Methods of assessing the impact of dollarization on economic development

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Abstract

The article considers the transformation of the money function as a consequence of the impact of dollarization on the economic development of countries in the global context. The economic substantiation of the process of dollarization of the economy, which is connected with the function of money, is proved. The influence of dollarization on the macro – and macro levels of the economy is substantiated. Approaches to methods of estimating dollarization on the economic development of the country in the context of globalization are proposed. The article defines the degree of dependence of the machine-building industry of Ukraine on the processes of dollarization of the world economy through the use of the effect of transferring the dynamics of changes in exchange rates to the price dynamics in the machine-building industry. Using the ARIMA model, the effect of transferring the exchange rate to prices for mechanical engineering products is proved. The expediency of using the ARIMA forecasting model to predict the further spread of the effect of the change in exchange rates on prices. An approach is proposed to determine the sensitivity of domestic prices for the products of engineering enterprises to changes in the exchange rate through modified elasticity coefficients. It was determined factors affecting the size of the effect of transfer of the exchange rate on domestic prices for the products of machine-building enterprises.

Keywords: price dynamics, exchange rate, price indices, dollarization of the economy, indicators of dollarization.

Introduction

Under the influence of globalization, traditional pricing factors change in their content and content. In addition, there are new factors of global subordination, which should be attributed to uncontrolled factors for the company. In this context, one of the most important trends in globalization, which affects the transformation of pricing factors, is the dollarization of national economies. Dollarization contributes to the emergence of a new pricing factor - changes in exchange rates, which occurs on the methodology and pricing strategy of enterprises and entire sectors of the economy and many countries around the world, especially with economies in transition. Thus, dollarization as a factor of globalization affects all economic levels, starting from the macroeconomic scale and ending with a direct impact on the pricing of enterprises through the effect of the transfer of exchange rates to domestic prices.

Dollarization, as a global process, takes place against the background of partial or complete substitution of national currencies by the dollar in the internal settlements of many countries, which is associated with unofficial dollarization. It has been generally accepted among scholars that the problem of dollarization is more inherent in transition economies or emerging economies. This has led to scientific interest in the study of this issue on the example of the analysis of the

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dynamics of dollarization in developing countries.

Material and methods

The methodological basis of the study is the methods of theoretical generalization - to group the factors influencing pricing in the context of globalization and to determine the transformation of the functions of money in the context of dollarization; semantic-structural analysis - to clarify the conceptual and categorical apparatus of money functions in terms of dollarization. Specific research methods: statistical methods - to study the state and dynamics of dollarization through the definition of public debt and its share in GDP; vector autocorrelation model (VAR) and ARIMA model – to assess the degree of effect of the transfer of the dynamics of exchange rates to domestic prices for products of machine-building enterprises.

The information base of the study is the fundamental scientific works of domestic and foreign scientists on marketing pricing and globalism, legislative and regulatory documents, official materials of the State Statistics Service of Ukraine, the Ministry of Industrial Policy, information materials of international organizations (IMF, UNCTAD reports), societies and associations. Reporting of machine-building enterprises of Ukraine and the EU, open information resources of the Internet, expert assessments, results of own researches.

Results and discussion

Significant contributions to the study of dollarization of transition economies have been made by scientists such as: Calvo G. R.C. (Calvo, 2002: 379-408), Devereux M. (Devereux, 2006: 478-506), Webber A.G. (Webber, 2000: 71-87), Dobrynyskaya V.V. (Dobrynyskaya, 2008: 29-62), Delatte A.-L. (Delatte, 2012), Golovnin M.Yu. (Golovnin, 2004: 124-135), Anishchenko A.V. (Anishchenko, 2012: 172-174), Semenov S.K. (Semenov, 2007: 47-51), Piontkovsky R.V. (Piontkovsky, 2007).

However, the theoretical aspects of the dollarization of the national economy in these studies require further systematization of factors influencing the spread of the dollarization process and economic justification of the causes and relationships of dollarization and assessment of its impact on the national economy of Ukraine. The problem of dollarization in recent years has gone beyond the world's transition economies.

