2.3. Exchange rate and trade: symmetric or asymmetric relationship. Case of Ukraine

Introduction. The effect of the real exchange rate on the balance of payments is one of the most controversial issue in the scientific literature. The long-term impact of the exchange rate on trade was explained by Marshall-Lerner [1].The Marshall-Lerner condition indicates that the favorable effect of exchange rate changes on trade depends on the price elasticity of export and import products. In the case, when the sum of the elasticities exceeds one, the devaluation of the exchange rate will improve the long-term balance of payments, that is, lowering the hryvnia to the dollar in Ukraine will improve the terms of trade in country.

Another popular theory states that the positive effect of the devaluation of the national currency on the trade balance achieved with the lag, that is, only in the long-run positive effects observed. On the other hand, in line with the behavior of importers and exporters, the short-run balance of payments, on the contrary, deteriorate. This feature is known as the effect of the J-curve, proposed by Magee in 1993 [2]. The scientist highlighted several reasons for such an effect: the period of adaptation of sellers and consumers in response to changes in prices; currency contracts signed before the exchange rate devalued; the length of the adjustment period (meaning the time it takes for economic actors to make decisions).

Huchet-Bourdon and Korinek (2011) [3] used bilateral trade data for China, Eurozone and the United States of America to develop ARDL model to investigate how exchange rate fluctuations are carried over to the trade balance. However, in this study, the phenomenon of the J-curve was not confirmed, as there were favorable effects of devaluation of the national currency for trade in the short-term period.

The testing of the presence of the J-curve phenomenon for trade between the United States and Germany also was carried out by Bahmani-Oskooee and Hajilee [4]. The researchers divided the data into 131 industries where trade between the two countries was conducted. In one third of the cases, the effect of the J-curve was confirmed, that is, the trade balance in about 43 industries deteriorated in the short-term as a result of devaluation.

Consequently, scientists in their research find either confirmation or denial of the existence of the phenomenon of the J-curve for trade between different countries of the world. Therefore, it is relevant to implement similar for the Ukrainian economy.

The Models and Methodology

Bahmani-Oskooee, Harvey and Scott [5] defined the trade balance of the country as a function of the real exchange rate, the real income of the home country and the real income of the trade partner's countries. This study focuses on the analysis of Ukraine's trade balance with three major trading partners – Russia, Germany, Poland, and with all countries as a whole (with the world).

The limited form of the equation given in the literature is as follows:

$$TB_t = a + bLnY_t + cLnW_t + dLnREX_t + \varepsilon_t, \text{ where}$$

TB_t is trade between the home country and the rest of the world, presented as the ratio of total import to total export. This measure of trade was first used by Bahmani-Oskooee (1991) [6], its convenience is the absence of units of measurement. Also, this measure of trade is capable to show the balance of payments dynamics in both – nominal and real terms. Other determinants of the balance of payments in the model are the level of economic activity (namely real income) in the home country (Y_t) and in the rest of the world (W_t).The last variable is the real exchange rate, which is presented as the amount of the national currency for the currency of the partner country in real terms, that is adjusted to the level of prices in both countries.

According to Bahmani-Oskooee and Fariditavana [7], the effect of exchange rate changes on trade is both long-term and short-term, that's why it is appropriate to use Autoregressive Distributed Lag (ARDL) model. ARDLs are standard least squares regressions that include lags of both the dependent variable and explanatory variables as regressors and also takes into account a cointegration relationship between variables (the approach is based on the Pesaran and Shin methodology, 2001) [8].

The main hypotheses of the research are:

• An increase in national income leads to an increase in import, the positive value of the coefficient b is expected;

• Increasing the activity of the rest of the world (that is, our exporters) leads to an increase in export, hence the negative value of the coefficient c is expected;

• According to the phenomenon of the J-curve, in the short-term, negative values of the coefficient d are expected, and in the long-term – positive

In this research was used quarterly data from 2007 to 2017 years. The necessary transformations with the primary data were made to construct the model. The final specification of the models includes the following indicators:

• The ratio of import to export for Ukraine with each of its trading partners, as a proxy variable for trade, in million UAH;

• Real GDP index for Ukraine as a proxy variable for national income;

• Real partner country's GDP index as a proxy variable for the national income of the trading partner;

• The real bilateral exchange rate of the hryvnia to the partner currency, which is defined as $REX_i = (P_{ukr}.NEX_i / P_i)$, where P_{ukr} is consumer price index in Ukraine, P_i is consumer price index in the partner country, NEX_i is nominal exchange rate.

