

Evaluation and Analysis of the Price Change of the Azerbaijani Oil of “AzeriLight” Brand by Using the Monte Carlo Method

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ABSTRACT

The current turmoil in the global economy and volatile oil prices affected the economies of the oil-producing countries. Such instability also affected the economy of the Republic of Azerbaijan and led to a decrease in its key economic indicators. This article examines the main conditions of the oil industry in the world and in the Republic of Azerbaijan in 2015-2017. The reasons of sharp drop in oil and oil products demand in comparison with the previous years are being analyzed on the example of the State Oil Company of Azerbaijan Republic, and the forecast for 2018 is being clarified.

Keywords: oil, post-oil industry, forecast for 2018, calculation by using the Monte Carlo method.

JEL: C1, Q41; F15; F31.

1. INTRODUCTION

Nowadays oil industry is one of the large-scale economic spheres, which has its own capabilities and rules. In many countries, especially in the Republic of Azerbaijan, the situation of economic stability inside the country is determined by the situation in the oil market, which, in its turn, is established under the influence of the global political and economic factors.

2. SIGNIFICANT OIL MARKET REACTIONS IN THE POST-CRISIS PERIOD

The main influence in the global oil market belongs to the Organization of the Petroleum Exporting Countries (OPEC), and, as it is known, most of its member-countries are dependent on the export of oil and oil products. The share of the OPEC members is about 35% of the world supply. Starting from 2015, measures are being taken to stabilize the situation of discontinuity in the oil market. The main reason for this was the unexpected decline in oil prices in 2015-2016 and the strong imbalance between supply and demand in the oil market. In January 2016, the lowest price for the “Brent” crude oil, considered the benchmark of all world oil prices, was recorded over the past decades, about \$27.88 per barrel. The minimum price of the Azerbaijani oil of “AzeriLight” brand was also observed in January 2016 - \$28.82 per barrel.

In general, the sudden decline in oil prices negatively affected the economy of Azerbaijan in 2015-2016. This situation was conditioned by the uncertainty in the economic and political environment. This had a critical impact on the activities of the oil companies both in the world and in the Republic of Azerbaijan during the period 2015-2016 in the form of cost saving and cost reduction. However, all these negative consequences became the motivation for the necessary economic reforms, which diversified domestic economy in various spheres of the State. When the reserves of the State Oil Fund of the Republic of Azerbaijan (SOFAZ) reached a critical point, devaluation was used to restore the funds.

In 2015, the devaluation of the national currency was practically 50% (February 2015 USD to AZN – 0.78 to 1.05, in December 2015 from 1.05 to 1.50). At the same time, the estimated 4.5 billion manats of the state debt actually dropped to 1.15 billion dollars, and this helped to save the economy from the more sophisticated financial pervasions. The banking sector also underwent considerable changes. Taking into account all the difficulties of the population when paying loans, distrust of banking services, as well as the poor performance of the institutions themselves, licenses of 11 banks were revoked. In general, the period after the devaluation - 2016 - was the most difficult for the country. The tempus of GDP rate fell to minus for the first time since 1995, making -3.1%, while inflation was set to 13%. However, it is worth noting that comparing this situation with other CIS countries, Azerbaijan found better ways to normalize the problem. For example, raising the discount rate on manat deposits, the Central Bank guaranteed insurance of any investments by 100%. This aimed at restoring the population's confidence in the national currency, which after devaluation everyone tried to get rid of by buying dollars and currencies of other countries. At that time, the Central Bank of Azerbaijan made every effort to stabilize the monetary system and the economic situation. Using certain financial tools, the State managed to keep the increasing of the inflation and improve GDP indicators, and also stop the dollarization of the economy. Therefore, by 2017, the amount of dollar loans and deposits became noticeably less. After issuing the floating exchange rate, the Azerbaijani manat was being strengthened to USD at the level of 1.70. [4]