The spread of the dollar as the reserve currency of many countries creates the problem of accumulating a large money supply of the dollar, which has no economic support. In addition, there is the recognition and spread of the dollar as the second national currency in many countries. According to the IMF, in seven countries the dollar is used as the official currency in settlements along with national currencies. In another twelve countries, the share of foreign currencies in official transactions and settlements ranged from 30% to 50% (World Investment Report 2018; International Monetary Fund, 2018).

The International Monetary Fund (IMF) refers to semi-officially dollarized countries in which foreign currency acts as a secondary means of payment relative to the national currency. In the global world, there are more than 10 countries with semi-officially dollarized economies: the Bahamas, Bhutan, Brunei, Haiti, Cambodia, Sao Tome and Principe, Lesotho, Liberia, Namibia, the British Crown, the Isle of Man and the Channel Islands (Guernsey and Jersey) (International Monetary Fund, 2018).

In the global world, there are also about 20 officially dollarized national economies that use 2 currencies at the same time. For example, countries such as Andorra, the Vatican, Kosovo, Monaco, San Marino, Montenegro, as well as the overseas departments and provinces of France use both the euro and the dollar in their calculations. Liechtenstein uses the Swiss franc and the euro; Kiribati, Nauru, Tuvalu, and the three Australian-controlled territories use the
Australian dollar and the US dollar; the self-governing territories of Denmark, Greenland and the Faroe Islands use the Danish krone and the US dollar; the unrecognized republic of Northern Cyprus – the Turkish lira and the US dollar.

As shown by an analytical study of scientific and practical sources on this issue, the term “dollarization” is associated with the following two areas of economic policy:

1) The process of complete replacement of the national currency by the dollar or official support of the bimoney system, is the simultaneous functioning of the national currency and the dollar. Such monetary policy is officially pursued by the state (Panama, El Salvador, Ecuador, Palau, the Marshall Islands, the Federated States of Micronesia).

2) The process of economic replacement of the national currency by the dollar, which can be expressed in the use of the dollar as a means of payment in settlements in the domestic markets of national economies. However, this process takes place not only at the official level, but also in the shadow economy. This trend is also reflected in the depository policy of the National Bank, which is dominated by dollar assets and deposits. Which indicates the gradual replacement of the country's assets by the money supply of the dollar. The accumulation of dollar assets inevitably leads to dysfunctional shifts in national assets in the direction of dependence on exchange rate fluctuations. The openness of the national economy to international markets and the action of global factors, its dependence on exchange rate fluctuations while maintaining a negative foreign trade balance of the country, affects the growth of domestic prices in such economies.

The most influential structural shifts occur against the background of dollarization in the economies of developing countries or countries with economies in transition. Unconditional is the significant impact of dollarization on the monetary system of the economy, which can be manifested in the following:

- If the dollar participates in economic calculations along with the national currency, then there is a transfer of inflationary pressure to the national currency. Which is manifested in the increase in money supply, especially with floating exchange rates, and the promotion of inflation.

- Dollarization affects the function of demand for money by increasing the sensitivity of demand to the dynamics of exchange rates, which occurs on its elasticity depending on the interest rate.

- Exchange rate volatility increases, as the demand for currency in foreign markets is joined by the demand for currency in the domestic market. This complicates the implementation and regulation by the National Bank of monetary policy and its currency control.

- Dollarization has a significant effect due to the accumulation of deposits and loans in foreign currency. If the accumulation of deposits in foreign currency (dollars) increases the dependence on the money supply of foreign currency and the loss of stability of the national currency, then lending reduces credit risk for the banking system.

