https://www.statbureau.org/ru/belarus/inflation-charts-yearly. Дата доступа: 14.07.2018.

5. Текущий режим монетарной политики // – [Электронный ресурс] – Минск, 2018. Режим доступа: http://www.nbrb.by/mp/target/current-mode. Дата доступа: 14.07.2018.

6. Средний официальный курс белорусского рубля к иностранным валютам, рассчитанный как средняя арифметическая величина // – [Электронный ресурс] – Минск, 2018. Режим доступа: http://www.nbrb.by/statistics/Rates/AvgRate. Дата доступа: 14.07.2018.

7. Нормативы обязательных резервов // – [Электронный ресурс] – Минск, 2018. Режим доступа: http://www.nbrb.by/mp/ReserveRequirements. Дата доступа: 14.07.2018.

8. О решениях по дедолларизации экономики // – [Электронный ресурс] – Минск, 2018. Режим доступа: http://www.nbrb.by/press?id=6336. Дата доступа: 14.07.2018.

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V. Pleskatsevich
Belarus State Economic University
Republic of Belarus, Minsk
ol.plesk@gmail.com

THE IMPACT OF OIL SHOCKS ON MACROECONOMIC INDICATORS: EVIDENCE FROM BELARUS AND PORTUGAL

Плескацевич О.С. *Белорусский государственный экономический университет, Минск, Республика Беларусь.*

ВЛИЯНИЕ НЕФТЯНЫХ ШОКОВ НА МАКРОЭКОНОМИЧЕСКИЕ ПОКАЗАТЕЛИ: ДАННЫЕ РЕСПУБЛИКИ БЕЛАРУСЬ И ПОРТУГАЛИИ. В статье исследована зависимость основных макроэкономических показателей двух стран-импортеров нефти – Беларуси и Португалии – от мировых цен на нефть. Для достижения это цели были использованы модели векторной авторегрессии для изучения направления и силы взаимосвязи между этими факторами. Доказано, что изменение цен на нефть, несомненно, оказывает ощутимое влияние на экономическое развитие Португалии и Беларуси. Скачки цен на нефть оказывают более глубокое влияние на португальскую экономику, чем на экономику Беларуси. Цены на

нефть отрицательно сказываются на макроэкономических показателях обеих стран, но для Португалии они более ощутимы. В среднем в краткосрочном периоде наблюдается более негативное влияние, которое ослабевает с течением времени.

КЛЮЧЕВЫЕ СЛОВА: цены на нефть; экономический рост; VAR-модель; экономика Португалии; экономика Республики Беларусь.

The article examined the dependence of the main macroeconomic indicators of the two oil importing countries - Belarus and Portugal - on world oil prices. To achieve this goal, vector autoregression models were used to study the direction and strength of the relationship between these factors. We have shown that the change in oil prices undoubtedly has a tangible impact on the economic development of Portugal and Belarus. Oil price jumps have a deeper effect on the Portuguese economy than on the economy of Belarus. Oil prices have a negative impact on the macroeconomic indicators of both countries, but in Portugal they are more palpable. On average, in a short time, there is a more negative impact, which is weakening over time.

KEY WORDS: Oil price; Macroeconomic indicators; VAR model; Portuguese economy; Belarus economy.

Nowadays oil is a key energy factor in the global economy. Despite the noticeable growth in the popularity of alternative renewable natural sources, such as wind, water, nuclear and solar energy, oil still holds a dominant position in the global energy balance. According to the Statistical Review of World Energy 2017 (BP, 2017), oil was the most important type of energy consumed since the middle of the 20th century until now.

As this product plays an important role in the world economy, the level of prices for it is an important reference point for all countries of the world. Theoretically, low world oil prices are beneficial for oil- importing countries: the lower the price of oil, the cheaper the production, the higher the consumer activity, and, finally, the faster the rate of economic growth. On the contrary, high world oil prices are beneficial to oil-exporting countries: the higher the price of oil, the greater the income from exports, the higher the investment in infrastructure and the higher the welfare of the population of these states.

The mechanism of world oil prices has undergone significant changes over the years. For a long time, pricing in this market was oligopolistic, but since 1986 oil price is based on a stock exchange market. In this market oil prices experience daily fluctuations and are formed under the influence of a wide range of fundamental, geopolitical, financial and other factors. Slight fluctuations in prices do not have a signifi-

cant impact on the economies of oil-exporting countries, while sharp fluctuations in world oil prices can destabilize national economies.

In order to study the impact of changes in oil prices on the economies of Portugal and Belarus, one must understand that these two countries are developing in completely different economic conditions.

Therefore, at a given time, when all the indicators change quickly and, often, unexpectedly, it is very important to be ready for change and to know what they can lead the economies of the countries. This is what determines the importance and relevance of my research.

