Azerbaijan in the Context of the Consumer Confidence Index

L. Mammadova, N. Samigulina*

Abstract. An article analyses the Consumer Confidence Index that is observed in the context of Azerbaijan economy. It has been studied the connection between the changes in oil prices (Azeri Light) and the Index value.

Key Words and Phrases: the consumer confidence index, Azerbaijan economy, regression equation, time-series analysis, trend, forecast, Azeri light, oil prices.

The Consumer Confidence Index as an economic indicator shows the degree of optimism for the current period which can be computed using a certain methodology of measurement the consumer's activities on saving and spending [1]. There are three well-known methodologies – of Michigan University, ABC News/Money Magazine and The Conference Board. We will figure out the most common features of these indices.

The Consumer Confidence Index provides information about stages of economic cycles, the inflection points which show the change to the positive or negative trend. It's a very sensitive index, which can predict the upcoming recession on a very early stage. In theory, if the country is on stage of economic growth, the level of consumption increases, as the consumers spend more money and even buy elastic goods such as luxury goods etc. This feature found realization in index: because the consumers are optimistic, they spend more, and have positive expectations about economy, what has the direct connection to the index. And vice-versa, if there is a certain tension in economy, when, for example, the exchange rate of national currency dropped, or the world economic crisis occurred, or the prices for the goods started growing – this all influences the consumers' spirits and they start saving more than consume, and if they face the choice, whether to buy or not to buy a certain thing which may seem important, they would rather prefer to postpone this type of purchase, and keep these money as savings. This influences the index, which changes the dynamics from positive to the negative.

It's interesting to find a relation of this index not only to the economic growth, but also to other indicators. It can be a GDP value, unemployment level, the inflation rate.

In our study we took a model of connection between Azeri Light oil prices and the Index itself for Azerbaijan. We have the following data by the end of the month for

*Corresponding author.

Azeri Light oil prices (USD/barrel): September 2013 –112,22 [2]; March, 2014 -109,64\$
[3]; September 2014 – 97,48\$ [4]; December 2014 – 61,41\$ [5]; 57,27\$ in March, 2015 [9],
50,06\$ in September, 2015 [10], 38,23\$ in December 2015 [11], 41,41\$ in March 2016 [12].

Let's put the data we have in table form:

Periods	Month, year	Azeri Light Price, \$/barrel
1	September 2013	112,22
2	March 2014	109,64
3	September 2014	97,48
4	December 2014	61,41
5	March 2015	57,27
6	September 2015	50,06
7	December 2015	38,23
8	March 2016	41,41

We have the following values of Index for Azerbaijan: for September 2013 and March
2014 - 25,85 units respectively, and 26,35 [6, p.17]; for September 2014 - 25 [7, p.16]. For
December 2014 - 23.8 [8, p.10]. The data in table form will be represented as:

t, period	Month, year	Consumer Confidence Index
1	September 2013	25,85
2	March 2014	26,35
3	September 2014	25
4	December 2014	23,8

Let's try to build a time-series regression model (which is close to the simple linear
regression model):

$$y_t = \beta_0, \beta_1 z_t, u_t, t = \overline{1,n},$$

where y_t denotes Consumer Confidence Index, z_t-the price for Azeri Light crude oil; u_t is
a disturbance (error term); β_0, β_1 are model parameters.

Let's build a table using the data we have for 4 periods ($t = \overline{1,4}$):

t	z_t	y_t
1	112,22	25,85
2	109,64	26,35
3	97,48	25
4	61,41	23,8

Now we will use the data we have to obtain OLS estimators. So, we need the following
auxiliary table:

t	z_t	y_t	z_t^2	y_t^2	$y_t * z_t$
1	112,22	25,85	12593,33	668,2225	2900,887
2	109,64	26,35	12020,93	694,3225	2889,014
3	97,48	25	9502,35	625	2437
4	61,41	23,8	3771,188	566,44	1461,558
Sum	380,75	101	37887,8	2553,985	9688,459

First, let's calculate the correlation coefficient and check, whether the data we have, can be approximated by the simple linear regression. The formula looks like this:

$$r_{xy} = \frac{n \sum xy - \sum x \sum y}{\sqrt{[(n \sum x^2 - (\sum x)^2) * (n \sum y^2 - (\sum y)^2)]}}.$$

For the model we use z_t as x, and yt as y. Formula will change the look and the applied calculations will be (using the previous table data):

$$r_{z_t y_t} = \frac{n \sum z_t y_t - \sum z_t \sum y_t}{\sqrt{[(n \sum z_t^2 - (\sum z_t)^2) * (n \sum y_t^2 - (\sum y_t)^2)]}} =$$

$$= \frac{4 * 9688,459 - 380,75 * 101}{\sqrt{[4 * 37887,8 - (380,75)^2] * [4 * 2553,985 - 101^2]}} = 0,95067.$$

The correlation coefficient value that we obtained (0,95) shows that there is a strong direct (positive) connection between two variables y_t and z_t.

