand and investment activity.

Investment spending is the most volatile part of demand, and its volume is very sensitive to changes in economic conditions. But Ramei and Ramei (1995), based on their study of 92 countries, note that high fluctuations reduce the rate of economic growth. So it is advisable to reduce the dependence of the capital expenditures of the state budget on oil price volatility. It can be recommended to determine the amount of such expenditures depending on the possibilities of their effective absorption and the needs of infrastructure development in the national economy, and not on the oil prices. By the end of 2021, the assets of the State Oil Fund of Azerbaijan exceeded the capital expenditures of the state budget by 8.9 times. So there are opportunities to reduce the dependence of the capital expenditures of the state budget on the volatility of oil prices in Azerbaijan.

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