

To sum up, the system dynamics approach appeared to be a useful tool for analyzing a complex system such as the banking sector. The iterative nature of the modeling process deepened the understanding of the interactions between different variables and feedback loops. The high accuracy of the simulation within the complexity of the system, as well as the possibility to observe both short-term and long-term effects of different policy choices, are the main advantages of the system dynamics approach. According to the results of the SD model, deposit dollarization will continue increasing, however, its growth will be moderate. At the same time loan dollarization will stay on the same level due to both decreases in overall demand for borrowings and banks' unwillingness to take on additional risks during the crisis period.

4.4. De-dollarization policies and prospects for the de-dollarization of the Ukrainian economy

De-dollarization policies are becoming increasingly important for many countries as they seek to reduce their dependence on foreign currencies and promote economic stability. While the specific strategies for de-dollarization may vary, it is generally recognized that reducing dollarization can help countries avoid financial crises and currency shocks. However, the success of de-dollarization policies can depend on a range of factors, such as the strength of a country's financial institutions, the degree of public trust in the national currency, and the effectiveness of government policies in promoting alternative investment options. Therefore, it is important for policymakers to carefully consider the various approaches to de-dollarization and choose those that are most likely to be successful in their specific economic and political context.

The paper of Alvarez-Plata and Garcia-Herrero proposes a classification of de-dollarization strategies based on the policy approach adopted by the central bank [13]. They classify these strategies into two broad categories: market-based and administrative-based. Market-based strategies aim to reduce dollarization through the promotion of alternative financial instruments in local currency, such as government

bonds or certificates of deposit. This approach assumes that the market is efficient and that it will respond to incentives provided by the central bank. Administrative-based strategies, on the other hand, involve the implementation of regulatory measures by the central bank to discourage the use of the dollar in the financial system. These measures can include the use of reserve requirements, taxation, or limits on foreign currency lending. The authors note that both market-based and administrative-based strategies have their advantages and disadvantages and that the effectiveness of each strategy depends on the specific economic and institutional context of the country in question. The authors conclude that de-dollarization policies can be successful if they are implemented in a gradual and coordinated way, involve a combination of macroeconomic and financial measures, and are supported by sound monetary and fiscal policies [13].

The transmission mechanism refers to the process by which monetary policy decisions made by a central bank are transmitted to the real economy.

A strong transmission mechanism means that changes in monetary policy are transmitted quickly and effectively to the broader economy, which can help to reduce dollarization by affecting the relative attractiveness of local currency assets. For example, an increase in interest rates on local currency deposits can make them more attractive relative to foreign currency deposits, while an increase in reserve requirements can limit the availability of foreign currency loans.

However, if the transmission mechanism is weak, monetary policy measures may have a limited impact on deposit and loan dollarization. This can occur if financial markets are underdeveloped if there is a lack of confidence in the stability of the local currency, or if there are regulatory or institutional barriers that limit the effectiveness of monetary policy measures. In such cases, policymakers may need to implement additional measures, such as administrative-based policies, to reduce dollarization.

As countries around the world seek to reduce their dependence on foreign currencies, de-dollarization has become a popular policy objective. While the benefits of reducing the share of foreign currency deposits and loans are well-known, the process of achieving this goal can be challenging. One of the key questions

policymakers face is identifying the most effective leverage points for implementing de-dollarization policies. The term "leverage points" refers to the areas where a small change can have a significant impact on the entire system. In the context of de-dollarization, these are the areas where policy interventions can have the most significant effect on reducing the dollarization level of the economy.

Table 4.9. Leverage points to affect dollarization

De-dollarization policy	Description
Monetary policy	Central banks can use monetary policy to affect the demand for foreign currency loans and deposits. By increasing interest rates, the central bank can make local currency deposits and loans more attractive, thereby reducing the demand for foreign currency deposits and loans. As seen from the SD model in the previous chapter, generally hryvnia loans and deposits rates are more sensitive to changes in the policy rate.
Exchange rate policy	Exchange rate policy can affect dollarization by influencing the relative attractiveness of local and foreign currency deposits and loans. If the exchange rate is stable and predictable, it may reduce the demand for foreign currency deposits and loans. A developed system of simultaneous equations has shown the importance of both exchange rate and their volatility for changes in dollarization.
Prudential regulations	Prudential regulations can be used to reduce the risks associated with foreign currency loans and deposits. For example, banks may be required to hold more capital against foreign currency loans, which would make such loans less profitable and reduce the demand for them.
Financial education	Improving financial literacy can reduce the demand for foreign currency loans and deposits by making individuals and businesses more aware of the risks associated with such transactions. This can be done through public education campaigns, financial literacy courses, and other similar initiatives. NBU's communication strategy is very important for anchoring expectations, and increasing the credibility of the institution, and hence its actions.

