Міністерство освіти і науки України
Національний університет «Києво-Могилянська академія»
Факультет економічних наук
Кафедра фінансів

Магістерська робота

освітній ступінь – магістр

на тему: **«ВПЛИВ ВАЛЮТНО-КУРСОВОГО РЕГУЛЮВАННЯ НА СТАБІЛІЗАЦІЮ ЕКОНОМІКИ УКРАЇНИ В КРИЗОВИЙ ПЕРІОД»**

«THE INFLUENCE OF EXCHANGE RATE REGULATION ON THE STABILIZATION OF THE ECONOMY OF UKRAINE IN THE CRISIS PERIOD»

Виконала: студент 2-го року навчання,
спеціальність 072
«Фінанси, банківська справа та страхування»

Мордас Олена Сергіївна

Керівник: Слав'юк Н.Р.
кандидат економічних наук, доцент

Рецензент: Гордєєва Д.В.
(прізвище та ініціали)

Магістерська робота захищена з оцінкою
«_____»
Секретар ЕК _____Донкоглова Н.А.
«___» _____ 2023 р.

Київ 2023

CONTENT

List of Figures

List of Tables

INTRODUCTION

The development of the economy of any country in the world is dynamic and reflects all economic cycles with recurring periodicity. Each of the stages requires appropriate state regulation. However, in crisis periods, the market especially needs an effective and quick policy of the main state institutions, such as the central bank, ministries of finance, and the economy in cooperation with the government. The dynamics of the global world are so powerful that it is impossible to predict all potential causes of crisis phenomena and prepare a strategic response in advance. At the same time, many tools and analytical techniques allow to investigate the current shock, study its features, develop a complex response policy, and extrapolate the acquired knowledge for the future. In this way, it is possible to achieve stabilization of economic processes during the crisis period.

One of the powerful tools for curbing the economic downturn is the exchange rate regulation implemented by the central bank. Balanced currency policy, strengthening of the national monetary unit, and effective exchange rate policy can ensure the financial stability of the national economy. Also, the exchange rate policy can stimulate or restrain the national market's development and affect the country's competitive position in the world.

The development of the Ukrainian economy was affected by many powerful shocks, both global and local. In the last decade alone, three major crises have occurred – the occupation of the eastern and southern territories of Ukraine (2014), a global pandemic (2020), and a full-scale war (2022). Despite the varying degrees of consequences for the economy, the main goal (from the point of view of the financial market) remains unchanged - slowing down the economic decline and its stabilization, using one of the macro tools – the exchange rate.

Therefore, this scientific work is aimed at researching the optimal currency policy in order to achieve stabilization of economic development.

The topic of the influence of currency regulation, and the research on the optimal exchange rate is relevant among foreign and domestic scientists. Well-known foreign researchers, who devoted their research to exchange rate policy are Allen W., Barth R., Kote A., McKinnon R., Mandell M., and Walker, D. A significant contribution was also made by such Ukrainian scientists as Belinska Y., Vakhnenko T., Zhmurko N., Mishchenko V., Tkachenko A., Cherkasova S., Yushchenko V.

The **relevance** of the work lies in the development and application of mathematical and econometric models for studying and forecasting exchange rates in the crisis period.

The **purpose** is represented by the main methodical principles of stabilization of the economy of Ukraine in the crisis period through an effective monetary exchange rate policy.

The **tasks** of this research are:

- presentation of the conceptual and theoretical provisions of exchange rate policy in the crisis period. In particular, the disclosure of the concept of "economic crisis", a description of currency regulation tools;

- a description of the main features of exchange rate policy in crisis periods;

- research of the current and retrospective dynamics of the macro-indicators of the foreign exchange market, determination of the hryvnia exchange rate trend, and export-import indicators;

- developing an econometric model and forecasting future values of exchange rate indices;

- currency market modeling using the method of system dynamics and development of a set of currency policy scenarios;

- presentation of recommendations, and conclusions based on the results.

The **object** is the economic stability and trade competitiveness of Ukraine. The **subject** of the study is the impact of exchange rate policy on economic stabilization in the crisis period.

In accordance with the tasks, such **methods of scientific research** as the description (empirical method) of theoretical foundations, as well as analysis,

generalization, classification, and explanation were applied. When developing and improving the model, systematic, statistical functional methods were used.

The **information base of the study** consists of legal acts, regulations of the National Bank of Ukraine and the Ministry of Finance of Ukraine, statistical data from the State Statistics Service of Ukraine, the World Bank, reports of the National Commissions of the Financial Services Market and resources from the Internet.

The **scientific novelty** is that the work improved and expanded the use of econometric modeling in the field of exchange rate regulation by the central bank.

The **practical significance** of the developed model is the possibility of its use by the Central Bank in the package of forecasting models.

Structurally, the **work consists of three chapters**. The first one presents the theoretical justification of economic categories. The second is aimed at revealing the historical and current dynamics of macro indicators. The third section is devoted to the development of models and the construction of the forecast.

CHAPTER 1 THEORETICAL BASIS OF EXCHANGE RATE POLICY IN THE CRISIS PERIOD

1.1 Generalized theoretical foundations of the economic crisis

The word “crisis” from Greek is translated as “krisis” which means the turning point of something. The economic crisis represents the sudden decrease of the macro stability in the country due to external or internal shocks. As a result, a high discrepancy occurs in the balanced market supply and demand of goods and services, and the level of inflation and unemployment might increase. Moreover, the capacity of national producers declines and the GDP growth is slackening. All these factors lead to stagflation, depression, or recession. This depends on the intensity of the shock and the response to it. Other definitions of the term “crisis” from different researchers and scientists will be considered.

1. Economic crisis is a period in an economic cycle in which an economy faces difficulties for a long time (Deo & Kumar, 2022).

2. “It is a drastic fall in the economic performance of the country” that causes problems such as reduction of production, employment, and business bankruptcy. Consequently, increases the fraction of poverty in the country (Hai-Jew, 2022).

3. Other authors underline the unpredictability of crisis events that affect states both at macro and micro levels (Sanderson, 2015).

This is worth emphasizing that most scientists define the concept of crisis as a purely negative phenomenon that leads to the deterioration of macroeconomic conditions. However, many shocks in the business or on the market can cause a crisis.

Therefore, it is impossible to determine unilaterally whether the crisis leads to deterioration of macro-stability in the country, or whether deterioration of macro-indicators leads to the crisis. One thing can be said for sure, the crisis and the decrease in economic activity lead to losses for the country and its economic agents.

The main five types of economic crises (Figure 1.1) would be considered below. However, according to different publications, the number of kinds of crises may broadly vary and be changed under the dynamic development of the world market.

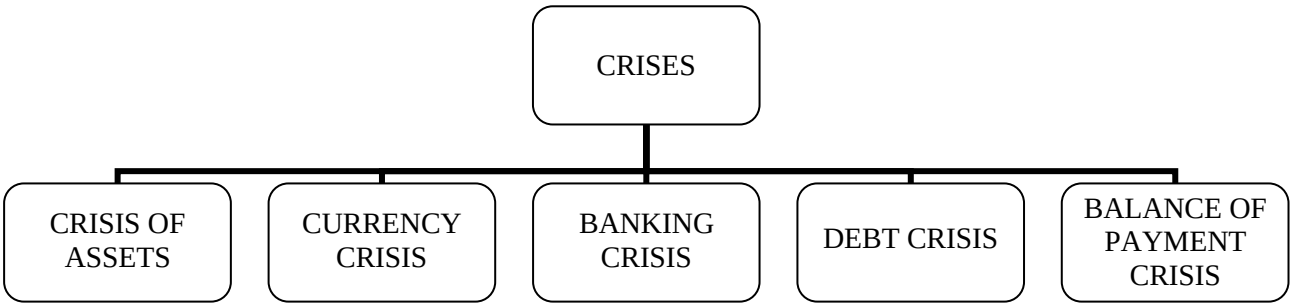

Figure 1.1. The classification of the crises in the economy

Source: compiled by authors based on (Obstfeld, 2011)

The first one is the crisis of assets that is also known as *bubble-assets.* No matter what kind of assets are – tangible or intangible, stocks or real products, the more important is the discrepancy between the market price and its fair value. If the difference is huge and growing rapidly in a short term, then the risk of a bubble and its negative consequences for the market is significant. The more money invested in such assets, the deeper reduction of the economic activity might occur.

One of the reasons to appear in bubble assets is the speculation on the stock market and the desire of the agents to earn money quickly and easily. However, when prices skyrocket after some time it suddenly falls. That sharp decrease leads to shock in the market, panic between agents, investors, and enormous losses for the economy.

Examples of the assets bubble crisis are the Real estate and Stock market crisis in Japan in the 1980s, the Dotcom Bubble in the 1990s, and the Housing Bubble that occurred from 1996 to 2006.

The first example of the bubble-assets crisis in Japan was caused by an excessively stimulative monetary policy from financial institutions in response to the recession that occurred in 1986. The result of enormous monetary and fiscal stimulus accelerated the participation in the market of many speculators, which led to a tripling of the price of stock and land. The record was achieved in 1989 when the value estimation of the Imperial Palace (Tokyo) was larger than the value of all real

estate in California (Ottino-Loffler, 2016). In 1991 the bubble burst. The following years in Japan were known as the years of stagnant economic growth and deflation.

In the 1990s Internet was becoming popular technology among companies. Many of them invested in that new progressive business. Simultaneously appeared a lot of speculators in that field. As soon as more than hundreds of dot-com companies went public, their valuations reached the multi-billion dollar level. For instance, the NASDAQ Index increased sharply from 750 in 1990 to 5 000 in 2000 (FCIC, 2011). The consequences of the crash of the index were long-lasting (the next peak index reached after 15 years from its previous peak) and was a trigger of the recession.

After the crisis with dot-com companies, many people believed that investment in real estate is safe and more reliable. Except for the increase of price for housing at a record pace, there were other financial problems such as mortgage fraud or the spreading of sub-prime borrowers. The peak price was in 2006 and after that year the value was decreasing by 2009. The price reduction, problem mortgage securities, and insolvency of the creditors lead to the biggest contractions in the global economy since the Great Depression.

Another type of crisis is a *currency crisis*, which occurred when people try to sell national currency because of its high devaluation and volatility. One of the reasons for the unstable exchange rate might lie in hyperinflation. In that case, the purchasing power of the national currency decreases deeply. Therefore, the population tries to exchange the domestic currency for a more stable, for instance, the U.S. Dollar. As a result, that leads to depreciation, which increases the debt. In order to pay the debt, the country is forced to raise more funds to cover its obligation.

Vivid examples of the currency crisis are the Mexican Crisis in 1994, Asian Crisis in 1997, the Argentine crisis in the 1990s, and the crisis in Venezuela and Turkey in 2016. More detailed information about these crises is presented below.

The reasons why the government decided to devaluate the national currency (the peso) in Mexico were the weakness of the economy, fiscal reforms, a high level of inflation, and the assassination of the presidential candidate (negative expectations and desire to sell the currency). Such a policy of the government pushed the peso

exchange rate much lower than it required. As a result, the annual percentage of GDP growth sharply declined from 4.9 % in 1994 to -6.3 % in 1995.

The main trigger for the Asian financial crisis in 1997-1998 was the decision of Bangkok to unpeg its national currency from the U.S. dollar. That led to currency devaluation and capital outflow not only in Bangkok but in its neighboring countries.

In the 1990s In Argentine, there was hyperinflation and deep depreciation of the national currency. These and other financial macro problems led to the Great Depression from 1998 until the end of 2002.

The examples of Venezuela and Turkey also demonstrated the devaluation of national currencies in combination with hyperinflation. The key feature of that case is an ineffective untimely policy response to the crisis.

The *banking crises* are related to the massive sudden withdrawals of deposits. There are many reasons for such actions of the customers, for instance, the lack of credibility for the bank due to its insolvency and other problem, panic on the market due to depreciation of the domestic currency, or political and economic changes. All these factors contribute to the desire of people to save money in cash, not on bank deposits. The whole banking system is integral and has a lot of interbank connections. So, the panic withdrawals lead to the violation and to the systematic crisis.

The worst banking crisis is the Great Depression between 1929 and 1939. Other examples are the Norwegian banking crisis (1988-1992), the banking crisis in Venezuela in 2009-2010, and two bank rescue packages from the U.K. in 2008, 2009.

During the Great Depression, almost half of the U.S. banks and other financial institutions went bankrupt, and millions of citizens lost their savings. The reason for the crisis in Norway was the involving more banks in risky credit operations, and the sharp fall in the oil price (1985) which caused the budget deficit and devaluation of the national currency – the Norwegian krone.

The banking crisis in Venezuela was connected to corruption, speculation, and abuse of authority by some politicians. There were problems with capitalization, legislation, questionable activity, and fraud. The decision was to take over the government of numerous banks and provide investigations regarding crimes.

The debt crisis is the risk of the country not having the ability to pay the debt and interest due to a high level of budget deficit. Such a country is on the verge of default and does not have the opportunity to increase tax income or foreign investment because of the low trust in the domestic economy.

An example of the profound debt crisis occurred in 2009 when five European countries with the acronym “PIIGS” (Portugal, Ireland, Italy, Greece, Spain) had an enormous public debt. These countries were forced to ask for help from the International Monetary Fund (IMF), and the European Central Bank (ECB) due to their insolvency and inability to repay a debt obligation.

The balance of payment crisis represents the inability of a country to cover its imports and service foreign debt. As a rule, that crisis causes a decrease in the exchange rate. If the economic conditions are weak or the market has more risks and a low business environment for investors, then capital outflow occurred. As a result, the national currency depreciates. To stabilize the situation or increase trust the central bank might use foreign reserves or raise the interest rate. However, such a policy must be balanced so that the economy does not suffer even greater losses.

One of the examples of payment crisis was in India which the country faced in 1991. In the decades before the crisis, the government provided an imprudent policy. The expenditures significantly exceeded the earnings, the fraction of imports was higher than exports, the Gulf War, and as a result, the increase of crude oil prices. That affect the internal debt, which rose from 35% of GDP in 1985 to 53% in the 1990s (Kolte et al., 2021). Therefore, India had a high level of fiscal and current account deficit. To put the economy back the government developed a strategy that included industrial, trade, public sectors, and fiscal reforms.

There are many reasons that can cause the crisis. One group of them is systematic, and another – is unsystematic. The first type of risk can not be completely avoided or mitigated in the system. For instance, the changes in inflation, interest rates, exchange rates, market growth, etc. The unsystematic risk might be prevented and eliminated – the effect of political actions on the economic stability, changes in trade terms of the country, a decrease in investments, and product capacity, etc.

The huge impact on the economy and its stability has shocks in different fields. The geopolitical shocks – war (as an example, the full-scale war in Ukraine from 24th February 2022), terrorist attacks, revolutions, armed conflicts, and confrontations. Natural shocks include floods, droughts, earthquakes, volcanic eruptions, and forest fires. Cases of epidemiological shocks insert the pandemic (COVID-19, plague, flu).

The mentioned types of causes of crises are only a small number compared to their real number. All of them are interconnected and lead to the emergence or intensification of crises. The consequences of any crisis are extremely negative for the country's economy - a decrease in GDP growth, an increase in the debt burden, a budget deficit, a decrease in the country's production capacity, a devaluation of the national currency, a deterioration in the credit rating, and many others.

The main principle of crisis management is prevention. For this purpose, a comprehensive and constant analysis of macro and micro indicators is carried out by financial institutions, mathematical and statistical models are developed, and the peculiarities of past crises are investigated.

In the event of a crisis, the main actions of the government and financial institutions should be aimed at the quick and accurate elimination of negative consequences and economic stabilization by the methods of state regulations. One of the key methods is an effective monetary exchange rate policy, which will be presented in more detail further.

1.2 The role of the national commodity market in the recovery of the economy after the crisis period

The national commodity market plays an important role during any crisis, and after it in the post-crisis period. The effectiveness and capacity of producers affect the speed of overcoming the crisis by stimulating GDP growth and strengthening the domestic exchange rate.

The economy of any country in the world is based on the continuous exchange of goods. The commodity market is one of the most essential because it is through it

that the state is able to simultaneously accumulate and withdraw monetary resources or material goods to ensure social needs and fulfill state-wide tasks. Other important advantages of the commodity market are providing the population with goods and items for personal consumption, voluntary interaction between buyers and sellers without hidden pressure, and expansion of production possibilities thanks to open competition between entities. The concept of "commodity market" has many definitions, which are represented in Table 1.1.

Table 1.1. Comparative table of the concept of "commodity market"

№	Definition	Sources
1	The product market is the sphere of turnover of goods (interchangeable goods), for which there is demand and supply within a certain time and within a certain territory.	Law of Ukraine (ВВР, 2001)
2	The commodity market is a set of actual and potential buyers of goods (products and services) who receive them through the exchange.	Philip Kotler (Kotler, 1984)
3	The commodity market is a system of economic relations between subjects of the economic system regarding the coordination of supply and demand for goods, capital, and services.	(Солонінко, 2002)
4	The commodity market is a sphere of commodity exchange, where social needs are realized through the purchase and sale of goods.	(Бєлявцев & Л.В., 2005)
5	The commodity market is a sphere of commodity exchange based on the process of buying and selling goods, where the main parameters are the offer of sellers, the demand of buyers, and the market price.	(Громова, 2018)

Sources: compiled by the author based on the sources indicated in the table.

The commodity market represents a system of exchange relations between business entities regarding the purchase and sale of goods and services in accordance with the laws of supply and demand. The object of the commodity market is a good that has a defined material form, as well as a service, idea, product, or material that has qualitative and quantitative characteristics. Subjects of the commodity market are both legal entities and individuals engaged in the production, or purchase of goods.

There is a wide classification of types of commodity markets according to certain characteristics. The most important allocation criteria are presented below.

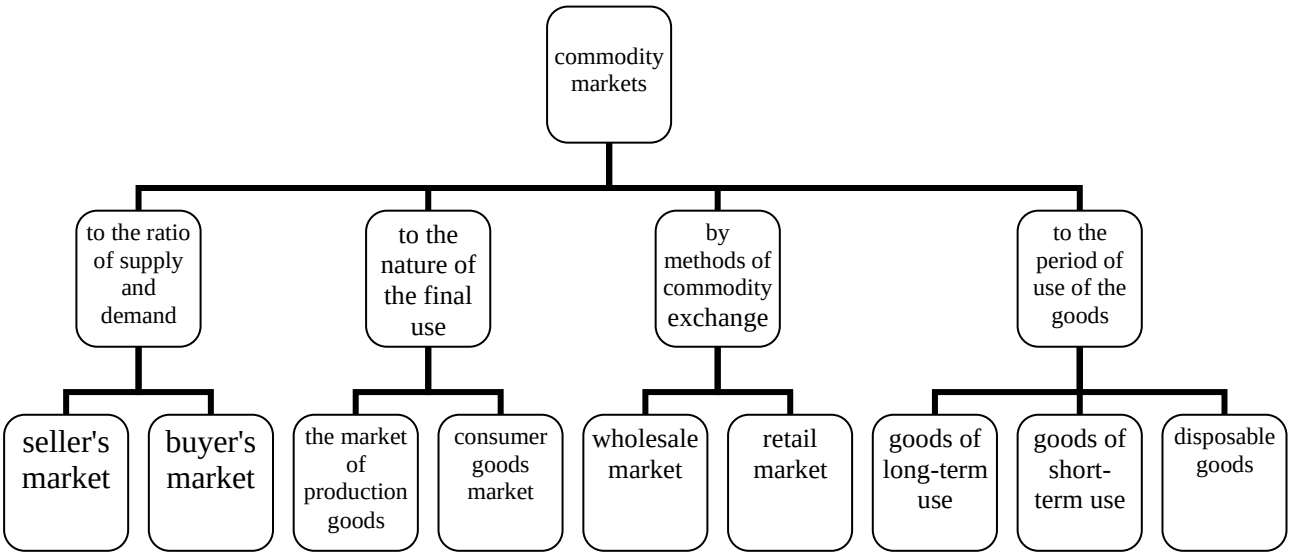

Figure 1.2. Scheme of types of commodity markets

Source: compiled by authors based on (Бутенко, 2006)

Figure 1.2 and other types of commodity markets form the infrastructure of the commodity market. The infrastructure of the commodity market is a set of activities and business entities that ensure the uninterrupted circulation of material factors of production and final consumption goods (Прокопенко et al., 2007). The degree of development and efficiency of the commodity market infrastructure depends on the share of the utilization of the production potential of enterprises, the quality of provision, and the degree of consumer satisfaction.