The object of this study became the economies of Portugal and Belarus in the light of the main macroeconomic indicators and the impact of the fluctuations in world oil prices.

As a method of research, we use the Vector Autoregression (VAR) model. It is one of the most popular methods of analysing various economic impacts in empirical literature. VAR allows to evaluate several variables at once and takes into account their interaction. The popularity of this method is explained by the relative simplicity of use, as well as by the ability to determine the channels for spreading various shocks in the country's economy by means of impulse response functions and obtain an economic interpretation of the evaluation results.

To study the impact we chose the following macroeconomic indicators: GDP growth (annual %) – GDP; unemployment rate (% of total labour force) – UNEMP; inflation, consumer prices (annual %) – INF; exports of goods and services (annual % growth) – EXP; Foreign direct investment, net inflows (% of GDP) – FDI; price of oil – OIL.

For Belarus, we examine the data from 1991 until now since there is no data available before that period, because the country was not independent and was a former member of the Soviet Union. For Portugal, we examine data from 1970, near 4 years before a political revolution from a dictatorship regime to a political democratic regime.

Before further research, we first check the time series for stationarity. To check stationarity, we conducted two tests: Augmented Dickey-Fuller and Phillips and Perron unit root tests.

After testing we came to the following result: although there are some variables stationary at the initial level, it can be observed that all variables are integrated of order one. So, it can be concluded that all variables are stationary in first difference. In this way, we will use all variables as stationary in the first difference.

To select the optimal VAR model, we need to determine the optimal number of lags. Since the choice of the optimal number of lags is relevant for the estimation of the VAR model, we use the following criteria: LR test statistic (LR); Final prediction error (FPE); Akaike information criterion (AIC); Schwarz information criterion (SC); Hannan-Quinn information criterion (HQ). If we analyse the data based in the Akaike information criterion, which is the best criteria, we would choose Lag 2 for Belarus and Lag 5 for Portugal. However, if we use other criteria we would get different conclusions, and because of the autocorrelation and heteroscedasticity test in the following section, we will use Lag 1 for Belarus and Lag 3 for Portugal.

The appropriate use of the VAR model makes it necessary to comply with some requirements in addition to the stationarity of the series, like the absence of autocorrelation, the absence of heteroscedasticity, and the normality of the residuals. Because of that, we make the analysis of these assumptions in this point.

VAR models use the assumption of the normality of distributions, so specific tests for normality are needed. In this work we start doing a histogram method to test the normality of distribution. The histogram divides the series range (the distance between the maximum and minimum values) into a number of equal length intervals or bins and displays a count of the number of observations that fall into each bin. We also use the Jarque-Bera test (JB), that is a statistical test which verifies the observations errors on the normality. The null hypothesis of JB test is the normal distribution. Using a level of significance of 1%, all variable will be greater than this level of significance in both countries. This means that for all variables the null hypothesis is not rejected and that all variables satisfy the condition of normal distribution.

Another important assumption that we need to verify is the non-presence of autocorrelation in my time series data. To test the hypothesis of autocorrelation of random deviations of the model we use the Breusch-Godfrey test, that allows to verify the autocorrelation of any order. After testing the VAR models for Portugal with 3 lags and for Belarus with 1 lag, we find that in both cases the p-value exceeds 5%, which means that we accept the null hypothesis. In turn, this means that both models do not have autocorrelation, and therefore are suitable for further testing.

The analysis of VAR model implies to study the heteroscedasticity. In this way we use White test, that is necessary in order to proceed to hypotheses testing or forecasting. The null hypothesis of white test is that the residuals are homoscedasticity (or no heteroscedasticity), and the alternative hypothesis is that the residuals are heteroscedasticity. After testing the VAR models for Portugal and Belarus we find that the p-value also exceeds 5% in the White test. It means that we accept the null hypothesis: both models do not have heteroscedasticity, and therefore are suitable for hypotheses testing and forecasting.

Granger's test of causality is a procedure for checking the cause-effect relationship between time series. The idea of the test is that the values (changes) of one-time series, which is the cause of changes in another time series, must precede the changes of this time series, and besides, they should make a significant contribution to the forecast of its values. Results of the test showed that the changes in the oil price do not Granger cause the macroeconomic indicators of Belarus. At the same time, I found an existence of Granger causality of the oil price factor on GDP and on the unemployment rate of Portugal.

The VAR coefficients1 are not interpretable. Interpretation of VAR is performed using the analysis of the Impulse Response Function (IRF) and the Variance Dispersion (VD).

Variance Decomposition determines how much of the variance of the predicted error of each variable can be attributed to shocks for other variables. In other words, the given analysis will allow to learn, what contribution change of one variable brings in change of another.