Source: developed by authors

All of the mentioned above policies and respective leverage points proved to be somewhat successful both in Ukraine and other countries. Now since the potential leverage points for de-dollarization policies have been identified, the next step is to consider how these policies can be effectively implemented. In this regard, it is useful

to draw on the experiences of other countries that have implemented de-dollarization policies in the past. By examining the successes and failures of these policies, valuable insights into what works and what does not can be gained.

Ukraine can take several countries as a reference for successful de-dollarization policies and tools (see Table 4.10).

Table 4.10. Successful de-dollarization practices

Country	Years	Results	Policies and tools
Kazakhstan	2010-now	The fastest rate of credit de-dollarization in the CCA region – from 67% in 2010 to 34% in 2021. LD decreased faster than DD.	Inflation targeting, increase in liquidity coverage ratios for FX obligations, long-term domestic capital market development.
Israel	1990-2004	DD largely and permanently decreased from 50% in the early	Growing the market of government bonds in national currency, inflation targeting.
Peru	2005-2019	LD decreased from around 80% in 2000 to 27,7% in 2015.	Limitations on the availability of FX deposits, inflation targeting, counter-cyclical reserve requirements.

Source: developed by authors based on data [13, 14, 15]

Kazakhstan has been implementing de-dollarization policies since 2013 to reduce the share of foreign currency deposits to 30% by 2020. According to the National Bank of Kazakhstan, deposit dollarization dropped from 70% at the end of 2015 to 36% in December 2021 [15]. Similarly to Ukraine, Kazakhstan officially adopted inflation targeting as its monetary policy framework in 2016, following a period of floating exchange rates. The National Bank of Kazakhstan has implemented several measures to encourage the use of the national currency, including lowering interest rates on foreign currency deposits, introducing preferential lending rates for borrowers in tenge, and requiring banks to maintain a certain ratio of tenge deposits to foreign currency deposits [15]. The country considers macroeconomic stability as the key factor for de-dollarization.

Another successful example is Israel. The period of dollarization in Israel started around 1990 and it was the first emerging country to have introduced

inflation-targeting [13]. Israel is an example of how the provision of alternatives to dollar-denominated assets helped to reduce dollarization by promoting national currency bonds. The Bank of Israel has implemented measures to encourage the use of shekels in international trade and to increase the availability of shekel-denominated financial instruments. These measures have included the establishment of shekel clearing arrangements with other countries, the issuance of government bonds in shekels, and the expansion of the domestic corporate bond market. The combination of the promotion of government bonds and the period of disinflation reduced investors' uncertainty about local currency assets [13]. In 2014, the Bank of Israel introduced regulations to limit foreign currency mortgage lending to homebuyers, to reduce the risks associated with exchange rate fluctuations. The regulations required banks to maintain higher capital reserves for foreign currency mortgages and to offer homebuyers the option of taking out a mortgage in shekels instead of dollars.

Peru has also been implementing de-dollarization policies in recent years, including requiring banks to maintain a certain level of local currency reserves and implementing tax breaks for companies that borrow in local currency. The central bank has also been gradually lowering interest rates on local currency deposits and raising interest rates on foreign currency deposits. Its experience can be characterized as the interaction between monetary and macro-prudential policy [16]. The central banks directly reduced vulnerabilities such as loan dollarization through the use of supplementary reserve requirements to enable traditional monetary policy to effectively fulfill its role [16].

There are various policies and strategies implemented by different countries to reduce dollarization in their respective banking systems. However, it is difficult to estimate the effectiveness of any particular instrument in isolation since dollarization is a complex issue that needs to be tackled from multiple angles. From the examples discussed above, it is evident that the common rule for successful de-dollarization is the achievement of economic stability, low inflation, and a stable exchange rate. It is only when these conditions are met that policymakers can effectively implement policies such as reserve requirements and macroeconomic policies to reduce

dollarization. Therefore, policymakers need to focus on maintaining a stable economic environment and addressing the root causes of dollarization rather than relying on individual policies in isolation.