The main conditions for the functioning of the commodity market are:

- ensuring the competitiveness of product manufacturers;

- the free cross-industry movement of goods;

- storage theory and hedging pressure theory are two important factors in the price setting (Villeneuve et al., 2012);

- formation of pricing depending on supply and demand;

- independence of business entities in their expressions of will, and independence in making business decisions;

- possession by the participants of market relations of complete and unbiased information about supply and demand, phases of economic development, price level.

One of the differences of the commodity market is its inherent variety of goods - trade assortment. It reflects the totality of industrial and consumer goods in circulation. In the case of the inflexibility of the trade assortment, an artificial deficit

arises in the market, which is formed because of the excessive accumulation of unconsumed goods. The role of the state in relations between buyers and sellers usually acquires intermediary functions. For example, in such matters as quality and safety criteria of the provided goods and services.

The trade competitiveness and strong position of the national commodity producers play an essential role in the spurring of economic growth, intensive increasing of the sector of real production, and creation of new jobs. The development of the commodity market and support of the key domestic features of producers should be a priority for developed and especially emerging countries. If the country has a strong trade position in the world market, then its international competitiveness is high, which is a positive side for foreign and domestic markets.

The importance of strong trade competitiveness demonstrated an example of Greece`s entry into the European Union (EU). On the one hand, Greece's membership contributed to the improvement of the country's export-import capabilities. During the first 25 years since the accession, the share of exports and imports increased more than 10 times (Комар, 2018). However, on the other hand, since the national goods of Greece were not competitive with the goods and services of the EU member states, the share of the internal consumption in Greece grew at the expense of imported goods. Instead, national production declined significantly, leading to the country's economic decline. Several sugar factories and large knitwear factories were closed, and the volume of fishing and cotton farming decreased. Grape production suffered particularly heavy losses – vineyard and fruit trees that were in quota were cut.

In the case of the developed national commodity market, all these losses could be avoided. Another example is the trade position of Poland entering the EU.

During the process of joining Poland to the EU, there were many fears and risks, especially from the point of view of business and the competitiveness of national goods. For example, there were many fears that there would be a significant deterioration in the position of farmers, whose products would not be able to compete with subsidized products from EU members. Another threat was the potential purchase of lands that played a critical role in Polish society. Most of these prejudices

did not appear, and for example, in 2014, thanks to the investments of global brands, Poland was the largest producer of sophisticated household appliances in Europe - 23.1 million household appliances were produced (Інтел, 2012).

However, despite this, many Polish products fell under quotas for distribution on the European market. Moreover, the European Commission forced two Polish shipyards in Gdynia and Szczecin to be declared insolvent due to a lack of competitiveness in the European market. This led to the deterioration of the conditions of national producers.

For Ukraine the theme of high competitiveness is extremely important in terms of its own development, entering the EU, and international market stability.

Thus, the role of the commodity market in the system of national economic development after the crisis is essential. After all, the degree of provision of personal and public goods to the population, the potential development of the production capacities of the industrial sector, and the state's ability to accumulate resources depend on the quality of the functioning of the commodity market.

1.3 The essence and tools of the exchange rate regulation of the national economy in a crisis period

The exchange rate plays an important role in the system of national settlements. The exchange rate shows the price of foreign currency according to the national one. In Ukraine, the exchange rate is formed on the interbank market. The Central bank can influence the demand and supply of foreign currency through interventions.

According to the definition from the Corporate Finance Institute, an exchange rate is a rate at which one currency can be exchanged for another between nations or economic zones (CFI, 2020). This rate is important to define trade and capital dynamics of the flow and the values of currencies to each other.

Foreign exchange intervention is one of the key instruments by means of which the Central bank provides its monetary policy to stabilize the exchange rate, strengthen the national currency, and support the economy during crisis events. The

main source of interventions is the bank's international reserves. Simultaneously, the size of interventions depends not only on the available reserves but also on the degree of economic shock, the stage of the country's development, and others.

The key purpose of currency interventions is achieving price stability in accordance with the goals of the Central Bank of Ukraine. Based on this, it is necessary to form three main tasks for interventions.

1. At the expense of interventions, it is possible to smooth out the volatility of the exchange rate at a certain level. Sharp and significant exchange rate turbulence occurs during crisis periods. In the case of active panic in the population, the negative consequences of the shock are intensified. It is during such a period that the central bank acts as an active participant in the interbank market and helps to avoid significant exchange rate turbulence by interventions. After the stabilization of the economy in the post-shock period, the involvement of the central bank decreased.

2. Another task is the accumulation of international reserves. It is important for the central bank to maintain the volume of reserves at the generally accepted adequacy criteria, which determine that the volume of reserves should be sufficient to cover three months of future imports of goods and services.

3. The interventions of the central bank should be aimed at maintaining the transmission mechanism, in the event of a decrease in the effectiveness of the interest rate as the main instrument of monetary policy.

Thus, the currency intervention strategy should correspond to the goals of inflation targeting, the current regime of the exchange rate (floating or fixed). Moreover, during the absence of a significant shock and gradual stable development of the economy, the central bank minimizes its influence on exchange rate formation and supports the development of the currency market. The reverse situation persists during the crisis. Then the central bank becomes an active participant in the interbank market, adjusting significant fluctuations through interventions.

During currency interventions, the central bank is guided by the principles of appropriate transparency. This means that information about the criteria for the participation of market subjects, and the results of the implementation of

interventions on the market are open and publicly available. However, sensitive parameters and the main motives, and tactics for interventions are not public for the sake of the effectiveness of exchange rate monetary policy.

Each country chooses its own exchange rate system according to its decisions and strategic financial goals. This is the definition of the exchange rate regime. There are four main regimes: fixed, flexible (freely floated), managed float and pegged. However, these regimes can be modified and form new derived types such as dollarization, monetary union regime, and others.

Firstly, the definition all of four regimes would be considered. Then it will be presented the comparison of their advantages and disadvantages.

A *fixed regime* holds the exchange rate stable or with minor fluctuations in narrow boundaries during some period of time. The *freely floated* exchange rate is determined by the market`s supply and demand without any interventions from authorities or regulators. This regime might have significant fluctuations at any point in time. The *managed float* exchange rate is also defined by the market forces, but with the influence of the regulators to smooth the movements. Pegged exchange rate consists in “pegging” the value of the currency to other foreign currency or to a unit such as gold. All comparisons are depicted in Table 1.2.

In Ukraine, up to and including 2014, the exchange rate regime was fixed, and since 2015 – managed float. Fixation of the exchange rate caused many problems, including reduction of international reserves, loss of competitiveness of domestic producers, devaluation of the national currency, high level of inflation, etc. In fact, the exchange rate peg reflected the illusion of stability. Therefore, in August 2015, the inflation targeting regime was de facto approved in the Monetary Policy Strategies for 2016-2020, and in December 2016, it was de jure, approved by the Council of the NBU in the Basic Principles of Monetary Policy for 2017 and the medium-term perspective.

The flexible exchange rate regime in Ukraine was maintained until the start of a full-scale war.

Table 1.2. Comparative table of pros and cons of regimes of the exchange rate

Exchange rate regime	Advantages	Disadvantages
Fixed	-the constant basis for investment, trade, planning; -restraining devaluation of the currency and inflation; -less risk of price fluctuations -lack of monetary policy discipline.	-hard to define whether the fixed exchange rate is sustainable; -the risk of the significant appreciation of the exchange rate and as a result loss of competitiveness; -large expenditure of the reserves.
Free floated	-effective allocation of financial resources; -representation of all external and internal shocks; -balancing of demand and supply in the market.	-distortions of resources allocation -difficulties in planning and forecasting for businesses; -overshooting of exchange rate; -abuse of the domestic monetary policy.
Managed float	-protection of investors against sharp fluctuations; -provide a predictable and stable business environment; -protects the economy from big fluctuations.	-manipulation from the government due to lack of transparency; -conflict of interest between exchange rate policy and monetary policy.
Pegged	-mitigation of the impact of domestic price changes; -contributes to the stabilization of export-import prices; -the devaluation of the currency to a big shock.	-the looseness of the monetary independence by the central bank; -the negative impact of the country to which the national currency was pegged; -targets for speculations.

Sources: compiled by the author based on the (Encyclopedia, 2023).

After February 24, 2022, the NBU fixed the hryvnia-to-dollar rate at UAH 2,2549; and the hryvnia-to-euro rate at UAH 33,1707. Such actions of the central bank were forced to ensure exchange rate and macro-financial stability, uninterrupted operation of the financial system, balancing the current market situation, fixing the expectations of the population, and maintaining control over the dynamics of inflation. The exchange rate policy of the Central Bank during the war would be considered further in more detail.

So, currency interventions are an essential tool to affect the fluctuation of the exchange market. There are several types of currency regulation regimes. Each of them has its advantages and disadvantages. When choosing one of the currency regimes, the country must consider the specifics of the internal financial market, the country's development, economic growth, etc. During crisis events such as war, the optimal solution is to fix the exchange rate.

CHAPTER 2 ANALYSIS OF THE STATE AND PROBLEMS OF EXCHANGE RATE POLICY IN UKRAINE

2.1 Peculiarities of exchange rate regulation in the crisis period

In this section, the main dynamics of the exchange rate of the Ukrainian national currency, the hryvnia, will be considered. A small reminder that from 1996 to 2014, the exchange rate regime in Ukraine was fixed, from 2014 to March 2022 - floating, and from the next month after the start of a full-scale war (24.02.2022) in Ukraine - fixed. There are two main changes in the value of the domestic currency – reduction and increase. If the value of the national currency decreases under demand-supply forces with a flexible exchange rate regime, then the value depreciates. If the price of domestic currency declines, but under a fixed exchange rate regime, then the currency devaluates. A similar logic in terms is used when the value of the currency increases. The revaluation occurs under the fixed exchange rate regime, and appreciation under the flexible exchange rate system. The dynamic of the exchange rate of the hryvnia (UAH) from 1997 to 2022 is depicted in Figure 2.1.

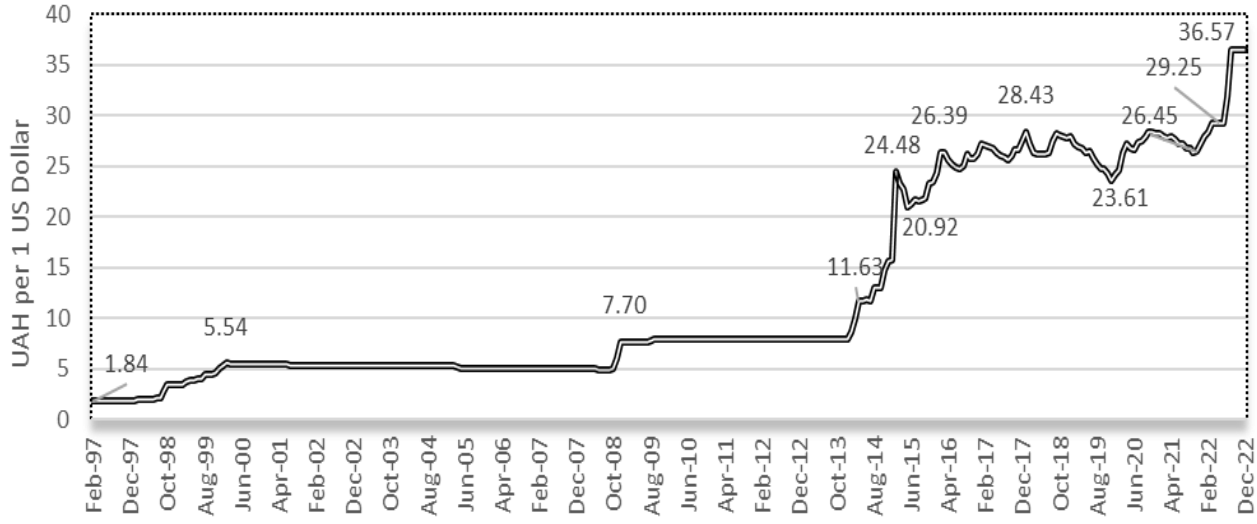

Figure 2.1. The dynamic of the exchange rate UAH/USD (average for period)

Sources: compiled by the author based on the (NBU, 2023f)

In 1997, it was observed that the National Bank pursued a policy of restraining the excessive revaluation of the hryvnia, which occurred due to the inflow of foreign

exchange funds. The largest fluctuations in the value exchange rate occurred in 1998-1999, 2008-2009, 2014-2015, 2019-2020, and 2021-2022.

The first devaluation of the hryvnia took place in 1998-1999. The main reasons were the impact of the Asian financial crisis, the fall in GDP, the trade balance deficit, and the growth of foreign debt. Additionally, the expansionary fiscal and monetary policies of the government had a negative impact on the economy. That led to instability that created uncertainty for investors and put pressure on the exchange rate. Simultaneously, the devaluation stimulated the export of goods producers, which led to an increase in the volume of sales of foreign currency and supply on the market. As a result, the volume of foreign currency reserves of the NBU increased.

From 2000-2004 Ukraine achieved macroeconomic stability. During that period was sharp economic growth, and low rates of inflation. At the same time, political instability plays an important role during that time. There were tensions between the president and parliament, which put downward pressure on the hryvnia. Additional uncertainty was created by the transition to a market-based economy. This was also facilitated by the fact that the position of the dollar in the domestic market was somewhat weakened by its devaluation in international markets (Базилевська & С.В., 2013).

In 2008-2009, the dynamics of the hryvnia exchange rate experienced significant fluctuations. The main factors of currency devaluation:

- global financial crisis and its negative impact on the inflow of foreign funds from abroad to the banking system;
- drop in world metal prices in August 2008 by 15-20%. As a result the export revenue significantly decreased, while the import value grow;
- intensification of the capital outflow due to negative expectations about the devaluation of the national currency;

In general, the dynamics of the hryvnia exchange rate reflected the conjuncture of international markets, where the depreciation of the US dollar was observed. In 2009 the decline of the official exchange rate of the hryvnia was 3.7 % in comparison with 52.5% in 2008.

In terms of exchange rate policy, since 2014, the national currency of Ukraine has been significantly undervalued. This was caused by three simultaneous crises: economic – caused by the annexation of Crimea and the war in Donbas; currency - because the fixed exchange rate had to be abandoned due to the deterioration of the foreign trade balance and the growth of the budget deficit, and banking - because the oligarchic banking system led to an increase in overdue debts and a panicked outflow of deposits. Instead, towards the end of the period (2019-2021), the gradual growth of the exchange rate to the equilibrium is observed.

The key positive and negative consequences for the economy during the float-managed exchange rate regime:

1. The float regime has allowed the Ukrainian national currency to adjust the market changes and, in that way, make the export goods more competitive.
2. This regime has contributed to an improvement in the investment climate in Ukraine due to relative stability in the foreign exchange market.
3. As the Central bank smoothed the high fluctuations due to interventions in the interbank exchange market, this put pressure on foreign reserves.
4. There was inflationary pressure as the price of imported goods and services increased due to the depreciation of the currency. This led to a decrease in the purchasing power of consumers.

To conclude, the managed-float exchange regime had a mixed impact on the economy. On one side, this allows for improving the investment climate and external competitiveness. On the other hand, this had a negative impact on foreign exchange reserves and inflation.

The exchange rate policy of the Central bank during the 2022 year will be considered separately. However, before that, it is worth noting that currency devaluation cannot always be viewed from the negative side.

For instance, countries can deliberately maintain a low exchange rate in order to protect the domestic market from foreign competition. Such a policy was observed in China and Japan, at the end of the XX century accumulated foreign currency reserves and pursued a protectionist policy.

For countries with a low or medium level of development, the devaluation of the national currency has a mostly negative effect on the economic development of market relations. This happens because for developing countries, due to the insufficient development of their own production capacities, exports are mainly aimed at cheap raw materials, and imports at technologically and resource-intensive goods. Therefore, during devaluation, it is extremely unprofitable for underdeveloped countries to import labor-intensive goods that are in demand in the domestic market due to high prices. At the same time, prices for export goods will rise.

The strengthening of the hryvnia exchange rate against foreign currencies can be observed due to the preponderance of foreign direct investment inflows over their outflows. According to McKinnon's research, such an inflow has a positive effect not only on the exchange rate of the national currency but also on the activities of entrepreneurs and the commodity market as a whole (Береславська & Серебрянський, 2009). During the strengthening of the national currency, the volume of export-oriented goods decreases. After all, the products of domestic manufacturers are becoming more expensive compared to foreign analogs. Such a situation is inherent in short-term changes in the exchange rate. With long-term planning and anticipation of the revaluation of the national currency, domestic exporting producers begin to improve their own production processes, modernize equipment, improve management processes, etc. Thus, in the long term, the volumes of export-oriented products will grow. This shows that the revaluation has a positive effect on the level of innovative investments.

Therefore, for the Ukrainian national commodity market, the devaluation of the national currency was an unprofitable direction of exchange rate policy. After all, under such conditions, the country remained a raw material exporter for developed partner countries. Instead, the strengthening of the exchange rate will direct entrepreneurs to the production of technological products for final consumption.

At the beginning of the war in Ukraine (24.02.2022) the NBU fixed the exchange rate at the level of 29,25 UAH per 1 USD and then increased the value up to 36.57 on July 21, 2022. A fixed currency regime has its advantages and

disadvantages, one of which is the high cost of usage foreign exchange reserves. However, such a policy of the central bank is a forced and necessary step to maintain nominal stability in the conditions of war. The fixed exchange rate policy is complemented by high-interest rates and currency restrictions.

Another important indicator of the exchange market is the real effective exchange rate (REER) and nominal effective exchange rate (NEER), the dynamics of which are depicted in Figure 2.2. The importance of these indexes lies in determining the competitive positions of domestic producers, identifying whether the national currency is undervalued or overvalued, and isolating destabilizing shocks to the economic macro system. These indexes reflect the change in the exchange rate adjusted for the level of inflation in Ukraine and the main trading partners. A fluctuation of +/-11% in a 3-year period is considered optimal (Новосьолова & Скаржинець, 2019).

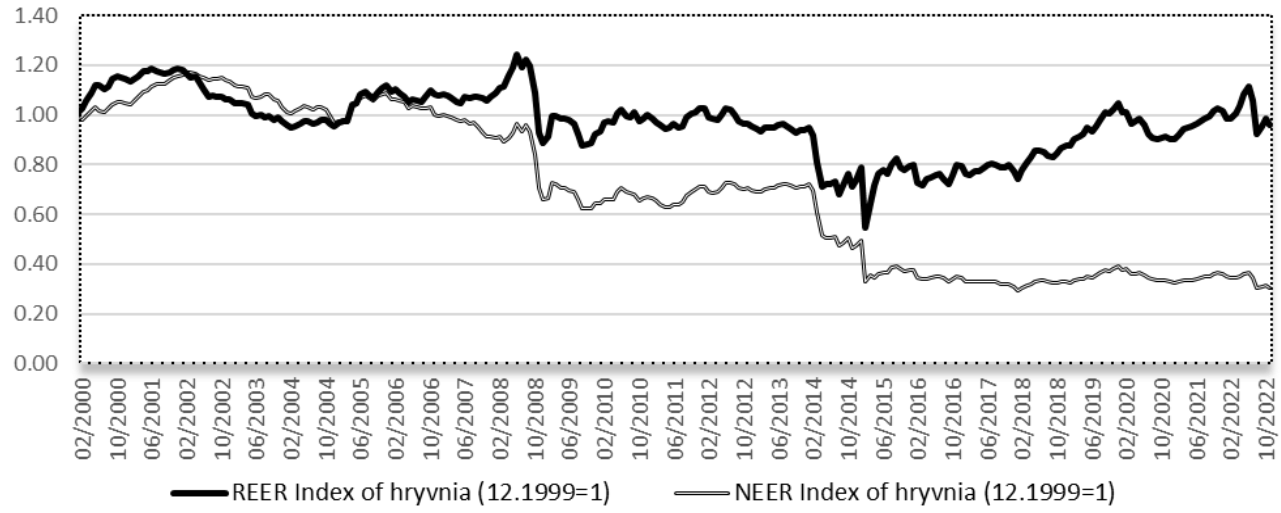

Figure 2.2. The dynamic of the REER and NEER

Sources: compiled by the author based on the (NBU, 2023c)

The dynamics of the two indices are synchronous. Since the real effective exchange rate differs from the nominal effective exchange rate in that it is adjusted for the level of price changes. The highest increases in the REER were in 2008 and 2022. This means that the competitiveness of domestic goods decreases both in the domestic and world markets. The causes are the excess of inflation in the country over the inflation of trading partners, as well as the devaluation of the exchange rate

of the national currency, and external and internal shocks. The reverse is the situation with a decrease in the REER index (the end of 2008 and 2015), in which the competitive positions of product manufacturers are strengthened. The main reasons for that were low rates of inflation and graduate recovery of the economy.