It should be taken into account that, despite the recession, the oil and gas sectors continue to play an important role in the economy of the Republic of Azerbaijan and their indicators are really important in shaping budget forecasts for the upcoming years. According to the information of the State Oil Fund of the Azerbaijan Republic (SOFAZ), revenues to the budget for 2017 amounted to 12,137.5 billion manats, while the expenses were fixed in the amount of 11 015.5 billion manats. Every year, the volume of oil production either increase or decrease. Thus, in 2015 oil and gas production in Azerbaijan amounted to 41 million 586 thousand tons, whereas in 2016 this figure was set at the level of 41 million 34.5 thousand tons of oil (by 1.5% less); in 2017, according to the data of SOCAR (State Oil Company of Azerbaijan Republic) – 38.688,900 tons (decrease of 5.7% compared to 2016). [2]

It was difficult for specialists and global financial institutions to reach a consensus on oil prices in 2018. For the current year, the budget of the Republic of Azerbaijan was

calculated taking into account the minimum oil price of \$45 per barrel. Uncertainty is revealed in inaccurate information, unstable political and economic position of the state with fluctuating exchange rate and other factors. In this case, Azerbaijan can be considered as a country, where most of the country's income remains dependent on the price of hydrocarbons. Therefore, a correct estimate and forecast of the prices are so necessary. For example, if the high initial budget price is being pledged, while the constant risk of real drop in oil prices remains relevant, then there can be faced the difficulties in raising funds to the budget. [1]

However, if the low price is being set, this could lead to a slowdown in economic growth, as the revenues of the State Oil Fund will grow, and the reservation process will be weak. It is also important to consider the fact that all economic and financial calculations in Azerbaijan are carried out in national currency, and revenues from the sale of oil and petroleum products in the foreign market are determined in USD, more precisely in the well-known “petrodollars”. Therefore, the author found it necessary to emphasize in the article such a “risk indicator” as the calculation of the rate of AZN to USD. As already noted, during the period of 2015-2016, the Azerbaijani manat underwent a dramatic devaluation and depreciated for 50%. If separate comparative analyzes of changes in the national currency and the price of the oil of “AzeriLight” brand from the period of 2014-2017 (it is more visible during this period) are being carried out, then the direct dependence of these two parameters can immediately be noted. Thus, when in 2016 the lowest price of the oil of “AzeriLight” brand was observed for the last decades at \$28.82 per barrel (the highest price was indicated in 2008 – \$149.66 per barrel), as the result of which the State had to review the budget set for the year, in January 2017 the rate of AZN to USD declined sharply to 1.92. This caused more dramatic calculations from the local financial institutions, as well as the great displeasure among the population. The threat of the drop of AZN to 2 or more against USD has become an urgent topic. However, after signing an agreement with OPEC to reduce production, the oil price began to rise throughout 2017, and due to the active measures taken by the State, Azerbaijani manat consolidated to USD at 1.7 and remains so until now (the third quarter of 2018). [pic.1]

3. MAJOR INDICATORS OF THE INTERNATIONAL OIL MARKET

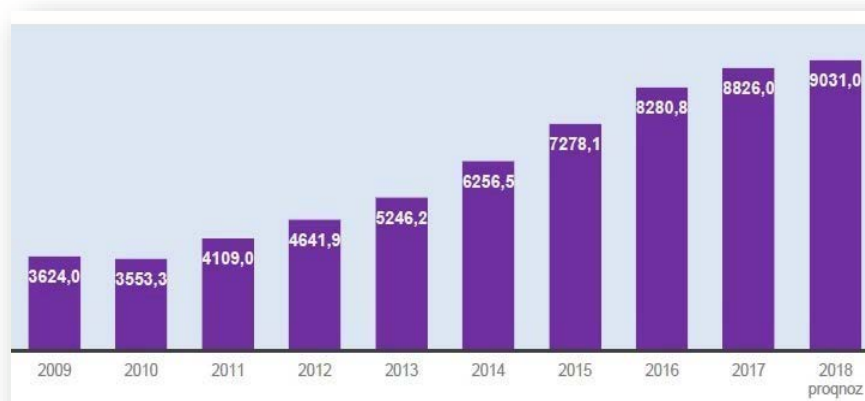
According to OPEC calculations, the “market balance” should be expected in the third and fourth quarters of 2018. Based on the global data, oil demand in 2017 was observed at 1.65 million barrels per day on average to 97.20 million barrels. As for 2018, the forecast for an increase in demand is maintained to 1.65 million barrels per day, approximately on average to 98.85 million barrels. The positive changes in the oil market make experts calculate and recalculate their scenarios for the right average price-set for oil. The forecast of the popular rating agency “Fitch Ratings” looks interesting. According to their expectations, the market will recover and strengthen at around \$55 in 2018 and \$60 in 2019. Another rating agency “Moody's” also assumes the cost of hydrocarbons at the level of 40-60 USD per barrel. The International