Central banks have a range of macroprudential policy tools at their disposal to control deposit and loan dollarization. Some of the mechanisms through which central banks' policies can affect FD are presented in table 4.11.

Overall, the effectiveness of these policies depends on a range of factors, including the degree of financial dollarization, the structure of the banking sector, and the broader macroeconomic environment. Therefore, central banks must carefully calibrate their policies to achieve their intended goals.

Table 4.11. Macroprudential policy tools and mechanisms to control dollarization

Policy tool	Mechanism
Reserve requirements	Central banks can set reserve requirements on deposits denominated in foreign currency to make them less attractive for banks. When banks hold a larger percentage of reserves, they have less money available to lend, which can reduce the demand for foreign currency loans.
Loan-to-value (LTV) ratios	Central banks can set loan-to-value (LTV) ratios for foreign currency loans, which limit the amount of foreign currency a borrower can receive as a percentage of the collateral value. This can reduce the demand for foreign currency loans by making them less attractive.
Risk weights	Central banks can assign higher risk weights to foreign currency loans, which means that banks will need to hold more capital against these loans. This can make foreign currency loans less profitable for banks and reduce their supply.
Capital requirements	Central banks can increase capital requirements for banks that hold a high level of foreign currency deposits or loans. This can motivate banks to decrease their vulnerability to foreign currency by decreasing the foreign currency operations.
FX liquidity management	Central banks can also use foreign exchange liquidity management tools to influence the supply and demand for foreign currency. For example, they can use currency swaps to provide liquidity to banks that need foreign currency, or they can intervene in the foreign exchange market to influence the exchange rate.

Source: developed by the author based on [1, 17]

The National Bank of Ukraine has been using several macroprudential policies to control deposit and loan dollarization, such as reserve requirements, liquidity requirements, and capital adequacy ratios. The NBU has been adjusting these requirements to encourage the shift towards local currency lending and to support the stability of the financial system. The liquidity requirements have also been used to encourage banks to lend in local currency. These requirements ensure that banks maintain a sufficient level of liquidity in their operations, and they are adjusted periodically based on market conditions and the level of dollarization in the banking system. In 2021, the NBU lowered the liquidity ratio from 80% to 70% to support economic recovery and facilitate lending in local currency. Finally, the capital adequacy ratios have been used to ensure that banks maintain sufficient capital to absorb potential losses and maintain their solvency in times of stress. These ratios have been adjusted over time to reflect changes in market conditions and the level of risk in the financial system. In 2020, the NBU introduced a new capital adequacy ratio framework that took into account the specific risks associated with dollarization and required banks to hold higher levels of capital for foreign currency loans and deposits. The new framework is based on the Basel III standards and takes into account the specific features of the Ukrainian banking system. The CAR is a key measure of a bank's financial strength, calculated as the ratio of its capital to its risk-weighted assets. The NBU's new framework includes higher minimum CAR requirements for banks, as well as additional capital buffers to be built up during good times to be drawn down during bad times. The framework also introduces a leverage ratio requirement, which limits a bank's overall exposure to risk. The new CAR framework is intended to enhance the stability of the banking system and ensure that banks have sufficient capital to withstand financial shocks, thereby reducing the risk of bank failures and systemic instability.

The suggested strategy for the de-dollarization of the Ukrainian financial sector can be summed up in the steps presented in Figure 4.13.

INFLATION TARGETING	FINANCIAL MARKET DEEPENING	ADMINISTRATIVE MEASURES
<p>Inflation targeting proved to be effective for de-dollarization both in Ukraine and other countries.</p> <p>Interest rate, inflation expectations and exchange rate channels are the strongest ones when conducting monetary policy in Ukraine, and have both direct and indirect affects on macroeconomic stability, hence the use of local currency.</p>	<p>Increase the accessibility of government bonds denominated in hryvnia through technological improvements, simplification of investors' experience.</p> <p>Increase the awareness among the population through marketing campaigns, educational programs, seminars, and online resources.</p> <p>Alternative hedging instruments, such as newly introduced instrument of the NBU for the protection of</p>	<p>Limitations on operations with foreign currency during martial law.</p> <p>Higher reserve requirements on FX</p>