Let`s return to the exchange rate policy of the NBU during the 2022 year. As was mentioned before, since the beginning of the full-scale war in Ukraine on February 24, 2022, the NBU fixed the exchange rate. This currency regime is maintained until June next year. Let's consider the consequences for the economy of fixing the exchange rate and whether it should be kept fixed in the future.

The positive consequences include the restoration of public confidence and the anchoring of expectations, the appearance of macro stability.

However, the reverse side of such a fixation also insinuates. For example, great pressure on foreign exchange reserves, deterioration of daily competitiveness, and a larger gap between the official and cash exchange rates. Since the main trading partners are the countries of the European Union, the depreciation of the euro against the dollar leads to even greater losses for exporters.

So, it is obvious that fixing the exchange rate had more advantages at the beginning of the war as a tool for stabilizing expectations and financial activity, but in the long run, the country would suffer more and more losses. For example, the biggest losses are the reduction of international reserves. In addition, economic imbalances (price level, drop in production) will gradually increase, which will not be reflected due to a change in the dynamics of the exchange rate. Therefore, it is worth considering a potential solution.

To do this, we will consider examples of exchange rate policies of other countries during the war. South Korea and Israel are countries that have not fixed the exchange rate for the past 30 years. However, they were in constant search for the optimal exchange rate - from managed floating and pegged to other hybrids. During the Vietnam War, the US abandoned the gold standard due to expansionist fiscal and monetary policies. Instead, Iraq fixed the exchange rate after the 2003 war. Thus,

there is no one-size-fits-all strategy for countries at war. It is necessary to consider all the conditions and features of each country.

For Ukraine, in our opinion, a free-floating exchange rate is not a solution, as the high sensitivity of inflationary expectations leads to excessive macroeconomic volatility. A vivid example is the hryvnia exchange rate fluctuations during the first invasion of the Russians in 2014.

Our proposals come out taking into account such factors that only under the action of market forces of demand and supply, the optimal rate is formed - not distorted, which reflects the current state of the economy. In the post-war period, Ukraine will return to a flexible exchange rate, inflation targeting, and restore the transmission mechanism. Therefore, we agree with the opinions of the Ukrainian and American professor Yuriy Gorodnichenko (Gorodnichenko, 2022) that during martial law the exchange rate should be flexible, the daily fluctuations of which are limited to a narrow range.

Thus, the exchange rate will change (rise or fall) under the influence of market forces, but within the corridor and at a rate determined by the central bank. Such a policy was already applied during the COVID-19 pandemic, and in some countries even earlier. This policy made it possible to slow down the pace of exchange rate appreciation and gradually introduce a flexible exchange rate.

Other positive aspects of the proposed exchange rate are the institutional independence of the central bank. It will also prepare for a smooth and safer transition to a flexible exchange rate, reduce pressure on currency reserves, and minimize post-war fluctuations.

The proposed policy is one way to decide on the optimal exchange rate strategy. Of course, such an approach requires complex actions - not only the adjustment of the exchange rate but also the interest rate, money supply, restrictions on capital movements, etc.). However, today it is worth thinking about future reconstruction, and restoration of the transmission mechanism.

2.2 Dynamics of the main instruments of exchange rate monetary policy

Currency interventions are the influence of the central bank of the country on the currency exchange rate by selling and buying foreign currency. In that way, the financial institution regulates the demand and supply of foreign currency and defines the desired level of the exchange rate. NBU can sell or buy the currency on the interbank exchange rate market. During the buying the NBU releases the hryvnia into circulation and vice versa when the central bank sells the currency, it withdraws the hryvnia from circulation. Figure 2.3 shows the dynamics of the interventions.

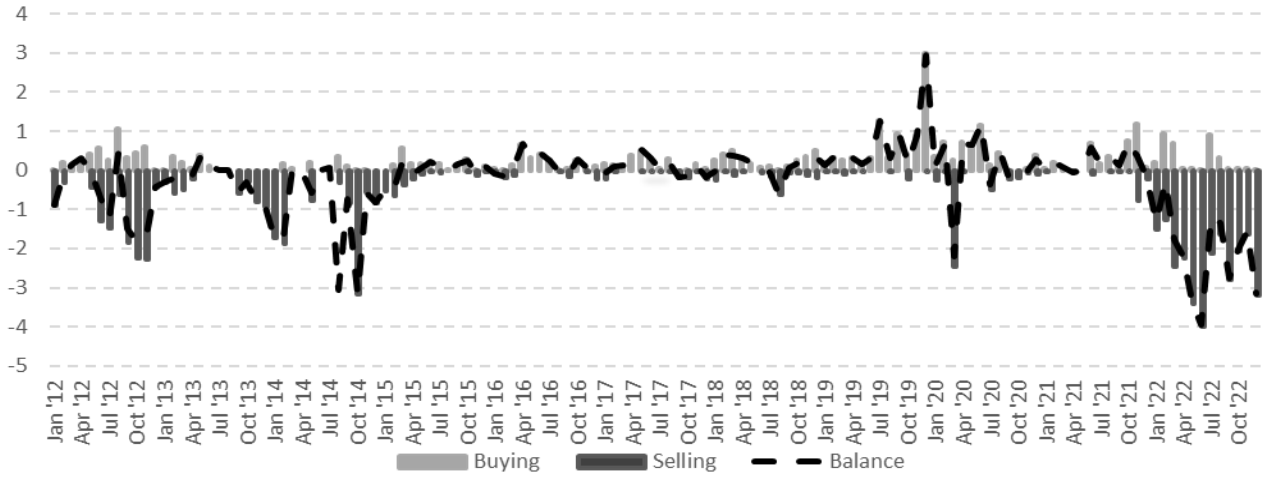

Figure 2.3. The dynamic of the foreign interventions

Sources: compiled by the author based on the (NBU, 2023e)

The main aims of the interventions are to balance the supply and demand for foreign currency and to support the stable exchange rate dynamics of the national currency. This strategy was followed until 2014. With flexible exchange rate formation, the goals of interventions change somewhat, although monetary authorities can also conduct them with the aim of avoiding unnatural deviations in the exchange rate, normalizing the situation on the market, and accumulating currency reserves (Самсонов, 2008). So, from 2014-2016, the National Bank of Ukraine carried out currency interventions with the goal to avoid high fluctuations in the exchange rate and accumulate foreign reserves.

On September 6, 2016, the board of the NBU presented the "On the approval of the Strategy of currency interventions of the National Bank of Ukraine for 2016-

2020" (NBU, 2016), in which were described the main principles of the currency interventions in accordance with inflation targeting. The purpose was not only to accumulate foreign reserves and smooth the excessive fluctuations, but also maintenance of the transmission of the policy rate.

In 2016-2020, in accordance with the currency intervention strategy, the National Bank of Ukraine did not buy currency during the period of fluctuations in the direction of devaluation of the hryvnia but replenished international reserves only under favorable conditions on the foreign exchange market. At the same time, starting in April 2018, to increase the transparency of monetary policy, the NBU constantly announces the volume of foreign currency purchases to replenish international reserves (Лавров et al., 2019).

Since the beginning of 2020, foreign exchange interventions have been carried out using interventions at the best rate, foreign exchange auctions, and interventions at a single rate. Some of the biggest sales of the currency are observed at the end of 2022. For comparison, in December 2022, the number of sales increased 13 times, compared to December of the previous year. It is worth noting that with the beginning of the full-scale war in 2022, the volume of currency sales fluctuated between 2-3 billion US dollars. At the end of the 2022 year, the value reached 3,19 billion US dollars. However, the highest was in June – 3,99 billion US dollars.

This adjustment of the exchange rate was caused by significant gaps in the balance of payments and the non-rhythmic inflow of international aid. As of today (January 2023), the foreign exchange market cannot be independently balanced under the influence of economic forces since the demand for currency from businesses and consumers will remain high. This has a significant impact on the foreign reserves, the dynamics of which will be analysed further (Figure 2.4).

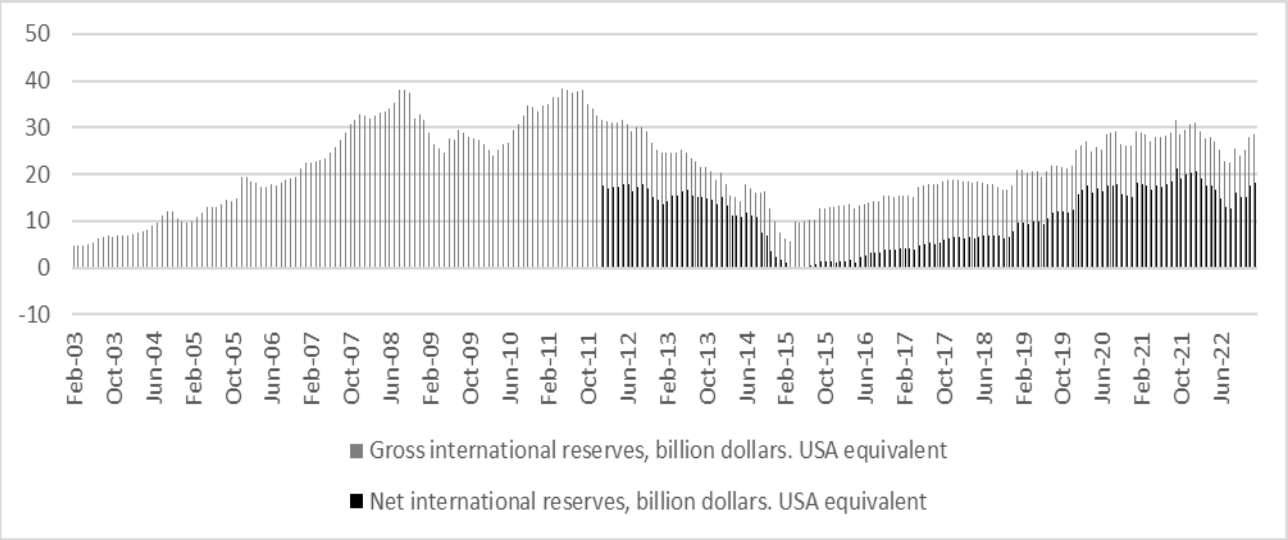

Figure 2.4. The dynamic of the international reserves

Sources: compiled by the author based on the (NBU, 2023b)

International reserves consist of liquid financial assets with the help of which the country's regulators can achieve the defined monetary goals. The difference between gross and net currency reserves lies in that net reserves do not include funds borrowed from the IMF.

The figure shows that the largest decline in reserves occurred at the end of 2014 and at the beginning of 2015 when the decision was made to switch from a fixed to a floating exchange rate. Then, there was a gradual increase in the number of reserves. In 2022, thanks to the international aid of foreign countries, the reserves as of the end of November have already exceeded the pre-war level and reached 28,5 billion dollars. The further inflow of international aid will make it possible to maintain reserves at a sufficient level.

The role of international financial aid from abroad during the crisis period is essential for any country. Such financial support ensures the solvency of the country, and its ability to fulfill obligations on time, and compensates part of the economic losses incurred due to different shocks that led to the crisis. Since the beginning of the full-scale war in Ukraine, many countries, and regions provided significant financial, humanitarian, and military aid, without which Ukraine could not conduct defensive action, carry about citizens, and maintain the economy.

Figure 2.5 depicts all three types of foreign support – military, humanitarian, and financial according to from which country or region it was received.

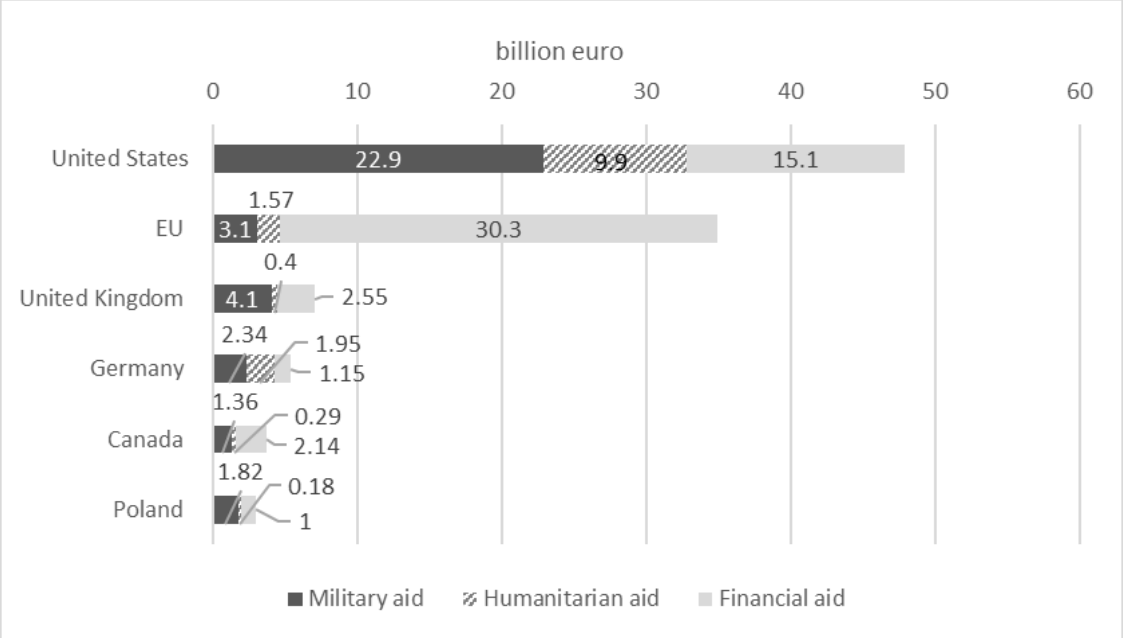

Figure 2.5. Top-6 countries with the highest fraction of government assistance to Ukraine since the beginning of the full-scale war to November 2022

Sources: compiled by the author based on the (KIEL, 2023)

The largest investor with the highest contribution and support is the United States. The total amount of support equals 48 billion euros. A significant sum (34.97 billion euros) of assistance was received from European Union Institution. The 7.05 billion euros contributed by the United Kingdom. The support from Germany is 5.44, from Canada – 3.79, and from Poland – 3 billion euros. In addition to this, from Figure 2.5 can be seen that all countries except EU Institutions provide more assistance which is aimed at the military sector. This reflects a primary necessity of Ukraine to defend its borders. However, the essential part of support is financial foreign aid, which prevents the occurrence of default and, as was mentioned before, maintains reserves at the necessary level, which is sufficient for the performance of the country`s obligation and covers three months of imports.

2.3 Export-import positions of producers of the national commodity market during the different periods of crisis

To analyze the position of the national producers and the trade facilities, it is worth presenting the main trade indicators, such as the dynamic and structure of export-import, the current balance of payment, the current account, and the trade balance. To begin with export and import analysis (Figure 2.6 - 2.7).

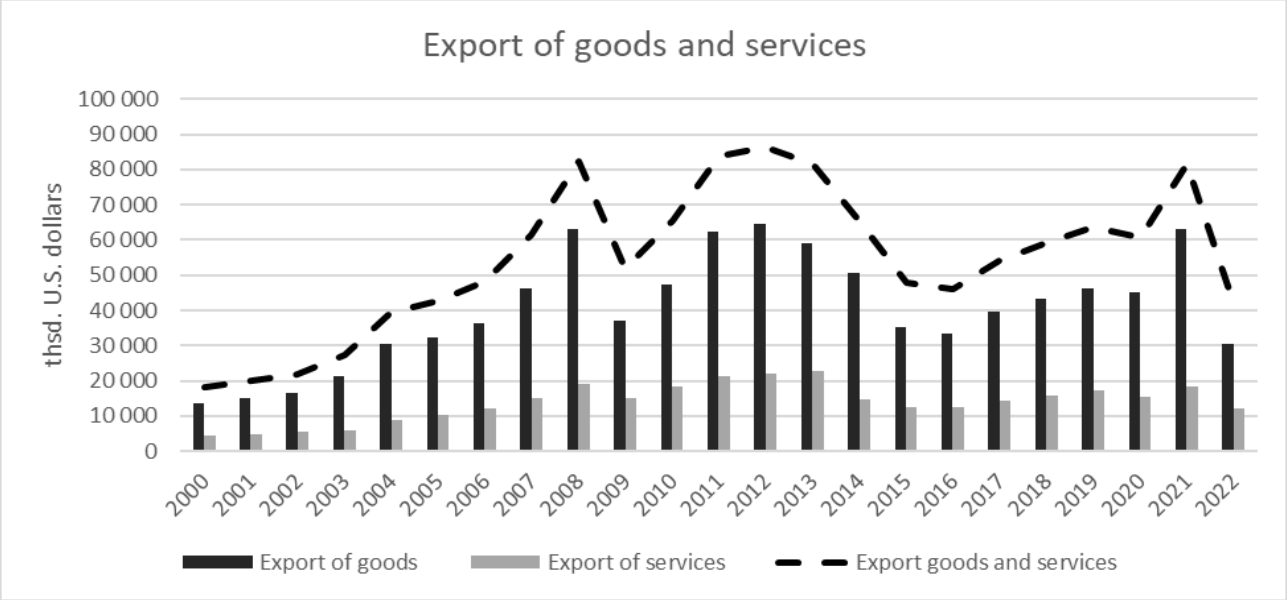

Figure 2.6. The dynamics of the export of goods and services as items of the balance of payment of Ukraine (analytical form) from 2000 to 2022

Sources: compiled by the author based on the (Minfin, 2023)

The graph illustrates that the highest volumes in the export of goods were achieved in 2008, 2012, and 2021. After that years there were shocks that led to economic crises (will be considered further). The amount of the export of services is almost three times smaller. This means that the country produced more goods for export and specializes in providing services in the domestic market. At the end of 2022, the total volume of export decreased to the value of 2005 and reached the lowest point in the last 17 years.

Another Figure 2.7 demonstrates the dynamics of the import of goods and services. Regardless of the similar tendencies between the graphs of export and import, the value of import is much higher in comparison with export volumes.