The coefficient of determination R^2 can be calculated from the coefficient of correlation. It is equal to:

$$R^2 = (r_{z_t y_t})^2 = 0,95067^2 = 0,9038.$$

This coefficient shows that the variation in dependent variable (Consumer Confidence Index) can be explained by the variation in the explanatory variable (Azeri Light oil price) for 90%. It is highly fitting the simple linear regression model.

Let's return to OLS estimations of b_0 and b_1. The results of the table we will put in our system of equations:

$$\begin{cases} n\beta_0 + \beta_1 \sum z_t = \sum y_t, \\ \beta_0 \sum z_t + \beta_1 \sum z_t^2 = \sum y_t * z_t. \end{cases}$$

Let's put the data we have in our model:

$$\begin{cases} 4\beta_0 + 380,75\beta_1 = 101, \\ 380,75\beta_0 + 37887,8\beta_1 = 9688,459. \end{cases}$$

We can use Cramer's rule. We have the following matrices:

$$Z = \begin{bmatrix} 4 & 380,75 \\ 380,75 & 37887,8 \end{bmatrix}; \ Y = \begin{bmatrix} 101 \\ 9688,459 \end{bmatrix}.$$

Mathematically, $det(Z) = 6580,637$; $det(\beta_0) = 137787$; $det(\beta_1) = 298,086$. So, $\beta_0 = \frac{det(\beta_0)}{det(Z)} = 209382504$; β_1 using the same analogue equals to $0,045297435$.

So, the model that we obtain looks like this:

$$y_t = 20,9382504 + 0,045297435 * z_t + u_t; t = \overline{1,n}.$$

Using the above model, we can make a certain forecast. Let's fill the table with the results we know:

t, period	z_t	y_t
1	112,22	25,85
2	109,64	26,35
3	97,48	25
4	61,41	23,8
5	57,27	-
6	50,06	-
7	38,23	-
8	41,41	-

We will put the price of Azeri Light crude oil for a period $t = 5$ to obtain the Consumer Confidence Index for this period:

$$y_{t=5} = 20,9382504 + 0,045297435 * 57,27 \approx 23,53243085.$$

For the periods $t = \overline{1,8}$ the results will be the following (analogical calculations):

$$y_{t=6} \approx 23,20583565; \ y_{t=7} \approx 22,66996585; \ y_{t=8} \approx 22,814012.$$

Finally, we obtain the table and a corresponding graph:

Periods, t	Azeri Light price, $/barrel	Consumer Confidence Index
1	112,22	25,85
2	109,64	26,35
3	97,48	25
4	61,41	23,8
5	57,27	23,53
6	50,06	23,21
7	38,23	22,67
8	41,41	22,81

As we can see, the Index started to increase in the current period. It shows that the recession in our economy has finished and the economic growth is about to start again.
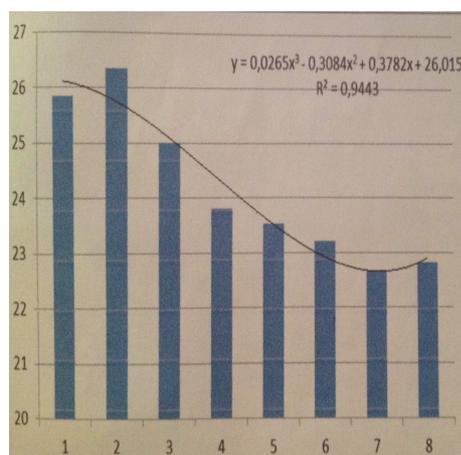
In conclusion, we would like to point out that the economy of our country still has the connection with the dynamics of the World oil prices. There's a need to say that this connection is getting weaker from year to year, so, in future we say that our country will overcome this barrier and will choose non-oil sector as the base of development.

References

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Leyla Mammadova
Mathematical Economy Department, Baku State University
E-mail: mamedova2807@gmail.com

Naila Samigulina
World Economics Department, Baku State University
E-mail: snailya-1992@mail.ru