The above issues of dollarization have influenced the formation of scientific opinion on its interpretation. Most scholars who have studied dollarization and formed an economic opinion on its interpretation, hold the view of the official recognition of the dollar as a national currency, which will indicate the full dollarization of the economy. However, the informal use of foreign currency in the national calculations of many countries creates the phenomenon of penetration of the dollar as a means of circulation, payment and accumulation along with the national currencies of such countries. This aspect contributed to the emergence of a new integrative view of dollarization as a gradual process of replacing the national currency. For example, Anishchenko O. V. interprets dollarization as: “the process of distribution and use in the national economy as a means of payment, accumulation, measure of value and means of formation of assets by economic entities of
foreign currency, regardless of whether partial or complete replacement of national currency in money systems and assets» (Anishchenko, 2012: 172-174). Other scholars have linked this process to the complete replacement of the national currency as a means of circulation, payment, and a measure of value. Thus, Semenov S.K. (Semenov, 2007: 47-51) and Mikhalchuk N.O. (Mikhalchuk, 2016: 68-72) interpreting dollarization, focus on the formation of high inflation in countries where dollarization is widespread. Golovnin M.Yu. also follows the approach to the interpretation of dollarization in the context of foreign currency substitution of three functions (as a measure of value, means of circulation and means of payment), which performs the national currency in the economy (Golovnin, 2004: 124-135). In this context, his research focuses on the solved problems of economic measurement and assessment of the degree of dollarization and is based on the formation of indicators of dollarization of the country's economy.

While acknowledging the significant contribution of scientists to the study of the problem of dollarization of the economy, some aspects of this problem are debatable. According to the author of this study, when defining the concept of dollarization, it is necessary to take into account not only the official signs of dollarization, but also the degree of substitution of foreign currency functions performed by the national currency in the economy. In addition, none of the scholars working on this issue link dollarization with the transformation of pricing methodology and do not separate or justify it as a factor influencing pricing. The author understands the term “dollarization” as the process of complete replacement of all five functions of money by foreign currency, which contributes to the accumulation of money supply of foreign currency as an asset and reserve currency. This process affects the spread of inflationary pressures and the spread of the effect of transferring exchange rate fluctuations to external and domestic prices within the national economy.

Thus, the economic justification of the process of dollarization of the economy is associated with the functions of money, which are changing. Consider the transformation of the functions of money in the context of dollarization of the economy. Traditional economic theory defines five functions of money: as a measure of value; as a means of circulation; as a means of calculation; as a means of accumulation and storage and world money. Dollarization of the national economy can be justified through the transformation of the function of money, which is manifested in the following.

1) The replacement of the function of money as a measure of value contributes to the spread of the use of foreign currency in shaping the value of goods produced within the national economy. Given that the value of a commodity consists of the socially necessary labor costs that have been expended on its production, this function measures these costs in a single currency. If we take into account the trend of dollarization, the formation of value is directly influenced by the exchange rate and the dynamics of its change. Thus, the cost of factors of production within national economies becomes vulnerable to exogenous factors, namely exchange rate fluctuations. Given that the exchange rate depends on many factors of macroeconomic nature, the formation of the value of goods is subject to other laws of economics.

The transformation of factors influencing the price needs a separate substantiation, because the price is a monetary expression of the value of the goods. Changing the pricing system in the conditions provided by dollarization depends on the formation of value. In addition, there is a need to compare prices of different goods requires the reduction of the price system to their expression through a single currency, which will then be adjusted for the exchange rate. These processes are complicated by the difficulty of calculating the price in cases where companies use imported raw materials for
production.

2) Replacement of the function of money as a means of circulation occurs due to hyperinflation. The increase in inflation encourages market participants to switch to mutual settlements in foreign currency, which is the result of high costs of using the national currency. The spread of foreign currency as a means of circulation contributes to the full or partial replacement of the national currency in the calculations. Thus, there is a process of dependence of the formation of real prices on the exchange rate.

3) Replacement of the function of money as a means of accumulation and storage is carried out through the use of assets in foreign currency. If the majority of assets in national accounts, including deposits, are concentrated in dollars, then in fact there is a process of informal dollarization, which is manifested through the replacement of this function of money. Of course, the accumulation of savings and assets in foreign currency is a measure of insurance against currency risks, but, at the same time, is a means of contributing to the dependence of the economy on demand for foreign currency. It is through the indicator of the level of deposits and assets denominated in foreign currency that the level of dollarization of the country’s economy is determined. This approach is common.