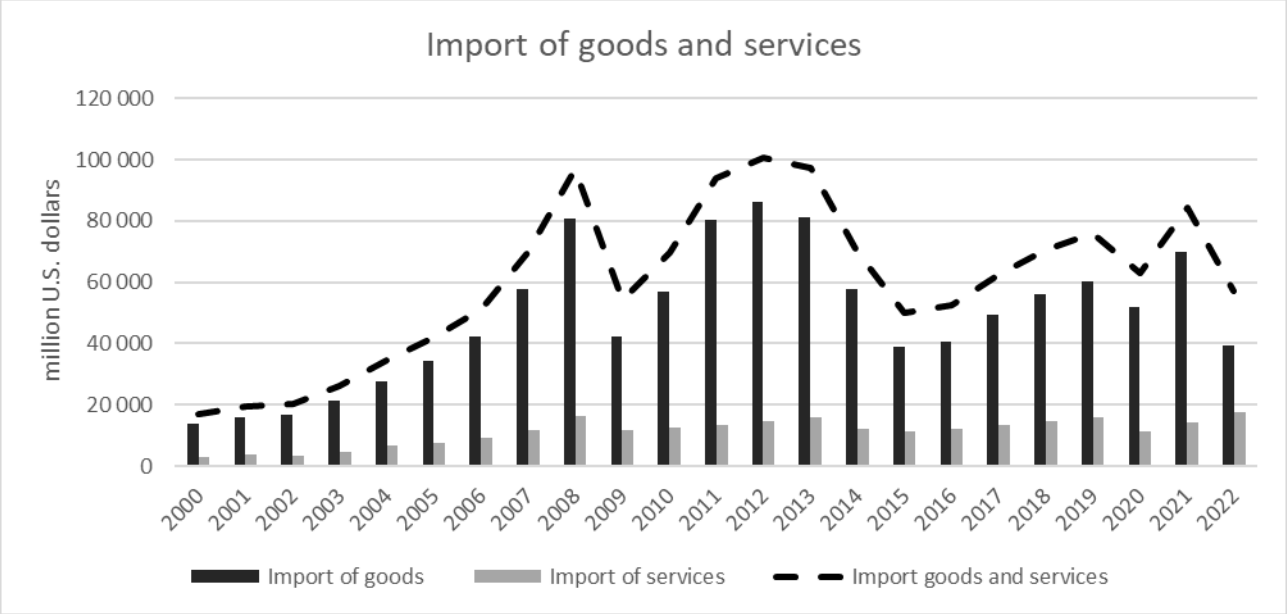

Figure 2.7. The dynamics of the import of goods and services as items of the balance of payment of Ukraine (analytical form) from 2000 to 2022

Sources: compiled by the author based on the (Minfin, 2023)

One more difference is the deep decrease in imports in 2020. This happened due to the disruption of supply chains because of the spreading of the pandemic COVID-19. Other mentioned shocks have similar negative impacts.

Another trade indicator is the current account balance. This is one of three accounts of the balance of payments (BOP). The BOP shows the fraction between funds received by the country from abroad and payments abroad for a certain period. It consists of the current account, which represents all transactions in terms of trade of goods and services, transfers, and investments; the capital account, which includes the capital inflow and outflow, foreign aid, and remittance; and the financial account, which shows the direct investment, portfolio investment, reserve asset. Let`s consider, the first current account, as it depicts operations of the trade of goods and services (Figure 2.8).

The current account consists of three balances: the balance of goods and services, and the balance of primary and secondary income. As was mentioned

before, the first one shows the trade dynamic and facilities of the country. This balance is counted as the difference between the volume of export of goods and services and imports. The balance of primary income includes the income of the country's citizens from abroad or the income of foreigners from the property or financial assets in the country. The secondary income balance includes transfers.

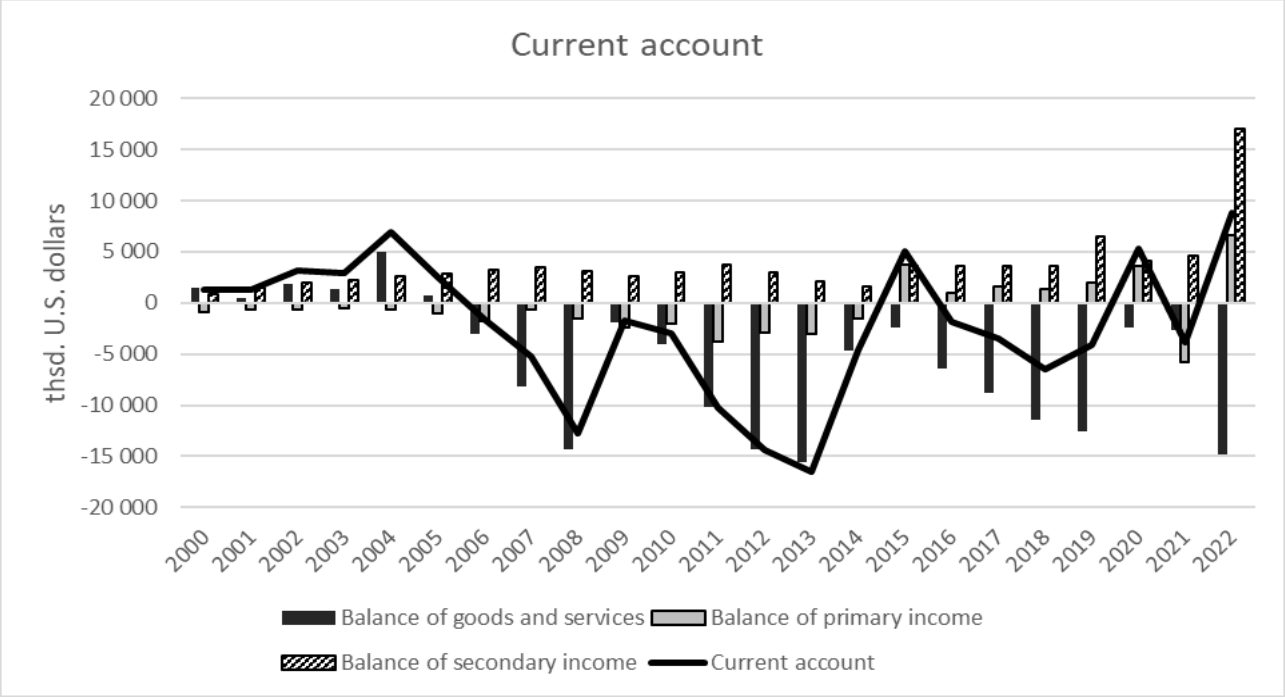

Figure 2.8. The key items of the current account of Ukraine

Sources: compiled by the author based on the (Minfin, 2023)

The export-import dynamics reflect the constant predominance of exports over imports until 2004. Since then, the balance of goods and services is constantly falling. The country's negative trade balance has some risks for the economy, such as the devaluation of the currency, dependence on the supplier country, increase of external debt, and others. The lowest value was in 2008 which was triggered by the financial global crisis. That period was the first time when the net export was negative (-17 million USD). However, after 2008 occurred sharp recovery of the economy. Another significant decline in the balance of goods and services started in 2010 and was the deepest in 2013 (-15,6 million USD). The main reasons for that were the combination of different shocks such as geopolitical (revolution and occupation of the East region of Ukraine), banking crisis, deterioration of trade, and reduction of the capacity of

producers. After the period of decline in trade activity, the economy sharply recrudesced. Simultaneously, the balance of the secondary income remained positive.

Due to the full-scale war in Ukraine, the balance of goods and services was – 14,8 million U.S. dollars. This happened due to many reasons which are caused by the war factor. For instance, the inability to produce goods in the temporarily occupied territories, disruption of logistics and transport connections between regions, blocking ports as the main trade routes, migration and forced relocation of workers, loss of stocks, warehouses, and equipment, restrictions on electricity consumption, loss of access to internal natural resources and so on.

However, in comparison with 2013 in 2022 the current account is positive, despite the huge drop in the balance of goods and services. The main reason lies in the level of primary and secondary income. The value of the balance of the secondary income is 2 million more than the balance of goods. This and the positive primary income balance compensate for the losses in the trade balance. This once again emphasizes the importance of international financial assistance during crisis periods.

Further, the structure of the export and import of goods will be analysed. To begin with the depictions of the export (Figure 2.9).

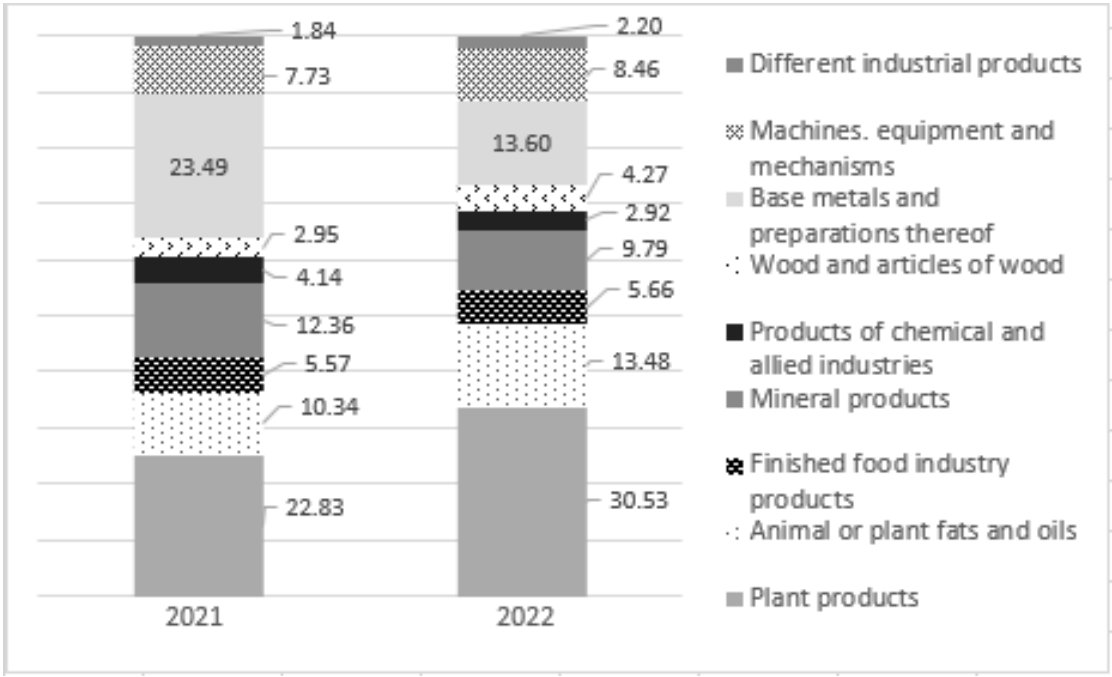

Figure 2.9. The commodity pattern of export of goods, 2021-2022

Sources: compiled by the author based on the (SSSU, 2023c)

The largest export items are products of plant origin – 31% (predominance of the share of grain crops, seeds, and fruits of oil plants), base metals and preparations thereof (ferrous metals and preparations thereof, copper, aluminum, nickel) -15%, animal or plant fats, and oils – 14%, mineral products (salt, ore, slag) – 11%, machines, equipment, and mechanisms – 9%. More than 71% of the total is raw products, the added value of which is low.

The structure described above indicates that the country's economy is raw material oriented. On the other hand, it demonstrates the lack of production potential to create high-tech goods with high added value. Thus, it can be concluded that as of 2022, Ukraine is a raw material country.

To analyse the dynamics of exports before and after the war, the change in export volumes for 2021 and 2022 will be described further.

In 2022, export volumes amounted to 44.1 billion U.S. dollars, which is 35.1% less compared to the previous year. 16 regions had negative dynamics. The largest drop in exports was observed in Donetsk, Dnipropetrovsk, Zaporizhzhia, Mykolaiv and Kharkiv regions. Cherkasy (+0.6 p.p.) and Odessa regions (+1.0 p.p.) provided the greatest increase in positive export dynamics (ME, 2023).

The groups of goods whose exports decreased the most (ME, 2023) - iron ores, concentrates (-3,987 million dollars), semi-finished products from carbon steel (-2,901.8 million dollars), rolled goods (-2,727.0 million dollars), wheat (-2,398.6 million dollars) and cast iron (-1,003.9 million dollars).

Below is represented the structure of import goods in 2022 (Figure 2.10). The highest fraction of imports is mineral products (27% of all imported goods). Among mineral products, the largest share (98% of all imported mineral resources) is mineral fuels; oil, and products of its distillation.

The second largest part of imports is machines, equipment and mechanisms, electric and technical equipment (18%). In addition to this, products of chemical and allied industries occupy 13%, the ground, air, and water means of transport - 12%, and polymeric materials – 7%. So, 30% of imports are machines. Those goods and other chemical or polymeric products are technological and labor-intensive goods.

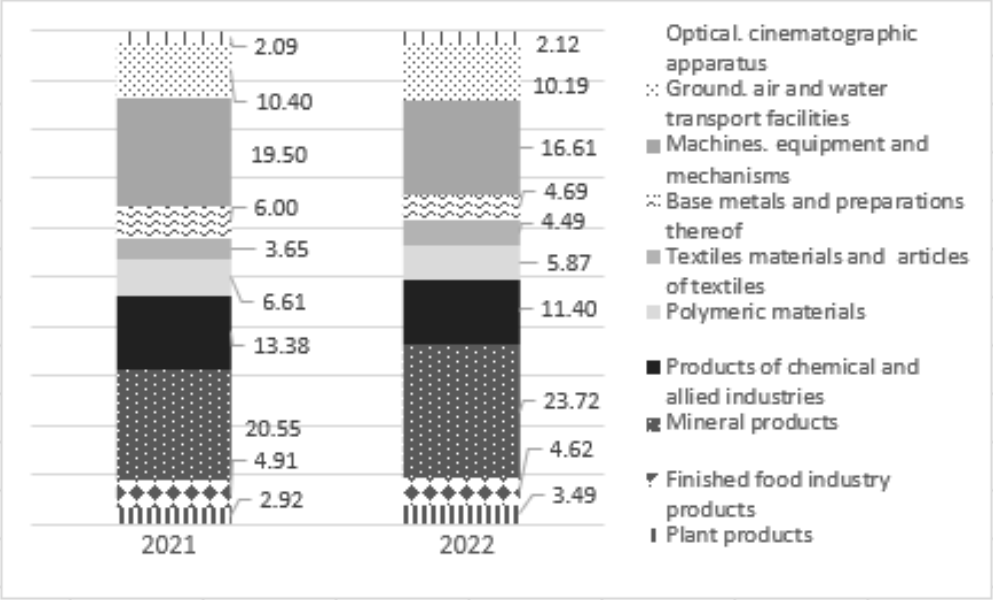

Figure 2.10. The commodity pattern of import of goods, 2021-2022

Sources: compiled by the author based on the (SSSU, 2023c)

The import of goods according to the results of 2022 (55.3 billion U.S. dollars) decreased by 24.1% compared to 2021 (ME, 2023). The largest decrease was experienced by such articles of import as petroleum gases (-2,238.0 million dollars), cars (-1,471.7 million dollars), hard coal, anthracite (-311.9 million dollars), medicines (-630, 2 million dollars), fertilizers (-568.1 million dollars) and crude oil (-506.7 million dollars).

The following conclusions can be drawn from the structured analysis of the main export and import articles. First, the country has great natural resource potential. Therefore, the country's exports are focused on the sale of raw materials. Secondly, the largest articles of import are fuel resources, petroleum products of distillation, and machinery. This shows that Ukraine, having its own fuel minerals, does not fully supply the domestic consumer market with them. A high share of imported machinery is an indicator of low national production capacities of the real sector of the economy, the reasons for which will be discussed further. Thus, the commodity structure of foreign trade confirms the raw material orientation of the economy.

According to the author’s opinion, the emphasis on the development of the raw material trade has a negative impact on the technological and scientific growth of the economy. Only focusing on the export of high-tech and knowledge-intensive

products with a high level of added value can ensure stability, sustainability, and minimal vulnerability to the influence of economic cycles.

There is such a pattern that resource-rich countries are significantly inferior in economic development to countries with smaller reserves of minerals, but with greater technological progress. There are many examples of successful use of own natural resources. Let us give an example of Sweden.

The main raw materials of Sweden are wood and ores. Extraction and export of this raw material could provide the country with significant income. However, Sweden has turned resources into a driving force rather than a drag on the economy. At the same time as the large extraction of resources, the country invested considerable funds in the construction of processing plants. Subsequently, this contributed to the growth of the economic potential, and the well-being of citizens. Today, the country is known for its brands of companies (Electrolux, H&M, IKEA, Husqvarna, Libero, Zewa) that produce finished products. Another positive consequence of the development of its own production capacities was less vulnerability to global economic shocks. For example, the crisis of 2008 caused great losses to export-oriented countries. Sweden, on the other hand, was not deeply affected. As of today, the country continues to actively develop and support the domestic market of manufacturers and invests in the latest high-tech areas of alternative energy. Other examples of countries with rich raw material resources and their effective usage are Australia, the United Arab Emirates, and Canada.

Examples of successful raw material countries confirm the author's main point that raw materials should be a tool for development, but not the basis of the economy.

Since Ukrainian foreign trade is focused on the export of raw materials and the import of technological machines, the need for technological and scientific development disappears. When extracting raw materials, there is no great need for highly qualified engineers and a powerful scientific base. Therefore, highly qualified personnel, as a rule, migrate to countries where there is a higher need for their specialization. In this way, not only brain drain occurs, but also the country lags behind in scientific and technological development.

Another disadvantage is the determination of the price of raw materials, namely the price that is set on the market and not by its producer. Minerals are usually commodities. Therefore, exporters have limited opportunities to influence the price and, accordingly, the level of income.

The smaller the share of processing and manufacturing industries, the lower the productivity of the economy. As a result, the level of wages decreases, which in turn leads to a decrease in domestic demand and negatively affects economic growth.

In the economic literature, there are such concepts that determine the raw material dependence of the country – "resource curse" and "Dutch disease". The first one is also known as the "poverty paradox" or "paradox of plenty". The key idea of the "resource curse" is the following – the countries with rich deposits of natural resources (fossil fuels, ores, minerals) under certain conditions have lower economic growth, a lower level of development, and democracy than resource-poor countries.

The concept of "Dutch disease" means the dependence of the economy on the export of one or two types of raw materials, which form the main income of the country. Instead, the development of own production is low, and therefore domestic demand is ensured at the expense of imported goods and services. The term originated in 1977 to describe the backwardness of the manufacturing and processing sectors of the economy in the Netherlands following the discovery in 1959 of a large natural gas field in Groningen.

Let's consider step by step the mechanism of action of the Dutch disease.

1. The price of fuel fossil natural resources on the world market is high. Therefore, a country (in that case – the Netherlands) with large reserves of fuel resources exports resources to the world market.

2. Due to the increase in exports, there is an inflow of foreign currency to the country. As a result, the demand for the national currency increases. Therefore, the nominal and real exchange rate of the national currency strengthens.

3. If the national currency strengthens, the import price decreases. As a result, imported goods become more attractive, and accordingly their volume increases. On

the other hand, the export of goods (except for raw materials) is not profitable. Thus, there is a decrease in the indicator of net exports and the predominance of imports.

4. The export of raw materials stimulates the development of the mining industry and the decline of processing and production capacities.

5. The inflow of foreign currency leads to an increase in the income of the population. In the case of the Netherlands, a political factor also played an important role - the government increased the level of wages for its own benefit. However, this increase was not ensured by the real growth of the economy.

6. With the growth of the population's income, the service sector may develop for a certain period of time. As a result, the level of GDP may remain at the previous level or even grow slightly. Such a factor masks the problem of production reduction, following the example of masking the Dutch disease.

7. The growth of incomes and the level of wages increases the aggregate demand for goods, which cannot be provided by the available supply on the market. Thus, inflationary processes occur.

In our opinion, the “resource curse” and “Dutch disease” processes described above are observed in the Ukrainian market. The resource orientation of the economy leads to a deepening of the raw material recession and inhibition of the technological or innovative development of the national commodity market.

Further, the export-import structure of services will be considered and analyzed. To begin with the export of services (Figure 2.11).

The largest share of export services is transport -41%. From the subcategory of this article, 13.1% are air transport services, 12.7% are pipeline transport services, and 4.7% are sea transport. The sphere of telecommunications and information technology services is 30%, mineral resource processing services - 12%, and business services are 11%. The latter include professional and consulting services -5.5%, scientific and technical services – 2,4%, research and development services - 1.2%, and other business services – 1,1%.