Four separate ARDL models were developed: Ukraine-Russia, Ukraine-Germany, Ukraine-Poland and Ukraine-World for the three main trading partners of Ukraine and Ukraine's trade with all countries of the world in general. All these models take into account long-term relationship where this is possible.

Table 1 summarizes the results of modeling the relationship between the real exchange rate and the trade balance in Ukraine for the largest partners and the world. In all models, long-term connection with the plus sign, which means that in the long-run, the devaluation of the national currency creates favorable conditions for trade. At the same time, not all short-term estimates correspond to the phenomenon of the J-curve, for example, in the case of Russia, devaluation has positive effects instantaneously.

Table 1: Estimates of Real Exchange Rate

	Germany	Poland	Russia	World
Short-run Estimates(negative d is expected)				
$\Delta LnREX_t$	-0.57	-0.48	0.11	-0.17
$\Delta LnREX_{t-1}$	2.58	0.91		-0.14
$\Delta LnREX_{t-2}$	-1.57	-0.59		-0.01
$\Delta LnREX_{t-3}$	1.68			0.09
$\Delta LnREX_{t-4}$	-0.81			0.2
$\Delta LnREX_{t-5}$	1.28			0.18
$\Delta LnREX_{t-6}$	0.55			0.13
Long-run Estimates (positive d is expected)				
ΔECM_{t-1}	1.58		0.03	0.13

For trade with Poland, the assumption about the negative effects of devaluation during the first few quarters is true in majority.Trade with Germany characterized by a certain "seasonality", since negative elasticity appears in the zero, second and fifth lags, this can neither deny nor confirm the phenomenon of the J-curve. This case requires additional research related to the analysis of the historical conditions of trade with the country.

Taking into account the Ukraine-World model, can be seen that the theory is completely confirmed, during the first three quarters, devaluation has a negative effect on trade, then positive. That is why it can be argued that the phenomenon of the J-curve is true for Ukraine's trade with all countries as a whole. The effect may be unconfirmed on the example of bilateral trade with a particular country, as other features were not taken into account, such as trade agreements, blockades, embargoes etc.

Since, in addition to the real exchange rate, the real income of Ukraine and its main trading partners was included in the model, so it is make sense to analyze this estimates. In the case of Germany, the change in the national income positively affects trade, which corresponds to the theory (it do not take into account the negative elasticity of the zero lag, since the effect of the change in income on trade flows is transferred with a delay).

The growth of Ukraine's income has negative implications for trade with Russia, most likely due to a significant decrease in imports of energy resources over the past 5

years, and an increase in income, respectively. With the growth of national income of Ukrainians, trade with the world in general is increasing, however, the effect is with a lag in one year (Table 2).

Table 2: Estimates of national income

	Germany	Poland	Russia	World
Short-run Estimates(positive b is expected)				
ΔLnY_t	-0.65	-0.08	-0.26	-0.17
ΔLnY_{t-1}	1.36	0.5		0.31
ΔLnY_{t-2}	0.72	-0.64		-0.04
ΔLnY_{t-3}	2.62	0.93		-0.01
ΔLnY_{t-4}	0.42			0.81
ΔLnY_{t-5}	1.93			0.24
ΔLnY_{t-6}				0.65
Long-run Estimates(positive b is expected)				
ECM_{t-1}	3.15		-0.08	0.86

The growth of the national income of the trading partner's country should provoke a negative value of elasticity, as for Ukraine this will be an increase in exports (due to the growth of the aggregate demand of the importing country), and hence a decrease in the excess of imports over exports, and thus an improvement in the trade balance.

This hypothesis is valid for trading with Germany, Poland and partly with Russia. In the last case, it is difficult to make a definite conclusion, as in the short-term perspective, there are positive elasticities present too (Table 3). In the case of trade with the world, the hypothesis is not justified, because both in the short-term and in the long-term perspectives elasticities are positive.