4) Replacement of the function of money as a means of payment, which has the following manifestation. The function of money as a means of payment is used in servicing credit relations. It mediates the movement of goods and capital and is used in credit operations, bank settlements, wage payments. Historically, this feature is associated with the occurrence of installments and lending when buying goods. When selling goods on credit, debt obligations become a means of circulation, the repayment of which requires the use of money as a means of payment. Thus, money as a means of payment completes the exchange process, repaying debts, at the same time, as a means of circulation, they are an intermediary in the exchange of goods. If this function of money is replaced by the use of foreign currency, then there is a full or official dollarization of the economy. The level of settlements in foreign currency in the amount of domestic settlements in the country’s economy also determines the level of dollarization.

5) The function of world money is carried out in the context of international economic relations, when money is used to determine world prices and as an international means of payment and to form the country's foreign exchange reserves. In fact, this function requires money to perform all previous functions internationally. In practice, the function of world money is performed only by the currencies of those countries that have been recognized by the IMF as reserve currencies (US dollar, pound sterling, Chinese yuan, euro, Japanese yen). The quotations of these currencies are quoted on the basis of floating exchange rates, which are determined by the supply and demand for these currencies. According to the Jamaican monetary system, the introduction of special drawing rights involves the formation of a basket of currencies, which depends on the share of each currency in international trade and its contribution to world gross domestic product. Despite the possibility of an annual review of the shares of currencies in the basket of currencies, the leadership has remained for many years on the US dollar. According to the IMF Annual Report, from October 1, 2016, the ratio of currencies in the "currency basket" is as follows: the US dollar - 58.2%; euro - 38.6%; Chinese yuan - 10.2%; Japanese yen - 11.9%; British pound sterling - 8.5%. This trend creates demand for this currency in international settlements in world trade (International Monetary Fund, 2018).

The abandonment of the gold-currency standard in 1973 actually contributed to the emergence of an approach to determining the exchange rates of national currencies based on the ratio of prices in these currencies for a basket with the same set of goods. However, the existing difference in the cost of producing the
same goods in different countries makes such an equivalent an unreliable international measure of value. Thus, the rejection of the gold-currency standard, due to the fact that the development of the scale of commodity production was not ensured by the presence of such a mass of gold. The situation was exacerbated by the spread of paper and electronic money, increasingly separating the value of money from its gold equivalent. In our opinion, this situation is becoming the foundation of the dollarization of the world economy. In this context, the dollar begins to perform all the functions of money, establishing itself as the main currency in international settlements. In addition, the functions of the dollar as a world currency become the global function of money, as dollarization can be done legally when countries with economies in transition officially implement the transition dollar as a domestic currency. This aspect creates the preconditions for the emergence of the global function of money, which is more widely used than world money, through the legalization of a currency on a global scale and its recognition as the national currency of most countries. In addition, the emergence of digital currencies, among which a significant place belongs to cryptocurrencies, which are generally decentralized, form the basis of the global function of money. The generalization of the substantiation of the transformation of the functions of money proves that the substitution of all five functions of money can lead to the complete dollarization of the economy.

Full dollarization of the economy occurs in conditions of complete replacement of all functions of the national currency by the reserve currency (dollar). In this context, it should be noted that countries that pursue a policy of dollarization and do not have the opportunity to receive seigniorage, fully supporting the dollar as a world currency, give the United States the opportunity to receive quasi-money.

The general analysis of the degree of dollarization of the Ukrainian economy, conducted on two groups of indicators, reflecting the replacement of the functions of money as a means of payment and the functions of world money, allowed us to draw the following conclusions. According to the calculations of the coefficients of credit dependence of the population and the dependence of the national economy on loans from international funds, the Ukrainian economy can be attributed to economies with a high degree of dollarization.

Currently, the dependence of the Ukrainian economy on IMF loans is quite significant. Moreover, in recent years there has been an effect of accumulation of public debt, in 2017 its share was almost 72% of GDP. By the period 2018-2019, there is a slight decrease in these indicators (Fig. 1).