Monetary Fund (IMF) changed its ratings several times throughout 2017, either downwards or upwards. Thus, in April 2017, their forecast for the oil price was around \$55 per barrel, in the summer of 2017, this mark was reduced to \$52, and in January of 2018, was risen to \$59.9 per barrel, while in April 2018, it was fixed at \$62.3 per barrel. According to the OPEC reports, Saudi Arabia tends to the mark of 80-100 USD per barrel. However, many analysts, considering the possibility of increasing the price to \$80, relate it to geopolitical influence. This conclusion was also reached by the author of this article, after taking into consideration the tense of USIranian relations, the threat of sanctions on the activities of the Islamic Republic of Iran, the ambiguous position of Venezuela, one of the major oil exporters, and the situation in the Middle East. [5] Considering such a position of the world important oil exporters and the forecasts of the well-known rating agencies, what kind of oil strategy can Azerbaijan lead and what risks can occur? These are the main questions that the author would like to raise in this article.



Pic.1 Exchange rate USD to AZN, from 2009 to 2017yy.

source: kurs-dollar-euro.ru/kurs-usd-k-az



Pic.2 Non-oil production from 2014 to 2017yy., 2018 forecast

source: socar.az

Certainly, the development of the non-oil sector is very important. After all, the dependence on the oil price will not be so strong in this case. And so, the indicators of 2017 perfectly prove that: the non-oil industry increased by 3.5%, the non-oil economy by 2.1%, and agriculture by 4.2%. [pic.2]

According to the Minister of Economy of Azerbaijan, a wide variety of infrastructural projects were implemented throughout 2017, and the State support was successfully used. One of the key gas projects of “Expansion of the Southern Gas Pipeline”, which is the initial stage of the TANAP and TAP projects carried out to deliver Azerbaijani gas from the Shah Deniz field (stage 2) to Europe, in particular, to Italy, is at the completion stage.

In general, Azerbaijan has a good potential for increasing public investment, considering that oil prices will remain at \$50 per barrel and higher. Therefore, in such conditions the necessity of setting the right price for oil, taking into consideration all the risks that are really difficult to predict in an uncertain environment should be re-emphasized. We have already reviewed the performance of various financial institutions, as well as the forecasts of the local institutions for the oil price for 2018. Together they are all the same and the differences between them are insignificant. Such similarities once again confirm the theory of a cautious forecast of determining oil prices in recent years.

4. SETTLING OF THE STATED PROBLEM WITH MONTE-CARLO SIMULATION

Gathering of information is one of the key points in calculating, assessing and managing risks. There are two main types of assessing of risks: qualitative and quantitative. It should be emphasized that these are not two different directions, but a phenomenon that goes from one state to another, and as a result of qualitative analysis becomes the starting point for quantitative. The effectiveness of a formula or model identified by a mathematical method, and their relevance in making decisions of similar problems, depends on the conclusions of qualitative analysis. This is a kind of business plan, including all the advantages and disadvantages of a future system.

The main objective of the risk management - is financial stability in both short and long term, taking into account all positive and negative events, and the possibility of minimizing these negative effects. There are distinguished four common techniques in risk management: avoidance, reduction, sharing and retention.

The aim of the article is to highlight the importance of the “reduction” method of managing the risk, which at the moment is being investigated by the author of the article in the oil market of Azerbaijan Republic. By the type of impact, this method can be classified as protective, which allows to avoid financial threats in the future.