Thus, according to the simulation results, the hypotheses which were put forward at the beginning of the study were rejected or confirmed. In some cases, hypotheses have not been confirmed, including because of the reorientation of export-import flows in recent years, the imperfection of the database and other effects.

Table 3: Estimates of trade partner's income

	Germany	Poland	Russia	World
Short-run Estimates(negative c is expected)				
ΔLnW_t	9.35	-4.1	1.69	4.18
ΔLnW_{t-1}	-2.17		-2.12	
ΔLnW_{t-2}	-5.22		2.61	
ΔLnW_{t-3}	-0.15		-6.82	
ΔLnW_{t-4}	-6.19			
ΔLnW_{t-5}	7.09			
ΔLnW_{t-6}	-3.07			
Long-run Estimates(negative c is expected)				
ECM_{t-1}	-0.18		-1.5	2.02

Conclusion. The devaluation of the national currency contributes to the improvement of the trade balance in the long-run. However, the phenomenon of the J-

curve shows that the improvement of the trade balance occurs after its deterioration in the short-term perspective, which is provoked by the need for time for decision-making by the subjects of the economy. Although, the theory of the phenomenon of the J-curve seems reasonable, as a result of simulation, it has not been confirmed in the case of some countries, both this study and past studies.

The initial hypothesis about the phenomenon of the J-curve is entirely valid for only one of four models. In Ukraine-World model, it has been confirmed, because in the short-term, devaluation really worsens terms of trade, and in the long-term it improves them. For Russia, the positive effects are not only in the long-term, but also in the short-term, due to the reorientation of trade flows.

In addition, as a result of the simulation, it was determined that the growth of incomes of Ukrainians leads to increase of trade, in particular with Germany, Poland and the world as a whole. The opposite situation in Russia (the increase in the income of Ukrainians reduces trade) is due to other factors, namely, because of trade wars with Ukraine, which led to a reduction in trade in all directions, a refusal to import Russian gas and deepening of cooperation with the EU.

The growth of the national income of the trading partner country provokes an increase in exports in connection with the growth of aggregate demand of the importing country. This is relevant for Ukraine's trade with Poland and Germany, for Russia, the results are quite controversial. Consequently, the study of link between the trade balance and exchange rate showed that J-curve effect is really present in the case of Ukraine's trade with the world as a whole. It is asymmetric, because in the short-term, devaluation worsens terms of trade, on the contrary, in the long-term trade balance improves. In the case of Russia, the effects are somewhat biased against the background of transformations in the structure of trade.

References:
1. Rose A. (1991). The rise of exchange rates in a popular model of international trade: does the 'Marshall-Lerner' condition hold? Journal of International Economics, Vol. 30: 301–316.
2. Magee S. (1973). Currency Contracts, Pass-Through, and Devaluation. Brookings Papers on Economic Activity, Vol. 1: 303-325.
3. Huchet-Bourdon M., Korinek J. (2011). To What Extent Do Exchange Rates and their Volatility Affect Trade? OECD Trade Policy Papers, Vol. 119: 10-21.
4. Bahmani-Oskooee M., Hajilee M. (2012). German-US Commodity Trade: Is there a J-Curve Effect? Applied Economics Quarterly, Vol. 58(4): 327-353.
5. Bahmani-Oskooee M., Harvey H., Scott W. (2017). The Japanese trade balance and asymmetric effects of yen fluctuations: Evidence using nonlinear methods. The Journal of Economic Asymmetries, Vol. 15: 56–63.
6. Bahmani-Oskooee, M. (1991). Is There a Long-Run Relation Between the Trade Balance and the RealEffective Exchange Rate of LDCs? Economic Letters, Vol. 36(4): 403-407.
7. Bahmani-Oskooee M., Fariditavana H. (2015). Nonlinear ARDL approach, asymmetric effects and the J-curve. Journal of Economic Studies, Vol. 43(3): 519–530.
8. Pesaran M., Shin Y., Smith R. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. Journal of Applied Econometrics, Vol. 16(3): 289-326.