![Fig.1. Dynamics of change in the share of public debt of Ukraine relative to GDP for the period 2010-2019 (%)](image-url)
Source: improved on the basis (State Statistics Service of Ukraine)

Over the past eight years, the dollarization ratio has tended to increase, but it reached a critical point in 2014, when the share of public debt relative to the country's GDP was 69.4%. The gradual increase in this indicator in the following years demonstrates the increase in Ukraine's dependence on foreign lending and the lack of economic growth. The state-guaranteed debt also increased during this period, but in 2017 its share almost approached the level of 2010.

The analysis of dollarization indicators at the macro level allows us to conclude that Ukraine's economy is highly dependent on dollarization processes.

A fundamental issue in the transformation of economic laws is the study of the mechanism by which one can assess the degree of dollarization of the economy at the enterprise level. This mechanism is based on the pricing process. It is through the price system at the micro level that the ultimate effect of dollarization on the activities of economic sectors is reflected.

In this context, the issue of studying the effect of the transfer of changes in the exchange rate to domestic prices for the products of enterprises operating within the framework of the national economy is actualized. If this effect is relatively high, then we can conclude that the economy is highly dollarized. This effect is the indicator that allows you to determine the level of dollarization at the micro level or at the level of individual industries.

The pass-through effect on prices means that fluctuations in the exchange rate of the national currency are reflected at the level of domestic prices of sectors of the economy. The main reason for the pass-through is the change in producers' costs, expressed in buyers' currency, when the exchange rate changes.

The most accurate definition of the exchange rate pass-through is provided in the scientific works of P. Goldberg and M. Knetter: “The exchange rate pass-through is the change in the prices of imported goods as a percentage, expressed in the national currency of the importing country, depending on the one-percent change in the exchange rate between the country -exporter and importing country” (Goldberg & Knetter, 1997).

Exchange rate transfer is always carried out using the following mechanisms:

- Direct effect. According to this approach, a change in the exchange rate of the national currency (for example, the hryvnia) to the currency of the importing country leads to a change in the producer's costs expressed in the national currency. This, in turn, forces exporters to change the prices of their goods.

- Indirect effect (indirect). This approach involves the transfer of exchange rate changes to the factors of production of the importing country. In this case, the effect of changes in the exchange rate on the goods of national producers is observed, both in the consumer market and in the market for industrial goods.

- The indirect effect of foreign direct investment (FDI), which is associated with the transfer of foreign production to countries with relatively cheap currencies in order to save costs for factors of production. This will lead to an increase in the demand for labor, wages and prices in this economy.

If there is a complete dependence of the price level on the exchange rate, then it can be argued about the full pass-through effect (at the level of 100%). This result indicates a single exchange rate elasticity of domestic prices. In practice, the pass-through effect is incomplete if its level is less than 100% or $E < 1$.

Based on this approach, the effect of the exchange rate pass-through on the internal prices of enterprises should be understood as the degree of price sensitivity to a 1% change in the exchange rate. If there is a complete transfer of the exchange rate of currencies to domestic prices, then there is a complete elasticity of prices depending on the exchange rate, which can be expressed through a coefficient presented in the form of the formula:

$$
\epsilon = \left| \frac{\Delta P}{P} \div \frac{\Delta K}{K} \right|, \hspace{1cm} (1)
$$
where: $\Delta P$ – changes in domestic prices; $\bar{P}$ – average value of domestic prices, $\bar{P}=(P_1+P_2)/2$; $\Delta K$ – differences in foreign exchange rates; $\bar{K}$ – average value of exchange rates for the period, $\bar{K}=(K_1+K_2)/2$.

The interpretation of the coefficient of elasticity of domestic prices from changes in the exchange rate of currencies is to determine the degree of price sensitivity in percent relative to the rate of change in exchange rates. If $E = 100\%$, there is a complete sensitivity of domestic prices to the exchange rate and there is an absolute pass-through of exchange rates on the domestic prices of enterprises.