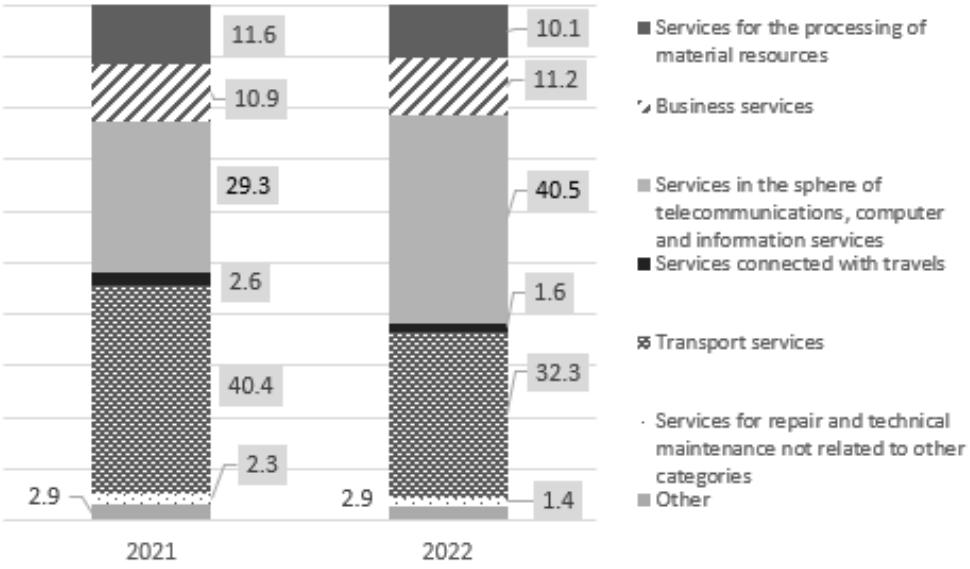

Figure 2.11. Structure of export by types of services in 2021 and 2022

Sources: compiled by the author based on the (SSSU, 2023b)

Thus, as of 2021, before the start of a full-scale war, Ukraine had a developed air transport system. Pipeline transportation services are explained by the large transit of fuel resources and the export of raw materials. This is also related to the processing of raw materials. The field of software and telecommunication services has a high potential, business services have a much smaller potential.

The total export of services decreased by 28.2% in 2022 compared to the previous year and amounted to 9.2 billion U.S. dollars. The structure of export of services in 2022 was as follows (the largest sections):

- 40.5% - computer and information services;

-32.3% transport services;

-11.2%- business services;

-10.1% - services for the processing of material resources.

The structure of the import of services is depicted in Figure 2.12. Similar to exports, the largest item is transport services - 23%. However, in this case, sea transportation prevails. This can be explained by the presence of a large water area of the sea and the transportation of goods by sea. Other important articles are services related to travel - 21% and business services - 15%. Separately, it is worth paying attention to state and government services, the share of which is 14%. These services

were purchased by the government for its needs to provide state operations. There is a wide range of such services. For instance, technology, consulting, foreign projects. It should also be noted that 3.6% of the share of services related to the usage of intellectual property consists of licensing services and 3% to the use of a trademark.

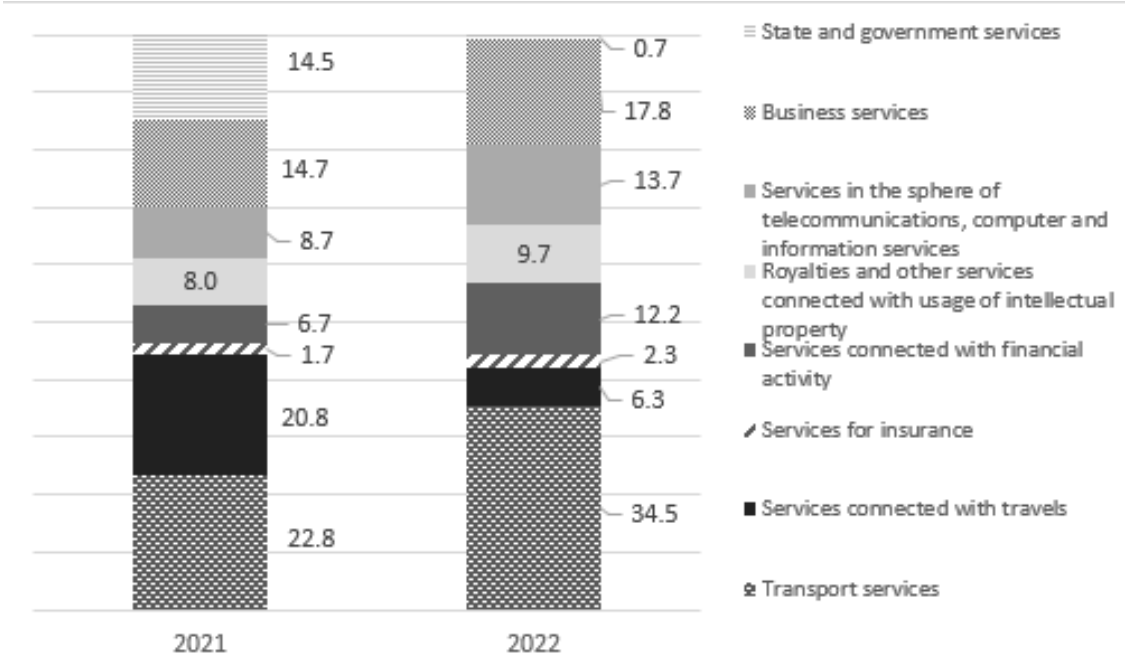

Figure 2.12. Structure of import by types of services in 2021 and 2022

Sources: compiled by the author based on the (SSSU, 2023b)

Summarizing the export-import structure of services, the following conclusions can be drawn. Before the war, Ukraine had a developed transport system and provided transportation air services. Transport services are the largest items of export and import. From our point of view, this is related to the sale of raw materials, and the transportation of fuel resources to Europe due to a favorable geopolitical position. Ukraine has the potential to provide programming and telecommunication services, which can be developed further. In addition, it is worth improving the field of consulting and business services. Licenses, franchises, and trademarks constitute a significant share of imports. This indicates the absence of own national enterprises and the predominance of international organizations.

The import of services in 2022 amounted to 3 billion U.S. dollars. Compared to 2021, the import of services decreased by 61.2%. The biggest drop occurred in Kyiv city (-33.1 p.p.), Kyiv region (-1.7 p.p.), Donetsk region (-1. p.p.), Dnipropetrovsk

region (-1.7 p.p.) and Odesa (-1.9 p.p.) regions (ME, 2023). According to the structure of the types of import of services, the following three are the largest: transport services (34.5%), business services (17.8%), computer and information services (13.7%) and services related to financial activities (12.2%).

According to the results of the export-import analysis of goods and services, it can be stated that before the war, Ukraine remained a country with a raw material-oriented economy. This has disadvantages for the development, scientific growth, and stimulation of own production facilities. The export of goods and services is insufficient to pay for the import of goods and services and the country becomes more of a consumer than a producer. This trend leads to an increase in external debt. As a rule, financing this deficit is possible due to obtaining loans from abroad or selling capital financial assets to foreigners. Simultaneously, Ukraine has the potential to produce more of its own goods. Furthermore, the level of IT services exported is high and can be further developed together with the improvement of financial services.

This a short reminder that the military year 2022 will be analyzed separately. Because it is important to determine the peculiarities of the Ukrainian economy in the pre-war period and after. Next, the geographical structure of foreign trade would be considered below. To begin the analysis from the presentation of the main-trade partners in export (Figure 2.13). In advance, we should note that the data are given as a percentage of the volume of export/import to the total turnover for all countries. The graph shows that the largest share of goods is exported to China (11.33%). One reason is China's rising demand for agricultural products due to its growing population and increased need for food. In addition to this, mineral raw materials are exported for the manufacture of finished products, which are then imported back.

The main goods exported (7.68%) to Turkey are grains, sunflowers oil, iron and steel, chemicals, and machinery. Before the war in 2022, the trade relationship between Ukraine and Turkey has grown. To Poland Ukraine also exports (6.48%) grains and steel, but also wood products, mineral fuels, and equipment. Other export partners of the country are Spain, Italy, and Netherlands.

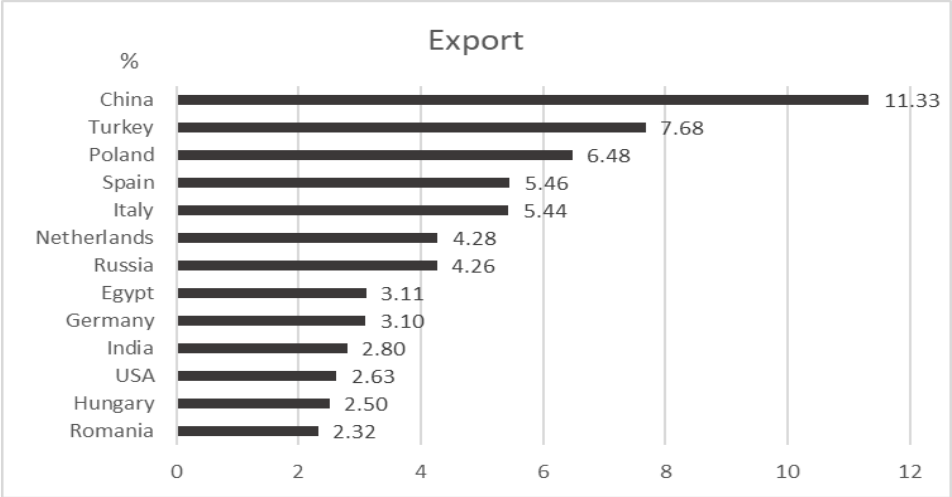

Figure 2.13. Geographical structure of export of goods in January 2022

Sources: compiled by the author based on the (SSSU, 2023a)

So, the highest demand for Ukrainian goods is on the Chinese and Turkish markets due to high quality of products and lower prices compared to domestic.

Further would be considered the geographical structure of import (Figure 2.14).

Similar to the export structure, the largest share of imported goods come from China (16.98%). However, in our opinion, this phenomenon is negative - when a country exports raw materials, and instead, imports finished products made from these raw materials. The next importers are Russia (10.25%) and Belarus (8.72%). I will allow myself to use a short emotional statement that, unfortunately, until January 2021, the share of these countries exceeded the percentage of imports with European countries. Unfortunately, because even despite the war that began in 2014, Ukraine has not clearly changed the vector of trade cooperation.

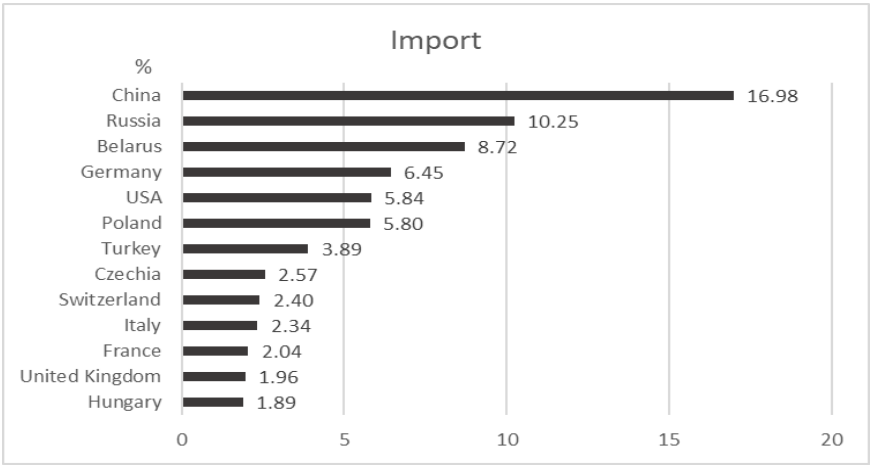

Figure 2.14. Geographical structure of import in goods in January 2022

Sources: compiled by the author based on the (SSSU, 2023a)

For the economy, trade with these countries had its short-term advantages, such as cheap goods compared to European ones. However, in the long term, such a policy of the government and business, in our opinion, inhibits any economic development, increases dependence on these countries, and makes one's own political independence impossible. The year 2022 was a confirmation of the fallacy of cooperation with these countries.

Other major importers are Germany (6.45%), the USA (5.84%), and Poland (5.80%). It is important to further develop trade relations with these countries. This will contribute to faster integration and improvement of national goods. This is especially important to meet the requirements for joining the EU.

2022 turned out to be the most tragic year for Ukrainians. The war caused enormous damage to the economy, infrastructure, trade, and manufacturing sectors. Access to the statistics of some trade indicators is publicly limited for objective reasons. However, it is possible to describe the main changes (Figure 2.15).

The main reasons for the decrease in exports are the violation of critical infrastructure facilities and the shortage of electricity for producers, low harvests, closure or removal of businesses from the war zone, population migration, and logistical difficulties.

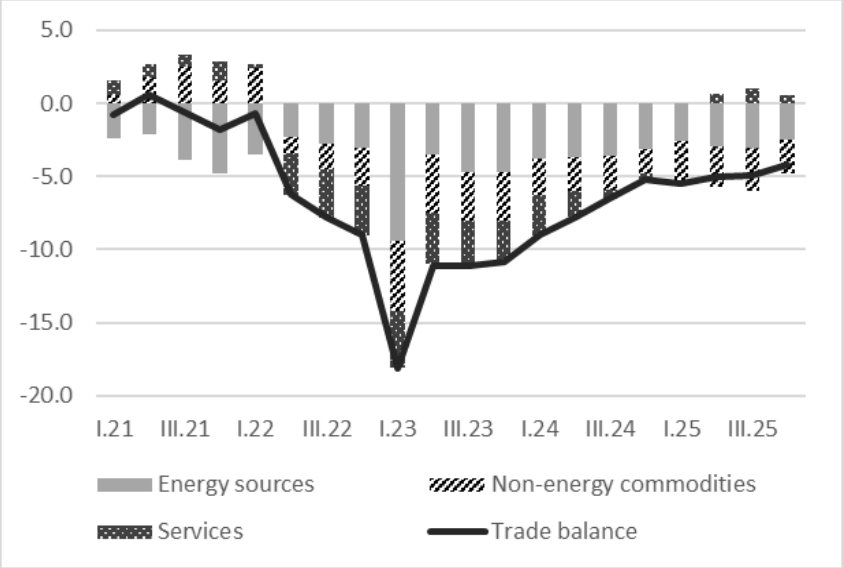

Figure 2.15. The trade balance of Ukraine in 2022 and its forecasting

Sources: compiled by the author based on the (NBU, 2023d)

A separate problem was created by representatives of the Russian Federation with the passage of ships through the "grain corridor". Positive adaptations in war conditions are the search for new logistical transport routes, relocation of production facilities, provision of enterprises with electric generators.

It is predicted that during 2023 there will continue to be a reduction in exports due to the war factor, global recession, logistical problems, electricity shortages, etc.

The reverse situation is the growth of imported products. Due to the attacks on the energy infrastructure, the import of generators, accumulators, and batteries increased from 3.3% in 2021 to 17%. It also happened thanks to the exemption of these goods from customs payments. High demand remains for petroleum products, recovery equipment, food, and industrial goods.

Considering such structural changes in exports and imports, the deficit of the trade balance reached the lowest value since 2013 - 14.6 billion dollars. The recovery and renewal of the trade balance would be moderate and not so quick regarding the huge losses. It all depends on the stage of the war and how quickly the Ukrainians will win. So, in the best-case scenario, the recovery will start in 2024. In addition to this, the enormous role plays the foreign assistance from the world. This might accelerate progress and development. Let’s consider the main directions of the increasing of the trade balance and export-import facilities.

When Ukraine wins, in our opinion, it is worth investing in such directions, which are presented below. Furthermore, the strategy of rebuilding should already be developed.

1. To develop one's own real sector of the economy, create diversified products and attract new innovative technologies. Ukraine has all the necessary conditions for this: resources, and the territorial opportunity to build new plants and factories.

2. Invest in the science, and education of highly qualified specialists.

3. Stimulate the return of labor migrants and ensure a high level of wages (for the first time, the source of financing is international aid).

4. Cooperate with foreign cities and companies so that their production facilities are placed on the Ukrainian market. For example, representatives of the

automobile industry. However, the main attention should be paid to the protection of national manufacturers and their products.

5. Search for new trade partners to establish new trade relations.

6. To produce certified products of a high level, so that in the future manufacturers do not lose their competitive positions during integration into the EU, as happened in Greece or Poland.

7. Support the development of small businesses through effective taxation.

Now Ukraine is going through unique times with a lot of terrible things. Notwithstanding the war, it is worth determining the direction of economic expansion and the strategic vector of integration. In this work, we propose to develop and invest in national production and the real sector, the domestic market. It is worth starting with such niche industries as the high-tech production of airplanes, oil pipelines, railway locomotives, wagons, and cars. At the same time, it is necessary to develop a light industry - to produce one's own clothes, food products, etc. The events of 2022 and the assistance from all over the world are a unique opportunity for reconstruction, rebuilding, and investing in the new type of economy.

CHAPTER 3 MODELING OF THE DYNAMIC BEHAVIOUR OF THE UKRAINIAN TRADE POSITION UNDER THE DIFFERENT REGIMES OF EXCHANGE RATE POLICY

3.1 The development of a VAR model for forecasting and explaining the trade competitiveness of Ukraine

The VAR (Vector Autoregressive) model was chosen to represent the main relationships between variables and build a forecast of the key macro indicators of the trade competitiveness of Ukraine. This model is based on the reproduction of the dynamics of the time series based on its historical values, and long-term memory of series. Thus, a feature of these models is a high empirical level. This tool is primarily focused on obtaining forecast values of time series. However, by performing the analysis of impulse responses and decomposition, it is possible to reveal the detailed relationship between the variables. Let's consider the name of this toolkit in more detail. The word “vector” means the modeling of two or more time series, and the word “autoregression” characterizes the inclusion of lag values of each model variable.

VAR models have many hybrids, for instance, BVAR, SVAR, VECM... If VAR model reflects a shorter-term forecast, then hybrids can describe the long-term relationship between variables.

Since it was important to investigate the short-term forecast and analyze the relationships between the variables, therefore, the VAR model was chosen. Let's move on to the first stage of building the model - data selection and preparation.

Variables that were included in the model:

- Real effective exchange rate (REER) that shows the competitiveness of national products and services relative to foreign ones. Unit – dimensionless (index);
- Net export (NET_EXP) is the difference between the export volume of the country and its import. Previously, the time series were seasonally adjusted and the data growth rate was taken. Unit – dimensionless;

- Policy rate (POLICY_RATE) is the key rate of the Central Bank that represents the impact of monetary policy on trade in the model. Unit - percentage;
- Consumer price index (CPI) that reflects the annual percentage change in prices of goods and services. Unit - percentage;
- Exchange rate (EX_RATE) is important to include because that affects the relative price of goods between countries and plays an essential role in trade. Unit – UAH/USD;
- Industry index (INDEX_IND), which describes the change in the volume of manufactured products relative to the base period. Unit – dimensionless (index);
- Reserves (RESERVES), the amount of gross international reserves of the Central Bank of Ukraine. Unit – billion USD.

The 7-time series mentioned above were chosen to build the model. The sources for them are the official statistics from the National Bank of Ukraine (NBU, 2023c) and the State Statistics Services of Ukraine (SSSU, 2023c). The sample research period is from the first month of 2010 to the 12th month of 2022 (2010M01 2022M12). The number of observations is 156 for each time series. The forecast period is until December 2023 (2023M12).

Previously, the all-time series was checked for seasonality. For this, the ACF and PACF correlogram was considered. Sinusoidal oscillations are one of the signs of seasonality. In addition, 12, 24, and 36 lags were statistically significant for certain time series. Therefore, taking into account the presence of seasonality in such time series as net exports, a seasonal adjustment was used.

The next step is to test all time series for stationarity. Since only stationary series can be applied to the VAR model. To do this, it is necessary to check the Dickey-Fuller test and perform Unit root Test in the EViews. The results are depicted in Figure 3.1.

Null Hypothesis: Unit root (individual unit root process)
Series: REER, CPI, EX_RATE, NET_EXP, INDEX_IND, POLICY_RATE, RESERVES
Date: 04/08/23 Time: 12:47
Sample: 2010M01 2022M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Total number of observations: 1084
Cross-sections included: 7

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-5.73978	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Series	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
REER	-2.0984	0.2457	-1.532	0.735	0	13	155
CPI	-5.9326	0.0000	-1.532	0.735	0	13	155
EX_RATE	-0.0014	0.9563	-1.532	0.735	0	13	155
NET_EXP	-12.793	0.0000	-1.532	0.735	0	13	155
INDEX_IND	-0.1698	0.9384	-1.532	0.735	0	13	155
POLICY_RATE	-1.7012	0.4287	-1.530	0.745	1	13	154
RESERVES	-1.0581	0.7314	-1.532	0.735	0	13	155
Average	-3.3934		-1.532	0.736			

Figure 3.1. Dickey-Fuller test in Level

Sources: compiled by the author

According to the obtained results, it can be concluded that only two time series are stationary in levels - Net export (NET_EXP) and Inflation (CPI). Since the probability of the series < 0.05. The rest of the time series is not stationary in levels. Therefore, we further perform this test in the first differences, which are presented in Figure 3.2.