Analysing Variance Decomposition, we can say that the impact of oil prices has a significantly different impact on macroeconomic indicators of Portugal and Belarus.

The Variance Decomposition for Belarus shows that in the short run, that is year 2, impulse or innovation or shock to oil prices account 0,10% variation of the fluctuation in Belarus exportation growth, shock to oil prices can cause 1,81% fluctuation in foreign direct investment. Also, a shock of 1% in oil prices can cause 0,40% fluctuation in GDP growth, 0,55% fluctuation in inflation rate and 0,2% fluctuation in unemployment rate. In the long run, that is year 10, impulse or innovation or shock to oil prices account 0,17% variation of the fluctuation in growth exportations, shock to oil prices can cause 1,51% fluctuation in foreign direct investment. Also, a shock of 1% in oil prices can cause

0,52% fluctuation in GDP growth, 0,56% fluctuation in inflation rate and 0,47% fluctuation in unemployment rate.

When we look into the Portuguese results, we see that the impact of oil prices increases a lot. We can say that a change in the variance of oil prices by 1% will lead to an increase 11,63% in the variance of Portugal's GDP in the short term, that is year 2. In the long run, year 10, this influence does not change much, and by the 10th period oil prices have an impact of 11,48%. Also for exportations we can observe a decrease in the influence of the change in oil prices, since in the long run the percentage of the exponents of the dispersion of the variance decreases: from 14,98% in the short run to 12,11% in the long run. In the short run, that is year 2, impulse or innovation or shock to oil prices account 14,98% variation of the fluctuation in growth exportations, shock to oil prices can cause 2,96% fluctuation in foreign direct investment. Also, a shock of 1% in oil prices can cause 11,63% fluctuation in GDP growth, 0,50% fluctuation in inflation rate and 3,46% fluctuation in unemployment rate. In the long run, that is year 10, impulse or innovation or shock to oil prices account 12,11% variation of the fluctuation in growth exportations, shock to oil prices can cause 11,10% fluctuation in foreign direct investment. Also, a shock of 1% in oil prices can cause 11,48% fluctuation in GDP growth, 4,71% fluctuation in inflation rate and 10,10% fluctuation in unemployment rate.

Although the results of oil prices impact are more relevant in Portugal, they have some more differences between short and long term effects. In general, it can be said that change in OIL has much more contribution in change of macroeconomic variables in Portugal than in Belarus.

The Impulse Response function describes the response of a dynamic series in response to some external shocks. Basically, it shows how an increase in oil prices by 1% will change the macroeconomic indicators of countries. It is used the response to cholesky one standard deviation innovations.

The results of the Impulse Response function of Belarusian macroeconomic indicators show the response of Belarusian macroeconomic variables to oil price shocks and we find that all variables have a very slight response. However, in all variables there is a slightly negative response in the second period and a slightly positive response in the following period. In the long term, the response to the oil price shock is practically non-existent. The analysis of Portuguese data showed that

that a change in the price of oil gives a negative response to the growth rate of GDP and to the growth rate of exports. There is also a positive response in the inflation rate and in the unemployment rate when a shock occurs in oil price.

From this analysis it seems to be concluded that oil price shocks have deeper effects on the Portuguese economy than on the Belarusian economy. Comparing the two countries, Portuguese macroeconomic indicators are more prone responding to oil shocks than Belarus variables. This situation may be related to the greater openness of the Portuguese economy to international trade and its greater dependence on the oil price traded in international markets.

Considering the impact of oil prices on macroeconomic indicators through the Impulse Response function of the two countries, the oil prices has a negative effect on the macroeconomic indicators of both countries, but they are deeper in Portugal. On average, in 2-3 years there is a significant negative impact of rising oil prices, which weaken over the years.

Summarising all we can say that the research showed that the change in oil prices undoubtedly has a tangible impact on the economic development of Portugal and Belarus. It is worth noting the negative impact of rising oil prices due to the fact that both countries are importers of oil. The oil prices have a negative impact on the macroeconomic indicators of both countries, but they are deeper in Portugal. On average, there is a more negative impact in short time, which weaken over the years. This situation may be related to the greater openness of the Portuguese economy to international trade and its greater dependence on the oil price traded in international markets.

In view of the conclusions reached, the oil price is much more important for the Portuguese state budget than for Belarusian accounts. In this sense, the macroeconomic policy in Portugal must take into account the oil price in the international market as a major factor for the evolution of economic indicators. However, in Belarus the oil price on the international market does not seem to affect daily life or the economic policy.

Literature:

1. BP [Electronic resource] : BP Statistical Review of World Energy 2017. Retrieved from BP Statistical Review of World Energy. – Mode of access : https://www.bp.com/content/dam/bp/en/corporate/pdf/en. – Date of access : 20.06.2018.