In addition, the effect of exchange rate pass-through on prices is reflected in the degree of interchangeability between domestic and imported goods. With significant fluctuations in exchange rates, the rise in prices for imported products forces buyers to switch demand to domestic counterparts. The degree of interchangeability between domestic and imported goods can be determined using the modified coefficient of cross-elasticity of demand, which is determined by the following formula:

$$
\varepsilon = \left| \frac{\Delta Q_e}{\Delta P_i} \times \frac{P_e}{Q_i} \right|,
$$

where: $Q_i$ – sales of domestic goods product group in the commodity market; $\Delta Q_e$ – change in the volume of domestic goods of this product group in the commodity market; $P_i$ – the price of the imported product in this commodity market; $\Delta P_i$ – increase the price of imported goods in this product market.

Cross-elasticity coefficient shows the percentage change in demand for domestic goods while increasing the price of imported goods due to the increase in the exchange rate.

If $E > 0$, then the goods are interchangeable, which indicates a high degree of demand switching for domestic goods with an increase in prices for imported goods, due to an increase in the exchange rate. This confirms the high degree of sensitivity of demand with the effect of pass-through of changes in exchange rates to import prices.

If $E < 0$, then such goods are mutually complementary, that is, an increase in prices for imported goods due to changes in exchange rates will lead to a drop-in demand for goods from domestic producers. This will also confirm the indirect impact of exchange rate pass-through on enterprise prices.

If $E = 0$, then the goods are independent from each other and the effect of exchange rate pass-through does not affect demand in any way.

In the study, the coefficients of elasticity of domestic prices for finished products of machine-building enterprises from changes in the exchange rate were calculated (Table 2).

### Table 2. Calculations of the coefficient of elasticity of domestic prices for finished products of machine-building enterprises of Ukraine for the period from 2014 to 2018

| Year   | Price change | The average price | Change in exchange rates | Average exchange rate | The rate of change in price | The rate of change of exchange rate differences | The value of the coefficient of elasticity |
|--------|--------------|-------------------|--------------------------|-----------------------|-----------------------------|-----------------------------------------------|------------------------------------------|
| 2014 (I) | 38          | 733               | 0,71                     | 8,345                 | 0,051                       | 0,085                                         | 0,61                                    |
| 2014 (II) | 23,05      | 763,525           | 2,6                      | 10                    | 0,030                       | 0,26                                          | 0,12                                    |
| 2014 (III) | 43,92      | 797,01            | -3,07                    | 9,765                 | 0,055                       | -0,315                                        | -0,17                                   |
| 2014 (IV)  | 75,83      | 856,885           | 6,27                     | 11,365                | 0,088                       | 0,55                                          | 0,16                                    |
| 2015 (I)   | 545,2       | 1167,4            | 7,8                      | 18,4                  | 0,467                       | 0,42                                          | 1,10                                    |
| 2015 (II)  | 99,3        | 1489,65           | -0,2                     | 22,2                  | 0,066                       | -0,009                                        | -7,4                                    |
| 2015 (III) | 29,5        | 1554,05           | 0                        | 22,1                  | 0,018                       | 0                                             | 0                                       |
As you can see from the table, in those periods when there were sharp changes in exchange rates, there is full price elasticity depending on changes in the exchange rate. Thus, it can be argued that there is a pass-through effect of changes in exchange rates to domestic prices for finished products of machine-building enterprises. However, in those periods when the exchange rate was stable and unchanged during the analyzed period, the values of the coefficients are equal to zero, which indicates that there is no reaction of prices to changes in the exchange rate.

Calculations of the modified coefficient of cross-elasticity of demand, which shows the percentage changes in demand for domestic goods with a simultaneous increase in the price of imported goods due to an increase in the exchange rate, for the engineering industry of Ukraine are presented in Table 3.