Null Hypothesis: Unit root (individual unit root process)
Series: REER, CPI, EX_RATE, NET_EXP, INDEX_IND, POLICY_RATE, RESERVES
Date: 04/08/23 Time: 12:47
Sample: 2010M01 2022M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 4
Total number of observations: 1070
Cross-sections included: 7

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-28.2891	0.0000

** Probabilities are computed assuming asympotic normality

Intermediate ADF test results

Series	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
D(REER)	-11.103	0.0000	-1.530	0.745	1	13	153
D(CPI)	-9.9470	0.0000	-1.512	0.761	3	13	151
D(EX_RATE)	-11.233	0.0000	-1.532	0.735	0	13	154
D(NET_EXP)	-10.357	0.0000	-1.495	0.771	4	13	150
D(INDEX_IND)	-11.783	0.0000	-1.532	0.735	0	13	154
D(POLICY_R...	-10.145	0.0000	-1.532	0.735	0	13	154
D(RESERVES)	-10.712	0.0000	-1.532	0.735	0	13	154
Average	-10.754		-1.524	0.745			

Figure 3.2. Dickey-Fuller test in First Difference

Sources: compiled by the author

As a result, in the first differences in values probability, all other previous series (REER, POLICY_RATE, EX_RATE, INDEX_IND, RESERVES) are stationary. Therefore, the CPI and NT_EXPORT time series are stationary in levels (d = 0), and the other time series are stationary in first differences (d= 1).

Cointegration occurs when two or more variables have long-term relationships. The main prerequisites for availability cointegration relationship – non-stationarity of time series and is the same order of integration. Since a cointegration relationship cannot arise between time series of a different order of integration, the next step is the specification of a VAR model.

Firstly, it was necessary to determine the optimal number of lags to include in the model. For this, the Lag Exclusion Tests and the Lag Length Criteria test were used. Let's start with the presentation of the last test. It is important to correctly set the maximum number of lags, which is 10% percent of all observations. In our case, it is 15 (out of 153 observations). The obtained results are shown in Figure 3.3.

VAR Lag Order Selection Criteria
Endogenous variables: D(REER) CPI NET_EXP D(POLICY_RATE) D(RESERVES)
Exogenous variables: C D(INDEX_IND)
Date: 04/08/23 Time: 12:52
Sample: 2010M01 2022M12
Included observations: 140

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-957.7224	NA	0.694357	13.82461	14.03472	13.90999
1	-890.1775	128.3353	0.378270	13.21682	13.95223*	13.51567
2	-855.5179	63.37762	0.330070	13.07883	14.33953	13.59114
3	-823.2898	56.62933	0.298856	12.97557	14.76157	13.70134
4	-800.0768	39.13049	0.308770	13.00110	15.31239	13.94034
5	-772.9557	43.78120	0.302967	12.97080	15.80738	14.12350
6	-756.2525	25.77063	0.346816	13.08932	16.45120	14.45549
7	-730.5267	37.85372	0.351275	13.07895	16.96612	14.65858
8	-623.0276	150.4988	0.111493	11.90039	16.31286	13.69349
9	-546.6028	101.5357	0.055675*	11.16575	16.10351	13.17231*
10	-529.4912	21.51168	0.065583	11.27845	16.74150	13.49847
11	-500.7415	34.08898	0.066263	11.22488	17.21322	13.65836
12	-459.2684	46.21288*	0.056664	10.98955*	17.50319	13.63650
13	-439.8337	20.26758	0.067559	11.06905	18.10798	13.92946
14	-425.7907	13.64179	0.088809	11.22558	18.78981	14.29946
15	-397.2054	25.72675	0.097178	11.17436	19.26388	14.46170

Figure 3.3. Lag Order Selection Criteria

Sources: compiled by the author

The optimal length of the lags is determined at the same time for 5 information criteria – LR (sequential modified LR test statistic), FPE (Final prediction error), AIC (Akaike information criterion), SC (Schwarz information criterion), HQ (Hannan-Quinn information criterion). According to two criteria (FPE and HQ), the optimal number of lags is 9, respectively the other two (LR and AIC) have a maximum length of 12, while SC has a maximum length of 2. In this case, we will include all 12 lags, and then apply the exclusion test lags - Lag Exclusion Tests.

The main indicator of the lag exclusion test is Prob Joint. In the testing process, not all lag with p-value could be included in the model. The final result is presented in Figure 3.4.

VAR Lag Exclusion Wald Tests
Date: 04/08/23 Time: 12:53
Sample (adjusted): 2010M11 2022M12
Included observations: 146 after adjustments

Chi-squared test statistics for lag exclusion:
Numbers in [ ] are p-values

	D(REER)	CPI	NET_EXP	D(POLICY_...	D(RESERVES)	Joint
Lag 1	15.83063 [0.0073]	113.2013 [0.0000]	22.05920 [0.0005]	17.92749 [0.0030]	7.262169 [0.2019]	184.9613 [0.0000]
Lag 2	9.583968 [0.0879]	16.27622 [0.0061]	10.92789 [0.0528]	10.84307 [0.0546]	10.39725 [0.0647]	68.50767 [0.0000]
Lag 3	12.00253 [0.0348]	23.01072 [0.0003]	3.993919 [0.5503]	12.81845 [0.0251]	6.507668 [0.2599]	58.48068 [0.0002]
Lag 6	10.60516 [0.0598]	5.802659 [0.3259]	33.22948 [0.0000]	6.817974 [0.2345]	10.50497 [0.0621]	65.78080 [0.0000]
Lag 7	18.64598 [0.0022]	14.65936 [0.0119]	22.64574 [0.0004]	3.702903 [0.5929]	9.012021 [0.1086]	85.81123 [0.0000]
Lag 8	10.91723 [0.0530]	20.65143 [0.0009]	42.15989 [0.0000]	8.267995 [0.1421]	20.33487 [0.0011]	101.8758 [0.0000]
Lag 9	8.534415 [0.1291]	9.915246 [0.0777]	94.95189 [0.0000]	23.41611 [0.0003]	16.26373 [0.0061]	163.1180 [0.0000]
df	5	5	5	5	5	25

Figure 3.4. Lag Exclusion Wald Tests

Sources: compiled by the author

It can be seen from the figure that lags 4 and 5 were not included in the model. Since the Joint value for other lags is less than 0.05 or absolute zero, there is no need to discard the lags. However, it is worth noting that for some variables the lag probability is greater than 0.05. However, the overall p-value allows such lags to be included in the model. The next stage was the definition of exogenous and endogenous variables.

A Granger test was performed to determine which of the variables could be exogenous. The test results are shown in Figure 4.1 in Appendix A. Only one variable becomes an exogenous – Index Industry. The probability value was more than 0.05. The theoretical explanation is that the industry does not affect the REER directly. The greater impact has macro indicators such as the exchange rate or policy rate. Other variables remained in the endogenous block. Thus, the final specification is shown in Table 3.1.

Table 3.1. VAR Specification

Parameters	***Value***
VAR type	Standard VAR
Estimation sample	2010M01 2022M12
Endogenous variables	d(reer) cpi net_exp d(policy rate) d(reserves)
Lag Intervals for Endogenous	1 3 6 9
Exogenous variables	c d(index_ind)

Sources: compiled by the author.

It can be seen from the figure that the number of lags is 7 (except 4th and 5th), the index industry is exogenous variables and others are endogenous, and the type of model is Standard VAR.

An important stage for determining the adequacy of the constructed VAR model is checking the residuals for white noise, as well as the normality of the distribution and for the presence of serial correlation. Let's start with the Dickey-Fuller test for residuals models that are tested exclusively in levels. The results is depicted in the Figure 3.5.

Method		Statistic	Prob.**
Im, Pesaran and Shin W-stat		-29.2157	0.0000
Im, Pesaran and Shin t-bar		-12.7335	
T-bar critical values ***:	1% level	-2.40000	
	5% level	-2.15000	
	10% level	-2.01000	

** Probabilities are computed assuming asympotic normality
*** Critical values from original paper

Intermediate ADF test results

Series	t-Stat	Prob.	E(t)	E(Var)	Lag	Max Lag	Obs
RESID01	-12.550	0.0000	-1.532	0.735	0	13	145
RESID02	-13.454	0.0000	-1.532	0.735	0	13	145
RESID03	-12.568	0.0000	-1.532	0.735	0	13	145
RESID04	-12.548	0.0000	-1.532	0.735	0	13	145
RESID05	-12.548	0.0000	-1.532	0.735	0	13	145
Average	-12.733		-1.532	0.735			

Figure 3.5. Dickey-Fuller test for residuals

Sources: compiled by the author

According to the test results, it can be seen that there are residuals of each separate equation stationary because Prob <0.05. Also, overall Prob value < 0.05. Therefore, the residuals of the constructed VAR model are white noise.

An important indicator of checking the distribution of residuals is when the roots of the characteristic polynomial lie within the boundaries of the unit circle (Figure 3.6).

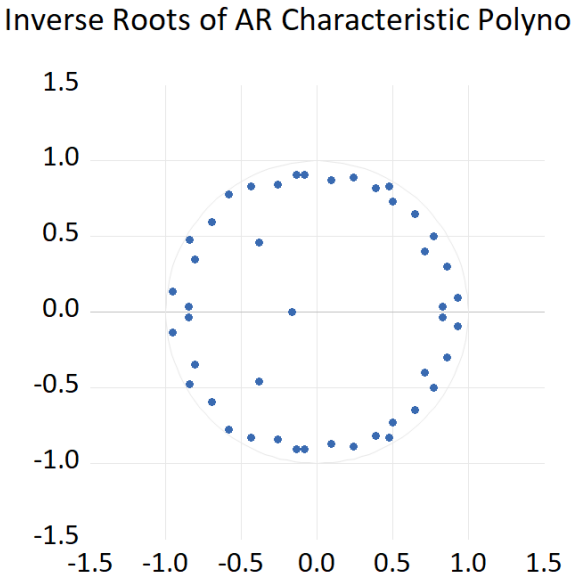

Figure 3.6. AR Characteristic Polynomial

Sources: compiled by the author

The graph illustrates no root lies outside the unit circle. So, VAR satisfies the stability condition. A serial correlation test showed (Figure 3.7) that it was absent.

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	18.96494	25	0.7988	0.754130	(25, 354.4)	0.7991
2	24.29179	25	0.5026	0.973076	(25, 354.4)	0.5031
3	43.10366	25	0.0136	1.772297	(25, 354.4)	0.0137
4	29.98357	25	0.2249	1.210571	(25, 354.4)	0.2254
5	25.14050	25	0.4545	1.008255	(25, 354.4)	0.4550
6	16.72227	25	0.8916	0.662901	(25, 354.4)	0.8918
7	17.27576	25	0.8715	0.685364	(25, 354.4)	0.8718
8	22.66704	25	0.5970	0.905957	(25, 354.4)	0.5975
9	16.47058	25	0.9001	0.652697	(25, 354.4)	0.9003

Figure 3.7. Dickey-Fuller test for residuals

Sources: compiled by the author

Based on the conducted residual evaluation tests, it can be concluded that the built VAR model is adequate and therefore it is possible to proceed to the next stage - construction of the impulse response function and dispersion decomposition.

Impulse response functions (Figure 3.8) examine the sensitivity of model indicators on the effect of shocks. For example, how and how much one variable will change under the influence of another change.

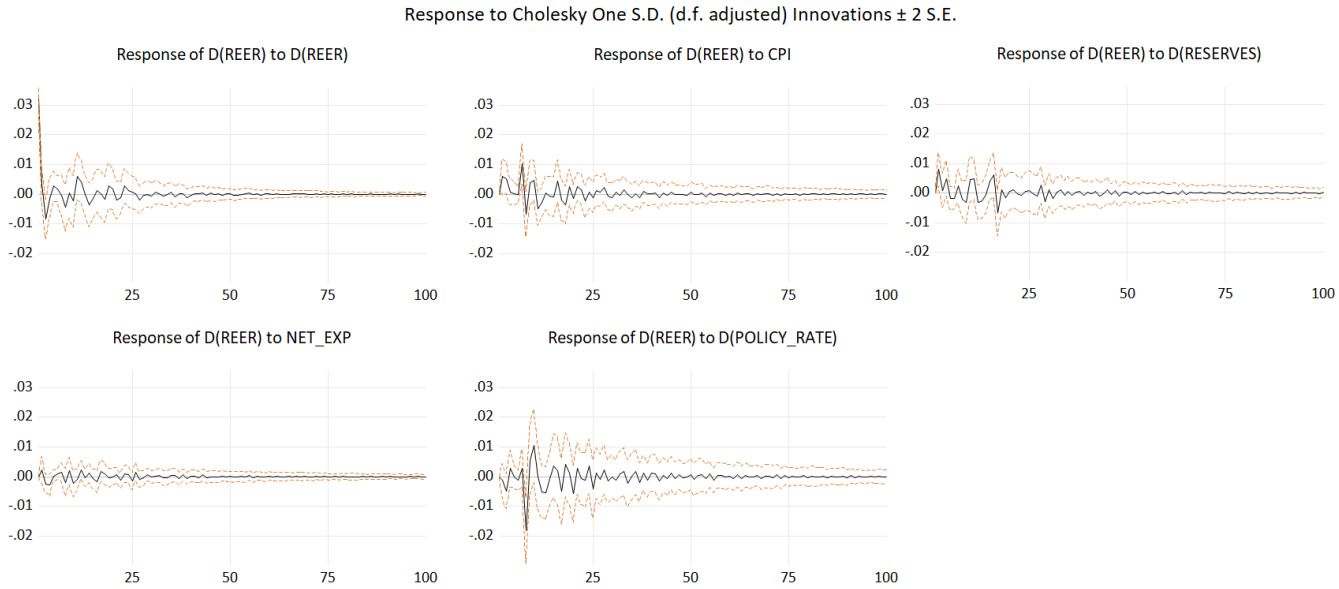

Figure 3.8. Impulse Response to Cholesky One S.D. (d.f. adjusted) Innovations

Sources: compiled by the author

In this research paper, we will consider the sensitivity of the REER, which determines the competitive positions of domestic manufacturers in response to a change, and the presence of a shock in the main indicators of the model. Firstly, it is worth noting that the impulse response function has a downward damping effect. The model constructed in this way is stable and adequate. However, it is also worth paying attention to the fact that attenuation occurs in the long term. That is, the effect of shocks has a long-term effect on destabilizing the equilibrium. Let us consider in more detail the behavior of the REER on the response of included variables.

The biggest deviation from equilibrium causes its own shock in the REER. In addition, the effect is the highest. However, attenuation is the fastest. Hence, the self-shock causes the largest deflection and at the same time the fastest decay.

The shock in inflation (CPI) does not cause significant deviations. However, the dynamics of influence are quite volatile and long-lasting. The net export (NET_EXP) variable has the smallest impact. Deviations in the model from equilibrium are insignificant. One important variable is the policy rate.

A shock in the rate initially has a smaller effect on REER, but subsequently increases, disturbing the state of equilibrium. Accordingly, attenuation is more long-lasting. This situation can be explained by the fact that the policy rate does not have a direct impact on the REER but has an impact through other macro-instruments such as the exchange rate, capital investments, and others. For example, with an increase in the policy rate, the attractiveness of investments in the national currency increases, as foreigners can get a higher return on their own investments, and the demand for the national currency increases accordingly. In this way, the appreciation of the currency takes place in accordance with other currencies, and competitiveness increases. However, such a mechanism operates with a certain time lag, which is why the greatest deviation does not occur in the first periods.

A shock in reserves does not lead to significant fluctuations. However, the impact is also long-lasting. The volume of reserves provides a certain buffer, and increased volumes raise confidence in the currency by reducing the risk of default. As a result, this leads to an appreciation of the REER.

To conclude, the largest deviation of the system from the equilibrium state causes a shock in the REER, and the least - net export. One important variable is the impact of the policy rate in addition to such variables as reserves.

The next stage of model building is the modeling of the variance decomposition. When constructing the decomposition, similar to the impulse response function, the order of the variables is essential. Since different combinations can produce different results, it is important to understand the theoretical rationale for modeling. The decomposition results are presented in Figure 3.9.

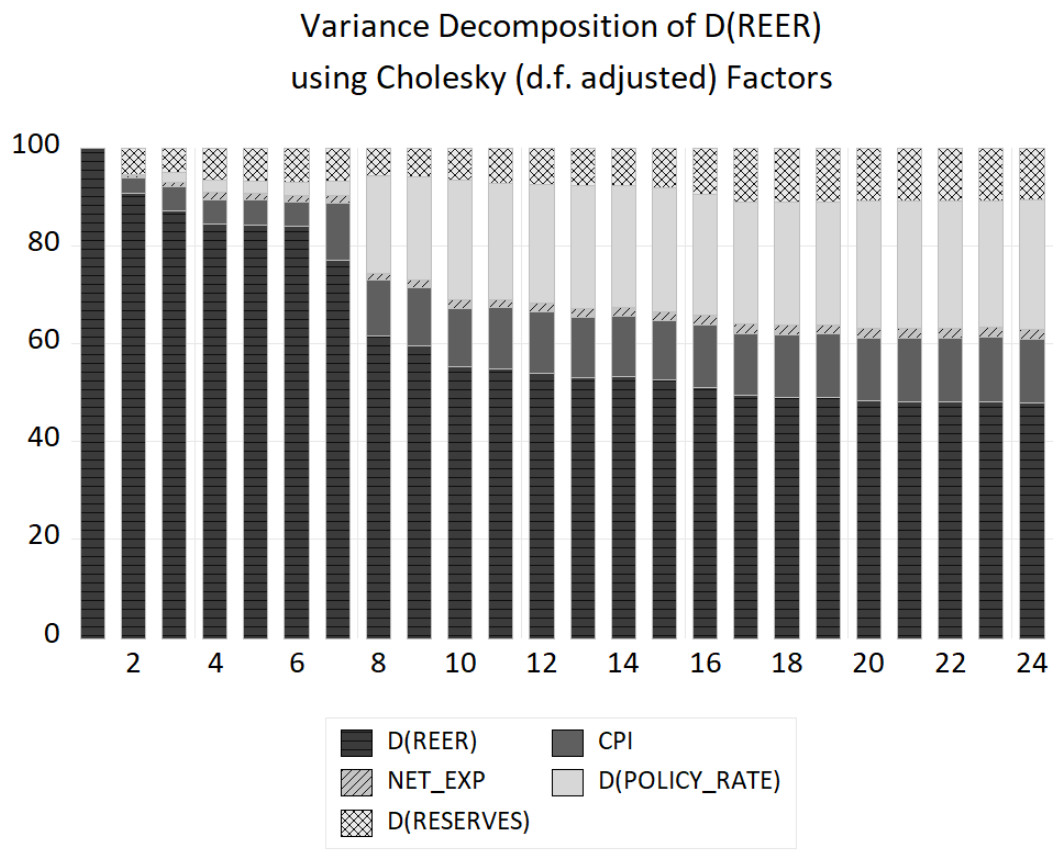

Figure 3.9. Variance Decomposition of REER

Sources: compiled by the author

From the dynamics of the influence of the variables included In the model (recall that the index industry is an exogenous variable), it can be seen that at the end of the period, the policy rate has the greatest influence - 26%, followed by inflation - 13% and reserves - 11%. The influence of net exports is the smallest - 2%. Data dynamics variables increased over time, significant changes occurred in the 8th period. This behavior can be explained by different exchange rate regimes and the corresponding policy rate of the central bank. Thus, when the exchange rate was fixed, the effect of the policy rate on the competitiveness of goods was insignificant. However, under floating exchange rates, the role of the rate has increased.

Firstly, we briefly note why a flexible exchange rate is beneficial for the competitiveness of goods. Under the conditions of such an exchange rate regime, currency devaluation or strengthening can maintain trade competitiveness. For example, under conditions of a trade deficit, a decrease in the exchange rate of the national currency can make exports more attractive and vice versa. Secondly, under

the conditions of a flexible exchange rate, the policy rate can influence such macro indicators as inflation, investments, etc., which in turn can strengthen the exchange rate and increase competitiveness. Instead, a fixed exchange rate uses the policy rate to maintain the peg. Therefore, the impact of the policy rate, which is also confirmed by the results of impulse functions, has a significant impact on the competitiveness of national producers and their international position.