The way of solving the problem through risk assessment and mathematical calculation has been judged by many organizations that have used these methods and has not been reliable recently. In addition, the oil sector is more defined than others with a high

degree of uncertainty due to the constant geopolitical influence, and it is difficult to make any valuations in such conditions. Therefore, the author of the article, considering all the expressions, developed its own appreciation of forecasts using the Monte Carlo method, compiled on the formula of geometric Brownian motion. This method, or stochastic modeling, is based on the collection of exponential motions. This is an accidental continued process, the logarithm of which is a Wiener process (mathematical model of Brownian motion) often used in pricing models. This expression consist of the mathematical expectation and variance.

$$dS_t = S_t(\mu dt + \sigma dz_t)$$

The historical data of any index is taken as a basis, as for instance the price for “AzeriLight” from 2014 to 2017. Choosing the variables and using formula, we get a whole series of numbers, which, if carefully sorted, will be used to determine the average value of the risk range of the oil price. The curve of price formation is a series of irregular generated prices, starting from a given current price and ending with the last one. In case this area consists of equal steps, the random variable will conform with the standard normal distribution. Each such curve is based on the scenario in which the price is set at the last step. The optimal number of steps in the process depends on the length of taken period.

Step-by-step Monte Carlo method works as:

1. According to retrospective data, the mathematical expectation (μ) and the variance are being calculated.
2. With a random number generator, normally distributed random numbers e ($\exp(x)$) are generated with the expectation equal to μ and the standard deviation (σ)
3. Random numbers e obtained in the previous step fill in a table of arbitrary dimension (to ensure high accuracy, it must be sufficiently large, for example, 500 columns per 1000 rows).
4. The trajectory of the modeled prices is calculated up to S1000 using the above formula.

The significance of the Monte Carlo method is to recognize the mathematical expectation of the price, by multiplying the generation of all possible pricing methods. The historical data will be taken as a basis, then will be calculated: S_t - the new oil price at the future time t , S_0 - the fixed price for oil as of a certain date, μ - the average value or the mathematical expectation expressed in %, σ - the standard deviation expressed in %, $\exp(x)$ - an exponential function, the number e (~ 2.72) to the power of x . If more than 10,000 random iterations are being generated, then the result will be as close to the truth as possible, though this will take a lot of time and effort. Microsoft Excel, which performs calculations automatically with the help of known commands, such as the generation of random numbers (RAND) under the condition of normal distribution (NORMINV), plays the main role here.

The certain advantage of the Monte Carlo method is that, unlike the historical modeling, it allows to consider not a single price trajectory (scenario), but promptly many, which as a rule, improves the accuracy of estimates. There is also a disadvantage of this technique as it gives low accuracy for really short period of time (example couple of months). [3][6]

5. RESULTS

The data obtained as the results of these calculations produced positive results. However, it is still under analysis and further steps of checking its relevance in making forecasts for future prices for the oil of “AzeriLight” brand. The author of the article, compiling the forecast for the chosen methodology for the upcoming and subsequent years, taking for example the beginning of 2017, also carried out comparative analyzes of the price of the oil of “AzeriLight” brand using the data from local economic news websites and from the State Statistics database.

These analyses showed that the total deviation from the data obtained by using the Monte Carlo method is not more than the actual picture. Using the formula arranged for the Monte Carlo analysis, the author settled the maximum price - \$65 per barrel for the oil of “AzeriLight” brand for 2018, and the minimum price - \$45 per barrel, which responded positively to the indicators set by the Government of Azerbaijan in late 2017. The average price was set at \$55 per barrel.

The Monte Carlo Method goes on to be one of the most useful ways to scientific computing due to its simplicity and general appropriateness. This, in its turn, proves that this expression can be applied in the calculation of risks and corresponds to the set conditions. The main task of the formula is the economic efficiency and pre-notification of possible decline and rise. I would like to re-emphasize that the oil market is one of the most unstable ones, in view of the fact that it is under the strong geopolitical influence of several key countries. It is a complicated process for getting the full picture of the situation, but it is still achievable.

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