Figure 4.13. De-dollarization strategy for Ukraine

Source: developed by authors

Looking back at the experience of NBU in managing dollarization, inflation targeting played a crucial role in anchoring people's expectations and maintaining a stable macroeconomic environment. However, maintaining a low level of dollarization during a period of war requires a comprehensive approach that includes a combination of macroeconomic and microeconomic policies. The NBU can take several steps to promote the use of the national currency and reduce dollarization in the banking system. These measures may include implementing monetary policy tools, such as interest rate differentials, reserve requirements, and capital adequacy ratios, to incentivize the use of local currency. The NBU may also consider introducing measures to reduce foreign currency lending, such as limiting the availability of foreign currency loans or implementing stricter collateral requirements for such loans. Additionally, the NBU can work to improve financial literacy and

education, increase public awareness of the risks associated with dollarization, and promote the benefits of using local currency. Finally, the NBU needs to maintain a stable macroeconomic environment characterized by low inflation and a stable exchange rate, which are critical factors in reducing dollarization.

Case of Israel in usage of national currency bonds may be a good example for how the deepening of the financial market can influence dollarization.

Another potential instruments to be used after the crisis period are dollar-indexed deposits and inflation-indexed bonds. These instruments have been also adopted in Israel in complex with other prudential rules, that would ensure that banks met the prudential requirements such as open position limits [21]. Dollar-indexed deposits are a type of financial instrument where the interest rate and principal are denominated in local currency but linked to the exchange rate of the US dollar. These deposits can affect dollarization by providing a way for individuals and businesses to obtain exposure to US dollars without actually holding dollars. Dollar-indexed deposits can be seen as a substitute for holding US dollar deposits, which can contribute to reducing dollarization in the banking system. However, the impact of dollar-indexed deposits on dollarization depends on how they are designed and implemented. If these deposits are not properly regulated, they can potentially increase dollarization by providing a way for individuals and businesses to access US dollars while still avoiding regulatory controls. Therefore, policymakers need to carefully consider the potential benefits and risks of dollar-indexed deposits and design appropriate regulatory frameworks to ensure that they contribute to sustainably reducing dollarization.

A similar logic is applied to the instrument that NBU introduced at the end of 2022 as an additional tool for the protection of hryvnia savings from exchange rate fluctuations while also helping to preserve its international reserves. With this new instrument, individuals can buy US dollars at the official exchange rate, make a term FX deposit with a bank, and withdraw the deposit by selling the dollars back to the bank for hryvnias after it matures. There will be no limits on the number or size of deposits per client. The banks can buy an amount of US dollars equal to the volume of such deposit transactions and deposit the purchased foreign currency into a

separate account with the NBU. The NBU will charge interest on the foreign exchange balance in the respective separate account with the NBU, to be paid in hryvnias. This tool is expected to reduce demand for foreign exchange cash, stabilize expectations, and ease exchange rate pressure in the cash segment of the foreign exchange market. It will also incentivize banks to compete for hryvnia deposits and improve the monetary transmission mechanism [22].

The Strategy of Ukrainian Financial Sector Development until 2025, which was implemented by the National Bank of Ukraine and other financial authorities, was focused on several strategic elements, such as financial stability, macroeconomic development, financial inclusion, expanding the financial markets, and increase of innovations. This strategy aimed to align Ukraine's financial sector with international best practices and commitments, such as those outlined in the EU-Ukraine Association Agreement. It included various measures such as improving the regulation and supervision of the financial sector, enhancing corporate governance and risk management, supporting lending to the economy, and developing nonbank financial services markets. This comprehensive approach was designed to bolster the overall resilience and efficiency of Ukraine's financial sector [1].

To sum up, National Bank of Ukraine conducts a very effective monetary and macroprudential policy that allows managing the dollarization. The experience of other countries indicates that macroeconomic stability should be the key objective, without which any additional policies targeted at de-dollarization won't be fully realized. The deepening of the financial market should be the main strategy to de-dollarize the economy. Easier access and promotion of hryvnia instruments, in particular popularization of hryvnia-denominated deposits and bonds, should be the priority for the National Bank of Ukraine and Ministry of Finance. Ensuring macroeconomic stability will keep dollarization on a relatively low level, however, to decrease its incentives for both banks and individuals and business entities should be provided.