The goal of modeling is to build a forecast. However, since the model contains one exogenous variable - the index industry. It is worth first indicating the predicted values based on assumptions and theoretical justifications. The main assumptions are based on the survey on the business activity of enterprises, which was conducted on April 3, 2023 (NBU, 2023a). Respondents believe that business activity will reach an equilibrium level due to improvements in the logistics situation, consumer sentiment, energy, and the external environment. However, of course, the factor of war, great destruction a,nd physical restrictions for producers remain. Based on this information, it was assumed that the industrial index will grow, but at a very low rate. The set values are shown in Table 3.2.

Table 3.2. Forecast values of the index industry

Time	***Value***
2023M01	55
2023M02	56
2023M03	58
2023M04	60
2023M05	61
2023M06	65
2023M07	65
2023M08	63
2023M09	64
2023M10	67
2023M11	68
2023M12	67

Sources: compiled by the author.

Based on the given values for the exogenous variable. Let's move on to the built forecast, which is shown in Figure 3.10.

Figure 3.10. Predicted values of variables according to the VAR model

Sources: compiled by the author

According to the obtained results, it can be concluded that the value of REER as the main indicator of competitiveness will decrease at the beginning of the year. This means that exports will become more attractive. This indicator will increase in the second quarter, which indicates the deterioration of the country's trade competitiveness. Then a slight fluctuation will be observed.

Inflation will rise sharply at the beginning of the year and then decline, although fluctuating dynamics will also persist. The dynamics of net exports reflect a mutual and logical change with the REER. For example, when REER falls, exports become more attractive, and accordingly, net exports will grow and vice versa. The change in the policy rate is related to the change in the number of reserves. It is expected that the policy rate will increase. Since the exchange rate is fixed and the rate will increase, the volume of reserves will decrease. The obtained forecast values are shown in Table 4.1 of Appendix A.

Important indicators are the criteria of predictive quality (Figure 3.11).

Forecast Evaluation
Date: 04/08/23 Time: 13:42
Sample: 2022M01 2023M12
Included observations: 24
Evaluation sample: 2022M01 2023M12
Number of forecasts: 1

Evaluation statistics

Forecast	RMSE	MAE	MAPE	SMAPE	Theil U1	Theil U2
REER	0.011526	0.003327	0.343043	0.350253	0.005754	0.254053

Forecast Evaluation
Date: 04/08/23 Time: 13:41
Sample: 2022M01 2023M12
Included observations: 24
Evaluation sample: 2022M01 2023M12
Number of forecasts: 1

Evaluation statistics

Forecast	RMSE	MAE	MAPE	SMAPE	Theil U1	Theil U2
CPI	0.007596	0.002193	0.002178	0.002178	3.72E-05	0.005848

Forecast Evaluation
Date: 04/08/23 Time: 13:42
Sample: 2022M01 2023M12
Included observations: 24
Evaluation sample: 2022M01 2023M12
Number of forecasts: 1

Evaluation statistics

Forecast	RMSE	MAE	MAPE	SMAPE	Theil U1	Theil U2
RESERVES	0.271340	0.078329	0.290000	0.285040	0.005145	0.163392

Forecast Evaluation
Date: 04/08/23 Time: 13:34
Sample: 2022M01 2023M12
Included observations: 24
Evaluation sample: 2022M01 2023M12
Number of forecasts: 1

Evaluation statistics

Forecast	RMSE	MAE	MAPE	SMAPE	Theil U1	Theil U2
NET_EXP	0.124706	0.035999	2.513940	2.960490	0.050443	0.038854

Forecast Evaluation
Date: 04/08/23 Time: 13:39
Sample: 2022M01 2023M12
Included observations: 24
Evaluation sample: 2022M01 2023M12
Number of forecasts: 1

Evaluation statistics

Forecast	RMSE	MAE	MAPE	SMAPE	Theil U1	Theil U2
POLICY_RATE	0.317937	0.091780	0.384040	0.375390	0.007909	0.029357

Figure 3.11. Forecasted Evaluation of all variables

Sources: compiled by the author

One of the criteria of predictive quality is the minimum mean square of errors (MSE). The optimal forecast is the one that minimizes the average squared forecast errors. Other criteria of predictive quality are MAPE, which defines the absolute mean percentage error as well as the MAE, a criterion Taylor... Let's consider the presented MAPE and MAE, RMSE criteria.

According to the criterion of the average absolute percentage error of MAPE, the predictive quality of the model is good for all indicators (the value is less than 20%).

The MAE (mean absolute error) criterion gives the ability to determine the average value of the error without taking into account the sign. For the model, the MAE value is less than 1, which is not too large a value. So, MAE corresponds to a linear (proportional to error) cost function.

The next criterion is the mean square of the RMSE error (root mean square error). An RMSE value that is less than 1 suggests that despite its difference from zero, the mathematical expectation of the error is probably equal to zero, and the variance is relatively small. That is, the effectiveness of the forecast is good.

Thus, the quality of the forecast developed on the basis of econometrics. There are VAR models according to the analyzed criteria of predictive quality high, which is a good indicator.

3.2 A system-dynamic approach of the exchange rate interaction on domestic production and trade

A system dynamics method was implemented for an in-depth analysis of the mutual influence of the exchange rate and the country's trade indicators. It allows to comprehensively describe the system, considering direct and inverse relationships between variables.

The detailed description of the built system model (Appendix B, Figures 4.2-4.3) is presented in another scientific work developed by the author of this study. This section will present the main relationships between the variables and the key findings of the model.

The CLD (Causal loop diagram) represents the main logic and links in the model, including the feedback structure of the system (Santos et al., 2002).

Figure 3.12 depicts the main balancing and reinforcing loops. Each of them will be considered further.

To begin with B1, the capacity utilization rate shows how efficiently and to what extent the economy uses its resources. In other words, it is the ratio between the output obtained at the current level of resources and the potential output that can be achieved if the production capacity is used to the maximum (Corrado & Mattey, 1997). Larger production capacities contribute to the increase in production volumes, which in turn leads to the accumulation of inventory. It is worth reminding that three main branches of the real sector of the economy are added to the model – manufacturing (the largest of them), agriculture, and the mining industry. Therefore, inventories (like other variables) relate only to these industries. A high level of inventory accumulation reduces the desired future needs in inventory due to the high financial costs of its maintenance, obsolescence, spoilage, and other losses. The identified inventory volume stimulates production.

It is also worth noting that the exchange rate is expressed in the number of hryvnias (national currency in Ukraine) per dollar USA unit (UAH/USD).

The concept of “demand-pull inflation” (B2) arises under conditions of growth in aggregate demand, but with a limited level of supply (its fall or constant level). In the model, this type of inflation is reflected as a ratio of Aggregate Demand to GDP and shows whether supply can or cannot meet growing demand (Curry & Lock, 2022). This type of inflation and cost-push inflation, which shows an increase in the price level due to an increase in production costs (materials, wages, salaries, etc.) are the components of the general level of inflation. Therefore, with the growth of each of them, the overall level of prices in the country increases. As a result, the real aggregate demand decreases due to rising prices.

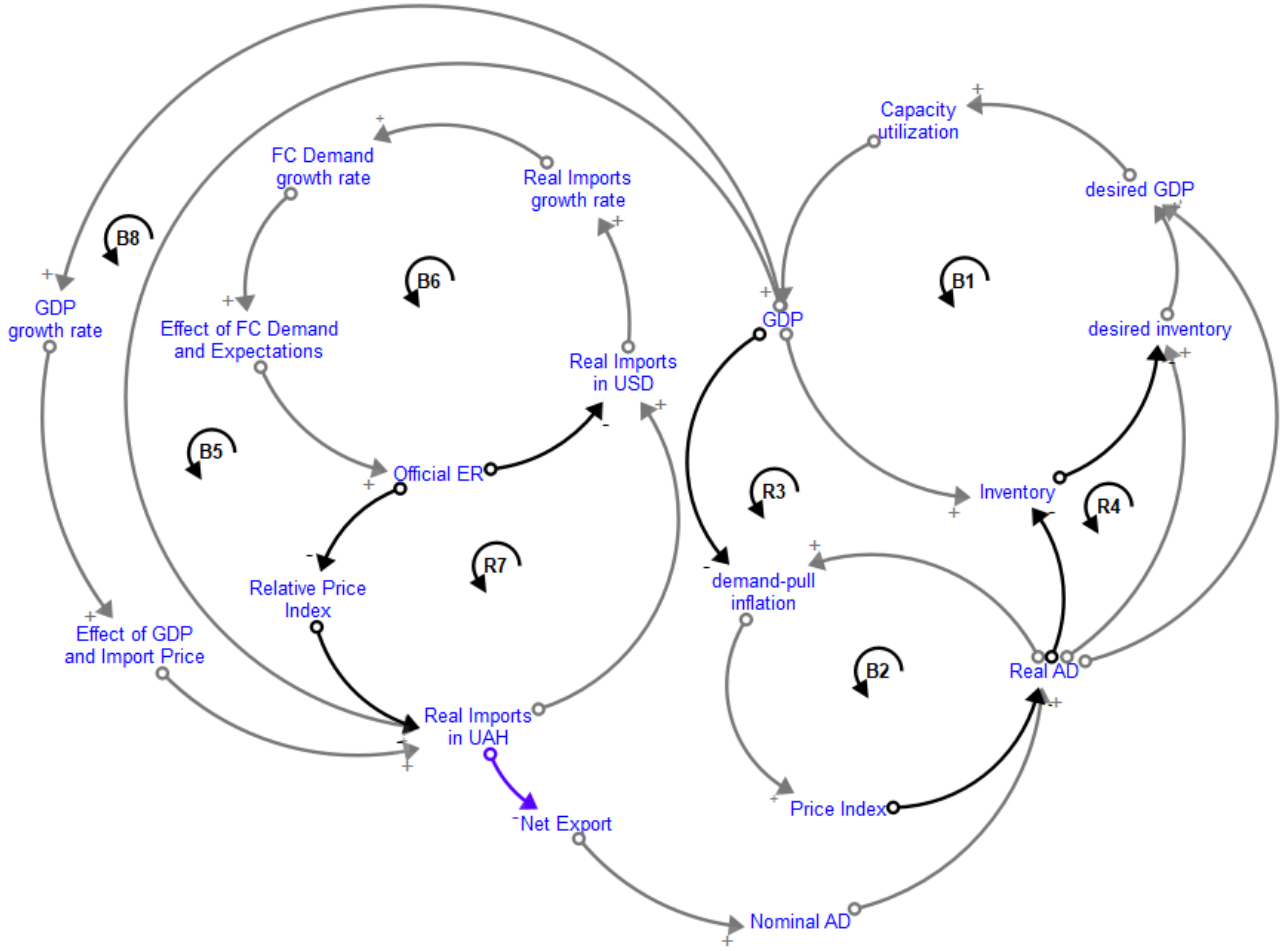

Figure 3.12. The CLD of the interactions of the exchange rate, trade, prices

Sources: compiled by the author

Next, will be considered two loops simultaneously (R3 and R4). R3 – GDP - demand-pull inflation – Price Index – Real AD – desired GDP – capacity utilization – GDP. R4 - GDP -demand-pull inflation – Price Index – Real AD – inventory – desired inventory – desired GDP – capacity utilization – GDP. These loops are based on the two previous ones. However, both are reinforcing.

Loop B5 is a balancing loop. An rising in GDP increases the country's import capacity. Simultaneously, imports volumes have a negative effect on net exports, which is defined as the difference between exports and imports. Net export is a component of Aggregate Demand. Therefore, the increase in net exports has a positive effect on real aggregate demand, which stimulates production and improving capacity utilization.

Import and its growth rate creates demand for foreign currency (B6). The greater the volume of imports, the greater the demand for foreign currency. If the demand for foreign currency increases, then the demand for the national currency decreases relatively. Accordingly, the exchange rate of the national currency falls, the currency devalues. Therefore, when the demand for foreign currency increases, the exchange rate of foreign currency increases. When the exchange rate increases, import prices also grow ceteris paribus. The increase in import prices reduces the incentives to import, and therefore the volume of imports decreases.

Relative price is the ratio of changes in prices on the domestic market in the national currency and on the foreign market in US dollars, adjusted for the exchange rate. The calculation of the relative price is the inverse of the expression of the real effective exchange rate (REER) (Schmitz et al., 2011), which reflects the level of competitiveness of national producers in the market.

Thus, the growth of the national exchange rate means appreciation of the currency (R7). During the appreciation, the foreign currency rate decreases, but the relative price of goods increases. This change means that the price of goods and services in Ukraine becomes higher relative to the price level in the rest of the world. One of the consequences of that changes in the relative price is an increase in import

prices. Importing goods becomes more expensive than domestically produced goods. As a result, import volumes are decreasing. Therefore, the relationship is inverse.

The last loop (B8) describes the relationship between GDP and imports. The growth of production capacity increases the opportunities for imports. However, if there is an increase in imports, the volume of aggregate demand will reduce due to a decrease in net exports. Thus, an excessive increase in imported goods restrains the development of domestic production.

The described links reveal the complexity of the exchange rate interaction system and the real sector of the economy through various channels. The developed model makes it possible to estimate the future dynamics of variables. According to the obtained results, the exchange rate will devalue in the coming years (provided there is a transition from a fixed currency regime to a flexible one), maintaining fluctuating dynamics throughout the forecast period (from 2023 to 2030). The value of imports and volumes of real GDP will also have downward dynamics until the next 3-4 years. However, the implemented policies of the model allow to improve and accelerate the recovery of indicators. Such main policies are the active attraction of international investments, improvement of population expectations and increase of the share of reinvested profit in enterprises of manufacturing industries of the economy. The results of the analysis are presented in more detail in the author's scientific paper.

3.3 Recommendations for improving the competitiveness of producers and strengthening the exchange rate

It is worth starting with the fact that, according to the author, in the post-war period, the optimal exchange rate policy is to return to a floating currency regime. At the beginning of the full-scale invasion in February 2022, the National Bank was forced to fix the course in order to avoid panic and support the economy and financial activity of the country. Such actions had a positive result in the first months of the war. However, in the long term, fixing the exchange rate will lead to deepening of the

country's economic problems. Thus, the exchange rate of the dollar is an indicator of the purchasing power of the population, the level of competitiveness of goods of national producers, inflationary expectations, etc. In the conditions of a fixed foreign currency regime, there is an accumulation of economic imbalances that are not reflected in the dynamics of the exchange rate.

One example of such imbalances is the deterioration of the real exchange rate due to the high level of inflation in Ukraine compared to its trading partners. This leads to the reducing of the competitive advantages of Ukrainian exporters. In addition, there is a lot of pressure on foreign exchange reserves, which are constantly shrinking. Thus, the proposed option is to switch to a free-floating exchange rate within defined corridors to correct significant deviations.

According to the simulation results, the exchange rate will gradually increase, and the level of competitiveness will decrease. However, in the long run, there will be improvement. In general, the REER indicator is not a valid tool capable of influencing the dynamics of external macro indicators or the country's trading position. Such a conclusion can be drawn based on the correlations tables and the results of econometric modeling. However, this indicator is a powerful analytical tool that reflects the level of competitiveness of domestic producers and can be used as an indicator of changes in the positions of producers on the market.

The real sector of the economy and export-import opportunities suffered major infrastructural, logistical, and industrial destruction as a result of the full-scale Russian invasion of Ukraine. In addition, the situation is complicated by the temporary occupation of territories, interruptions in the supply of electricity, disruption of logistics sales channels, and labour migration. That is why the primary task in the post-war period is the restoration and reconstruction of sectors of the economy, and the increase of production capacities. According to the author, the Ukrainian strategic plan should already be developed for the long term. A feature of such a plan should be a focus on the development of the real sector of the economy and investments in technology. At the same time, it should be emphasized that

industries should focus on the production of goods for final consumption, and not for intermediate ones.

An example of a strategic plan for the recovery of Ukraine is the plan that was presented in Lugano in July 2022. It is designed for gradual reconstruction over 10 years (2023-2032) and is estimated at $750 billion U.S. dollars. The plan covers 15 programs. According to the amount of funding (URC, 2022), the main directions are:

- restoration of housing and infrastructure (150-250 billion dollars);
- integration of logistics with the EU (USD 120-160 billion dollars);
- energy independence and "green" course (130 billion dollars);
-macrofinancial stability (USD 60-80 billion dollars);
- ensuring competitive access to capital (USD 75 billion dollars);
- development of the defense and economic sectors (50 billion dollars).

From the distribution of funding, it can be seen that the development of the real sector of the economy, the development of manufacturing enterprises is not a priority direction. The reconstruction of housing, infrastructure and logistics are priority sectors in the post-war period. However, in our opinion, the restoration of the real sector should also be one of the priority tasks. This will ensure the creation of new jobs, satisfaction of domestic demand with products of domestic production, reduce the share of imported goods, support national producers, and increase their competitiveness in the market and, as a result, will contribute to the growth of GDP. Therefore, the reconstruction of enterprises that create final consumption products should be one of the priority directions of economic reconstruction.

Promising niche sectors of the real economy (except military–industrial complex) that have potential and can become drivers of development are presented below (Ukrinvest, 2023).

1. Heavy engineering.
2. Production of electronics.
3. Automobile industry.
4. Aerospace industry.
5. Infrastructure.

6. Agro-processing industry.
7. Furniture industry.
8. Mining industry.
9. Pharmaceuticals.

The main goal of the strategic reconstruction of the real sector of the economy should be reorientation from raw materials to the production of goods with high added value and final consumption goods.

In turn, the exchange rate policy should be aimed at strengthening the national currency. It is the appreciation that will contribute to the increase in production. The strengthening of the currency has a positive effect on import volumes. Imported goods are becoming cheaper on the market and, accordingly, more attractive compared to domestically produced goods. Therefore, national manufacturers are interested in investing in technologies and innovations that will optimize manufacturing. Thus, domestically produced goods will become more competitive, which will also positively affect the strength of the national currency.

CONCLUSION

The definition of the “economic crisis” describes the general deterioration of economic conditions. The main reasons for that are either external or internal shocks which lead to deep economic problems in the system. There are five main types of economic crises. *Bubble assets* occur when there is a high discrepancy between the market price and its fair value for the different kinds of assets. *Currency crises* are caused by high fluctuations in the value of foreign currency. The *banking crises* are related to the massive sudden withdrawals of deposits. *The debt crisis* is the risk of the country not having the ability to pay the debt and interest due to a high level of budget deficit. *The balance of payment crisis* represents the inability of a country to cover its imports and service foreign debt.

The main strategy for the government and financial institutions should be prevention of the external and internal shocks and elimination of the negative consequences. So, state regulations play an essential role in providing stability to the economy. One of the key sectors that have a huge impact on national economic development and recovery in the post-crisis period is commodity market and national production capacity. The higher developed domestic production the country is less vulnerable during a crisis and the economy recovers more quickly.

Any crisis has a negative impact on the strength of the national currency. Therefore, a balanced exchange rate policy ensures the supporting effect of the national currency, and in particular, the position of national producers (export and import facilities). Currency interventions are a crucial means to influence the volatility of the foreign exchange market. There exist different types of currency regulation regimes, each with its own set of pros and cons. Selecting the appropriate currency regime involves considering various factors such as the characteristics of the domestic financial market, the level of economic growth, and the country's overall development. In times of crisis such as during a war, fixing the exchange rate is often the most appropriate solution.

The hryvnia has experienced devaluation several times due to various reasons. In 1998-1999, factors such as the Asian financial crisis, GDP fall, trade balance deficit, and government policies caused instability, uncertainty for investors, and pressure on the exchange rate. However, it stimulated export and increased foreign currency reserves. From 2000-2004, Ukraine achieved macroeconomic stability despite political instability, which affected the hryvnia. In 2008-2009, the global financial crisis, world metal price drop, and capital outflow caused significant fluctuations in the exchange rate. Since 2014, the hryvnia has been undervalued due to three crises. At the beginning of the war in Ukraine, the Central Bank of Ukraine fixed the exchange rate. As a result, the float-managed exchange rate regime had both positive and negative consequences such as making export goods more competitive, improving the investment climate, putting pressure on foreign reserves, and causing inflationary pressure. The fixed exchange rate can have short-term positive effects during deep shocks such as war.