### Table 3. Calculations of the modified coefficient of cross-elasticity of demand for the products of engineering enterprise

| Year | Production volume, mechanical engineering, thousand pieces | Price of imported products (thousand euros) | The average price in the industry | Volume of imported engineering products | Change in the price of imports | Changes in sales of domestic producers | The ratio of sales of domestic products to changes in import prices | The ratio of domestic prices to the volume of imports | Elasticity |
|------|---------------------------------------------------------|------------------------------------------|----------------------------------|--------------------------------------|-----------------------------|----------------------------------|--------------------------------|--------------------------------|-----------|
| 2008 | 36900,6                                                 | 5958218,58                               | 477,675                          | 13379839,3                          | 400000                     | -1191,9             | -0,003                      | 3,57                          | -1,063    |
| 2009 | 18785,7                                                 | 6558218,58                               | 533,55                           | 6257043,8                           | 600000                     | -18114,9           | -0,03                       | 8,52                          | -2,57     |
| 2010 | 30879,5                                                 | 7958218,58                               | 597,4675                         | 8166974,9                           | 1400000                    | 12093,8          | 0,008                       | 7,31                          | 6,32      |
| Year | Production volume of mechanical engineering, thousand pieces | Price of imported products (thousand euros) | The average price in the industry | Volume of imported engineering products | Change in the price of imports | Changes in sales of domestic producers | The ratio of sales of domestic products to changes in import prices | The ratio of domestic prices to the volume of imports | Elasticity |
|------|------------------------------------------------------------|--------------------------------------------|----------------------------------|-----------------------------------------|-------------------------------|-------------------------------------|-------------------------------------------------|---------------------------------------------|-----------|
| 2011 | 3119,7                                                    | 8602385,06                                 | 608,5225                         | 12795104,9                              | -27759,8                      | -0,04                               | 4,75                                           | -2,04                                       |           |
| 2012 | 2520,1                                                    | 8658754,32                                 | 633,655                          | 13178672,5                              | -599,6                        | -0,01                               | 4,80                                           | -5,11                                       |           |
| 2013 | 2168,7                                                    | 9096969,84                                 | 681,4725                         | 12470050,3                              | -351,4                        | -0,0008                             | 5,46                                           | -4,38                                       |           |
| 2014 | 1140,4                                                    | 9476347                                    | 810,205                          | 8720756,2                               | -1028,3                       | -0,002                              | 9,29                                           | -2,52                                       |           |
| 2015 | 1561,1                                                    | 10158193,2                                 | 1500,525                         | 6273379,8                               | 420,7                         | 0,0006                              | 0,0002                                          | 1,47                                        |           |
| 2016 | 20,79                                                     | 10517985,6                                 | 1970,222                         | 7889365,2                               | -1540,31                      | -0,0043                             | 0,0002                                          | -1,069                                      |           |

**Source:** own development

The size of the exchange rate pass-through on domestic producer prices depends on many factors, the most significant of which are:

- the structural organization of markets for specific goods or industries (the degree of market monopolization, product differentiation and the risks of price discrimination);
- features of consumption of imported goods and the elasticity of this consumption. The higher the share of imports in production costs, the closer the estimate of the elasticity between the exchange rate and inflation;
- macroeconomic features of the national economy (monetary policy regime, balance of payments structure).

Within the framework of the study, an assessment was made of the influence of the dynamics of changes in the exchange rate on the change in the average price in the general engineering industry. The results of the correlation analysis of the dynamics of the change in the exchange rate for the change in the average price in the car building industry with a lag in the 1st quarter are presented in Fig. 2.

As can be seen from the calculations, in the field of general mechanical engineering, there is a closer relationship between the change in the exchange rate and the price, while maintaining the seasonality factor. This is due to the fact that the Ukrainian car building industry is 80% export-oriented.

Calculation of the correlation of these indicators for the car building industry with a lag in the second quarter demonstrates an insignificant smoothing of the determination coefficients while maintaining the influence of the seasonal factor.