The structured analysis of the main export and import articles leads to the following conclusions. Firstly, the country's exports mainly consist of raw materials, indicating its significant natural resource potential. Secondly, the country relies heavily on imports for fuel resources, petroleum products of distillation, and machinery, despite having its own fuel minerals. The large share of imported machinery suggests a lack of domestic production capabilities in the real sector of the economy. Therefore, the commodity structure of foreign trade supports the idea that the economy is primarily focused on raw materials.

Despite facing difficult times, including the ongoing war, Ukraine has the opportunity to determine the direction of its economic expansion and strategic integration. Our suggestion is to invest in national production and the real sector, particularly the domestic market. Niche industries such as high-tech airplane production, oil pipelines, railway locomotives, wagons, and cars should be prioritized, along with the development of the light industry to produce clothing, food products, and other goods. With the events of 2022 and assistance from around the

world, Ukraine has a unique opportunity for reconstruction, rebuilding, and investing in a new type of economy.

In this scientific research was built the VAR model and additionally System Dynamics model. Based on the results, it can be inferred that the REER, which is the main competitiveness indicator, is expected to decline at the start of the year, making exports more appealing. However, it is predicted to increase in the second quarter, indicating a decrease in the country's trade competitiveness, followed by slight fluctuations. Inflation is anticipated to increase significantly initially and then decrease, albeit with some fluctuations. The net export dynamics display a logical correlation with the REER - a decline in REER makes exports more attractive, leading to an increase in net exports, and vice versa. The policy rate variation is associated with the alteration in reserves. The policy rate is projected to rise, which means that the volume of reserves will decrease since the exchange rate is fixed.

REFERENCES

CFI. (2020). Exchange Rate. https://corporatefinanceinstitute.com/resources/economics/exchange-rate/

Corrado, C., & Mattey, J. (1997). Capacity Utilization. Journal of Economic Perspectives, 11, 151-167. https://doi.org/10.1257/jep.11.1.151

Curry, B., & Lock, C. (2022). Demand-Pull Inflation. https://www.forbes.com/advisor/investing/demand-pull-inflation/

Deo, S., & Kumar, S. (2022). Emerging Trends and Insights on Economic Inequality in the Wake of Global Crises. https://doi.org/10.4018/978-1-6684-5289-9

Encyclopedia. (2023). Exchange Rates International Encyclopedia of the Social Sciences. https://www.encyclopedia.com/social-sciences/applied-and-social-sciences-magazines/exchange-rates

FCIC. (2011). The financial crisis inquiry report. https://www.govinfo.gov/content/pkg/GPO-FCIC/pdf/GPO-FCIC.pdf

Gorodnichenko, Y. (2022). No fear of floating for the hryvnia. Vox Ukraine. https://voxukraine.org/en/no-fear-of-floating-for-the-hryvnia

Hai-Jew, S. (2022). Career Retooling in a Pandemic-Recovery Phase. In (pp. 51-64). https://doi.org/10.4018/978-1-7998-8626-6.ch003

KIEL, I. (2023). Ukraine Support Tracker. Institute for the world economy https://www.ifw-kiel.de/topics/war-against-ukraine/ukraine-support-tracker/?cookieLevel=not-set

Kolte, A., Rossi, M., Torriero, O., Patil, A., & Pawar, A. (2021). Balance of Payment Crisis: Lessons from Indian Payment Crisis for Developing Economies. International Journal of Behavioural Accounting and Finance. https://doi.org/10.1504/IJBAF.2021.10038739

Kotler, P. (1984). Marketing Essentials.

ME, M. o. E. (2023). Infographics regarding general summary of exports and imports of goods and services in Ukraine in 2022 https://www.me.gov.ua/?lang=en-GB

Minfin. (2023). Платіжний баланс України. https://index.minfin.com.ua/ua/economy/balance/2000/

NBU. (2016). Рішення Правління Національного банку України № 21-рш від 06 вересня 2016 р. «Про затвердження Стратегії валютних інтервенцій Національного банку України на 2016-2020 роки». https://bank.gov.ua/ua/legislation/Decision_06092016_261-rsh_zmina

NBU. (2023a). Business activity expectations index almost reaches its neutral level – business outlook survey in March. Business Outlook Survey https://bank.gov.ua/en/news/all/indeks-ochikuvan-dilovoyi-aktivnosti-mayje-dosyag-rivnovajnogo-rivnya--rezultati-opituvannya-pidpriyemstv-u-berezni

NBU. (2023b). Dynamics of international reserves. https://bank.gov.ua/en/markets/international-reserves-allinfo/dynamics?startDate=01.01.1999&endDate=01.01.2023

NBU. (2023c). External Sector Statistics https://bank.gov.ua/en/statistic/sector-external#1

NBU. (2023d). Inflation Report, January 2023. https://bank.gov.ua/admin_uploads/article/IR_2023-Q1.pdf?v=4

NBU. (2023e). NBU currency interventions. https://bank.gov.ua/en/markets/currency-interventions

NBU. (2023f). Official hrivnya exchange rates. https://bank.gov.ua/en/markets/exchangerate-chart

Obstfeld, M. (2011). Financial Flows, Financial Crises, and Global Imbalances. Journal of International Money and Finance, 31. https://doi.org/10.1016/j.jimonfin.2011.10.003

Ottino-Loffler, J. (2016). How much was the Japanese Imperial Palace worth? https://amaral.northwestern.edu/blog/how-much-was-japanese-imperial-palace-worth

Sanderson, R. (2015). Handbook of Research on Financial and Banking Crisis Prediction through Early Warning Systems - Contributed chapter: Understanding Chaos as an Indicator of Economic Stability. In (pp. 353-372). https://doi.org/10.4018/978-1-4666-9484-2.ch017

Santos, S. P., Belton, V., & Howick, S. (2002). Adding value to performance measurement by using system dynamics and multicriteria analysis. International Journal of Operations & Production Management, 22(11), 1246-1272. https://doi.org/10.1108/01443570210450284

Schmitz, M., Clercq, M., Fidora, M., Lauro, B., & Pinheiro, C. (2011). Revisting the Effective Exchange Rates of the Euro. Journal of Economic and Social Measurement, 38. https://doi.org/10.3233/JEM-130374

SSSU. (2023a). Географічна структура зовнішньої торгівлі України товарами. https://ukrstat.gov.ua/operativ/operativ2022/zd/ztt/arh_ztt2022.html

SSSU. (2023b). Структура зовнішньої торгівлі послугами за видами. https://ukrstat.gov.ua/operativ/operativ2021/zd/ztp_kv/ztp_kv_u/arh_ztp_kv2021_u.html

SSSU. (2023c). Товарна структура зовнішньої торгівлі України. https://ukrstat.gov.ua/operativ/operativ2022/zd/tsztt/arh_tsztt2022_u.html

Ukrinvest. (2023). Investment opportunities. https://ukraineinvest.gov.ua/industries/

URC. (2022). Ukraine’s National Recovery Plan. https://www.urc-international.com/urc2022-recovery-plan

Villeneuve, B., Ekeland, I., & Lautier, D. (2012). A commodity market.

Базилевська, Я. І., & С.В., В. (2013). ВАЛЮТНО-КУРСОВИЙ АНАЛІЗ НА ОСНОВІ МАКРОЕКОНОМІЧНИХ ПОКАЗНИКІВ: ДИНАМІЧНИЙ АСПЕКТ. https://ela.kpi.ua/bitstream/123456789/12447/1/2013_2_Bazylevska.pdf

Береславська, О. І., & Серебрянський, Д. М. (2009). Курсова політика та її вплив на конкурентоспроможність економіки. Актуальні проблеми економіки, 8, 209–214.

Бєлявцев, М. І., & Л.В., Ш. (2005). Інфраструктура товарного ринку. https://textbook.com.ua/marketing/1473450995

Бутенко, Н. В. (2006). Маркетинг https://textbook.com.ua/marketing/1473451002

ВВР. (2001). Закон України "Про захист економічної конкуренції".

Громова, Т. М. (2018). Суперечності та тенденції розвитку товарного ринку http://www.visnyk-econom.uzhnu.uz.ua/archive/20_1_2018ua/30.pdf

Інтел, Б. (2012). Вступ Польщі до Європейського Союзу, НАТО та його наслідки. https://bintel.org.ua/nash_archiv/arxiv-evroatlantichna-integraciya/vstuplenie-polshi-v-evropejskij-sojuz-nato-i-ego-posledstvija/

Комар, Н. (2018). Вигоди та втрати Греції в процесі Європецької Інтеграції Вісник Львівського університету. Серія «Міжнародні відносини», 45. http://publications.lnu.edu.ua/bulletins/index.php/intrel/article/viewFile/9409/9613

Лавров, Р. В., Садчикова, І. В., & Середюк, І. О. (2019). Сучасні тенденції валютного регулювання в Україні Економічна наука(УДК 336.748 (477)). https://doi.org/10.32702/2306-6806.2019.8.4

Новосьолова, О. С., & Скаржинець, В. І. (2019). Реальний ефективний обмінний курс гривні як чинник конкурентоспроможності https://conf.ztu.edu.ua/wp-content/uploads/2019/06/72-2.pdf

Прокопенко, О. В., Школа, В. Ю., Дегтяренко О.О., & С.М., М. (2007). Інфраструктура товарного ринку. https://shron1.chtyvo.org.ua/Prokopenko_OV/Infrastruktura_tovarnoho_rynku.pdf

Самсонов, М. І. (2008). Режим валютного курсу при переході до інфляційного таргетування в Україні. https://essuir.sumdu.edu.ua/bitstream-download/123456789/54202/5/Samsonov_Valiutnyi_kurs.pdf;jsessionid=685FC1A85549503C1997DD544424D45E

Солонінко, К. С. (2002). Макроекономіка: Навчальний посібник для студентів економічних спеціальностей вищих навчальних закладів.

APPENDIXES

APPENDIX A

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 04/08/23 Time: 12:55
Sample: 2010M01 2022M12
Included observations: 146

Dependent variable: D(REER)

Excluded	Chi-sq	df	Prob.
CPI	23.38546	7	0.0015
NET_EXP	8.994255	7	0.2531
D(POLICY_RATE)	19.86614	7	0.0059
D(RESERVES)	20.34250	7	0.0049
All	65.57628	28	0.0001

Dependent variable: CPI

Excluded	Chi-sq	df	Prob.
D(REER)	57.64833	7	0.0000
NET_EXP	5.000115	7	0.6599
D(POLICY_RATE)	20.97928	7	0.0038
D(RESERVES)	21.32939	7	0.0033
All	174.6062	28	0.0000

Dependent variable: NET_EXP

Excluded	Chi-sq	df	Prob.
D(REER)	40.19164	7	0.0000
CPI	62.07976	7	0.0000
D(POLICY_RATE)	61.14641	7	0.0000
D(RESERVES)	21.94073	7	0.0026
All	580.4725	28	0.0000

Dependent variable: D(POLICY_RATE)

Excluded	Chi-sq	df	Prob.
D(REER)	13.75781	7	0.0557
CPI	24.71503	7	0.0009
NET_EXP	8.429410	7	0.2963
D(RESERVES)	30.91286	7	0.0001
All	74.80583	28	0.0000

Dependent variable: D(RESERVES)

Excluded	Chi-sq	df	Prob.
D(REER)	29.48751	7	0.0001
CPI	12.90749	7	0.0744
NET_EXP	2.958618	7	0.8888
D(POLICY_RATE)	20.55812	7	0.0045
All	54.52849	28	0.0019

Figure 4.1. VEC Granger Causality/Block Exogeneity Wald Tests

Sources: compiled by the author

Table 4.1. Forecasted value of all variables

2023						
	M01	***M02***	***M03***	***M04***	***M05***	***M06***
REER	0.74	0.84	0.94	0.92	0.88	0.84
RESERVES	21.2	25.2	22.9	22.3	20.2	20.5
CPI	97.9	100.2	106.5	99.8	99.6	101.3
INDEX_IND	55	56	58	60	61	65
NET_EXP	2.21	0.82	37.63	-13.43	-5.46	7.42
POLICY_RATE	27.0	31.3	30.2	28.6	27.7	32.1
	M07	***M08***	***M09***	***M10***	***M11***	***M12***
REER	0.81	0.82	0.87	0.79	0.84	0.87
RESERVES	18.8	17.7	16.5	17.1	17.8	19.3
CPI	101.8	104.2	100.3	103.1	100.3	102.7
INDEX_IND	65	63	64	67	68	67
NET_EXP	2.74	6.11	-10.09	-9.77	24.55	-1.55
POLICY_RATE	32.5	33.5	35.9	33.3	37.3	34.4

Sources: compiled by the author.

APPENDIX B

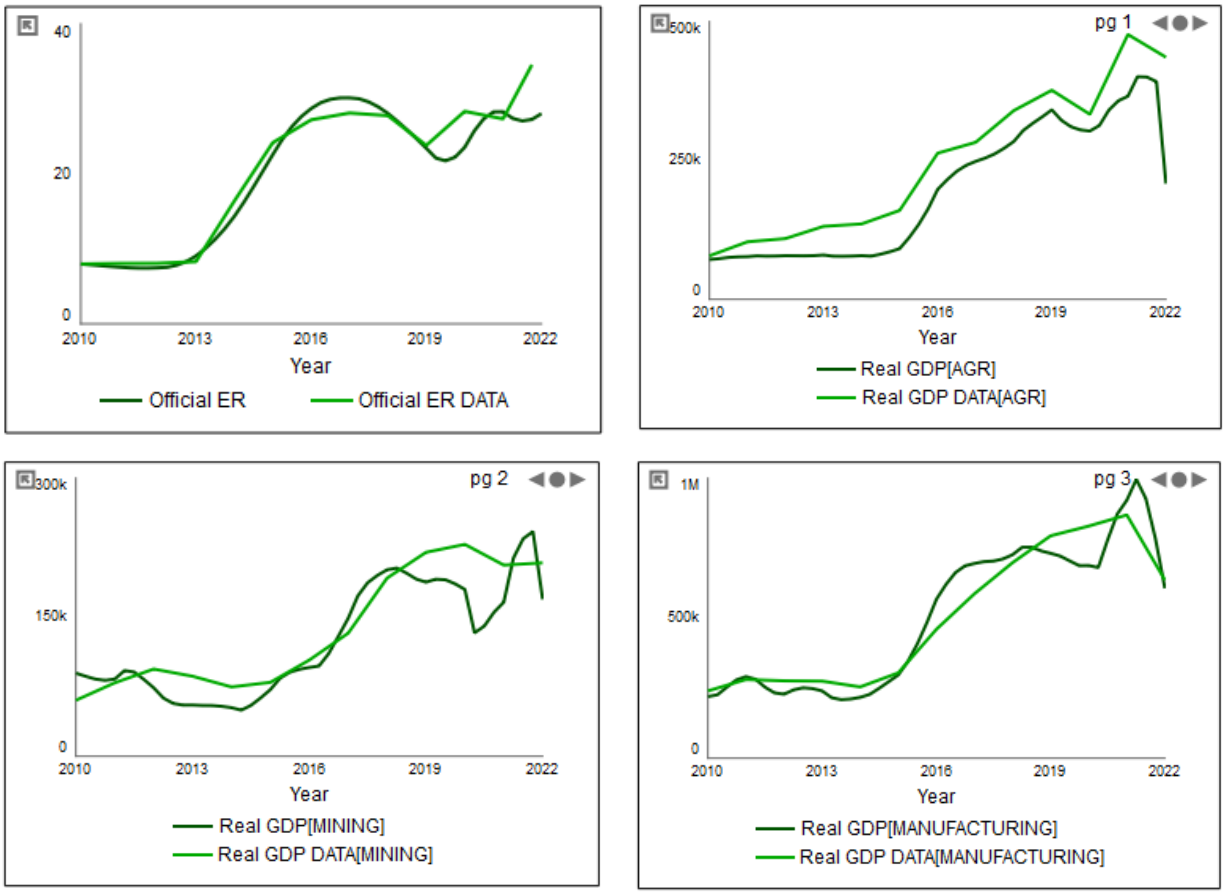

Figure 4.2. Reference mode of key model variables

Sources: compiled by the author

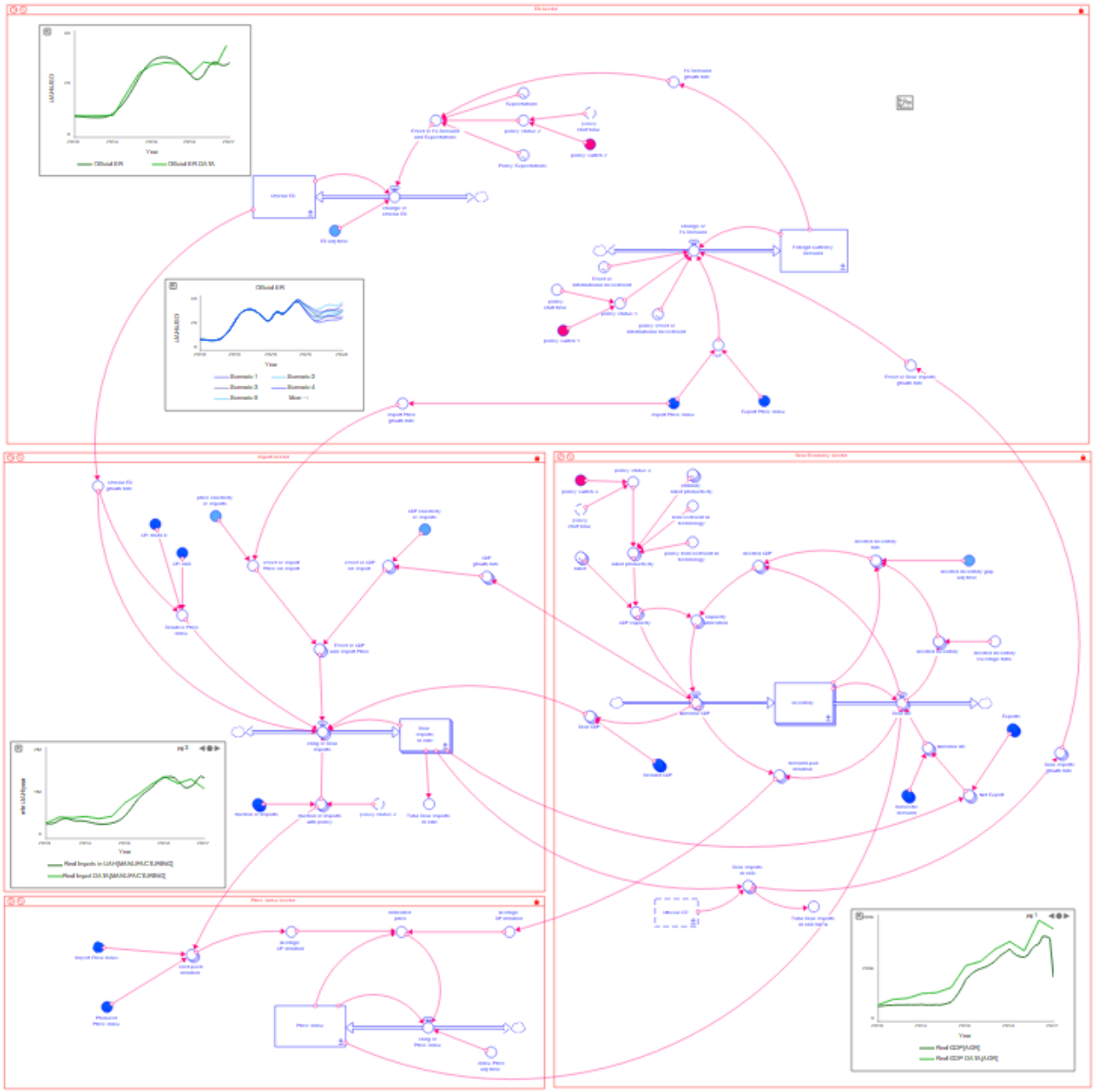

Figure 4.3. The main sectors of System Dynamics model

Sources: compiled by the author