The calculations show a close relationship between the change in the exchange rate and the price of general engineering products. In addition, calculations indicate the influence of seasonality on fluctuations in the exchange rate and prices (Fig. 3).
Studies of the degree of dollarization of Ukraine’s economy at the macro level and at the level of the engineering industry have shown that the Ukrainian economy is influenced by a high level of dollarization. At the micro level, i.e., at the enterprise level, the impact of dollarization is manifested through the effect of transferring the dynamics of exchange rates to domestic prices. In the course of the research, a scientific hypothesis of the closeness of the relationship between changes in exchange rates and domestic prices for products of machine-building enterprises was put forward.

To confirm the hypothesis, the autocorrelation method and the ARIMA prediction model were chosen. According to the hypothesis, we believe that the observed processes are random. In this case, it becomes impossible to use dynamic models that are based on the dependence of a variable on a
number of factors. For example, regression analysis extrapolation is a method of describing most time dependencies, which assume a clear functional dependence of one factor on the action of other factors. Therefore, if standard regression methods are applied to successive observations over a period of time, some problems may arise in interpreting the results. This statement fully justifies the choice of the model that was used for this research method.

The effect of transferring the influence of exchange rate dynamics on the domestic prices of car-building enterprises is also confirmed by the graph in Fig. 4.

![Graph showing the effect of transferring the dynamics of exchange rates to domestic prices of car companies](source: own development)

(Chukurna O., Nitsenko V. and other, 2019: 117-129)

The absolute value of the transfer effect and the speed of its implementation in mechanical engineering depends on the action of many factors, among which the following should be noted:

- The degree of openness of the industry to foreign markets, namely: the volume of exported products; the degree of involvement in the production of imported factors of production; degree of competition from imported products. Indeed, the products of the car-building industry have a high share of exports in the structure of total production and experience a high degree of competition.

- A high share of exports in the structure of manufactured products will strengthen the national currency. However, for exporters, this situation may put pressure on the price of engineering products in foreign markets, which will help producers to limit export prices for their products. In turn, they will seek to offset costs by raising domestic prices in the Ukrainian market. Thus, the following law comes into force: the lower the share of exported products, the less domestic prices for wagon products will be subject to pressure from the exchange rate.

The lower the degree of differentiation of wagon products, the more power machine-building enterprises have in setting discriminatory prices for consumers, translating their foreign exchange costs into product prices. This will indicate a high degree of monopolization of the car industry.

**Conclusions**

- The study of dollarization as a global factor has revealed the spread of dollarization in many economies, especially those in transition. The dollarization of the economy takes place against
the background of the replacement by foreign currency (dollar) of all five functions of money performed by the national currency. This approach to the definition of dollarization allowed to substantiate the fundamental approach to the functions of money in the context of dollarization and the transformation of price functions depending on the functions of money when they are replaced by foreign currency. It has been proved that the law of value transforms the mutual influence of money functions and price functions. The price reflects the value of the goods in cash through the sum of the values of the factors of production and the value of the goods. In this context, part of the price functions is reflected precisely through the law of value.

- In the course of the research, indicators of estimating the degree of dollarization of the economy at the macroeconomic level were formed and substantiated, the measurement and evaluation of which are interrelated with the transformation of money functions.

- It was proved that at the meso- and microeconomic level the degree of dollarization of the economy occurs at the domestic prices of machine-building industries and individual enterprises due to the effect of transferring the exchange rate to the prices of machine-building products. Economic and statistical models (autocorrelation, ARIMA model) were used to prove the close relationship between them.

The study substantiates the use of autocorrelation to prove the effect of the transfer of the impact of exchange rates on prices for finished products of mechanical engineering enterprises. The expediency of using the ARIMA forecasting model to predict the further spread of the effect of transferring exchange rate changes to prices for products of machine-building enterprises has been proved. When modeling the effect of the transfer of the impact of exchange rates on prices for products of machine-building enterprises, time gaps between changes in exchange rate indices and changes in domestic prices of machine-building enterprises were revealed. The main factors that determine the degree of influence on the effect of transfer of exchange rates on the prices of machine-building enterprises are substantiated, among which, the following have the greatest influence: degree of openness of the branch to foreign markets and dependence on import resources; high share of exports in the structure of manufactured products; low degree of product differentiation of machine-building enterprises; discriminatory prices for consumers.

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