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PECULIARITIES OF FINANCIAL DOLLARIZATION DURING MARTIAL LAW: CASE OF UKRAINE

The article evaluates the peculiarities of banking sector dollarization in Ukraine with the use of econometric tools and a systems approach, conducts a scenario analysis for dollarization dynamics during martial law, and develops a framework for recommendations with the consideration of long-term financial stability goals.

The study finds that the inflation-targeting regime has gradually reduced the dollarization of loans and deposits, but levels remain high. During the full-scale invasion of Russia in Ukraine, the record-low levels of dollarization and NBU restrictions prevented the rapid increase in dollarization as was previously observed during economic crises. The study also finds that loan dollarization is highly dependent on deposit dollarization and that economic agents tend to choose a more stable currency during periods of high inflation and exchange rate volatility. The scenario analysis forecasts that deposit dollarization will continue to grow during the crisis period and high uncertainty, while loan dollarization will stabilize on a new, higher level.

To ensure financial stability on a long-term horizon, the de-dollarization strategy should include monetary policy, vertical development of the financial market, in particular, the development of the bonds market and alternative hryvnia instruments, as well as the use of macroprudential tools.

Keywords: monetary policy, financial dollarization, econometric approach, systems approach, scenario analysis, banking sector dollarization, financial stability, transmission mechanism.

JEL classification: E52, E58, E63, C30, C53

Introduction and research problem. Financial dollarization has become a common denominator for emerging markets, raising the importance of this issue on policymakers' agenda. Financial dollarization (FD) typically refers to the extensive use of foreign currency in domestic financial transactions. In periods of macroeconomic instability associated with low trust in national currency, economic agents hedge their risks and substitute one currency over a relatively stable one.

High levels of FD can make a country's financial system more vulnerable to external shocks. In addition, it leaves limited monetary policy options to manage the economy and hence weakens the monetary transmission mechanism.

Ukraine, being an open economy, entered the financial crisis of 2008 and the beginning of the war in 2014 with high levels of deposit dollarization (DD) and loan dollarization (LD). Since the implementation of the inflation-targeting regime combined with macroprudential regulations of the NBU as a regulator, both DD and LD have been gradually decreasing, though the level of banking sector dollarization is still considered too high in comparison with the natural level estimated by the NBU research team. The full-scale invasion of Russia in Ukraine raised the attention of the regulator to the potential currency outflow or national currency substitution and consequent administrative measures have been taken to prevent risks to financial stability.

Recent publications analysis. Financial dollarization is a persistent feature of Ukraine's financial system that has attracted significant attention from policymakers, academics, and practitioners in recent years. Despite the growing interest in the topic, the existing literature provides mixed evidence on the determinants, consequences, and potential policy responses to financial dollarization in Ukraine. The analysis of the drivers of financial dollarization was developed and studied by Kishor and Neanidis (2015), De Nicolo et al. (2005), Ize and Yeyati (2003), Khvedchuk et al. (2019), Shportyuk and Mysko (2014), Kaminskyi and Versa (2018), and others. De-dollarization strategies have been studied and proposed by Alvarez-Plata and Garcia-Herrero (2008), Asel (2010), Vega (2015), Leiderman et al. (2006), and others.

Unsolved part of the problem. Recent studies have highlighted the interdependence between deposit and loan dollarization in Ukraine's financial system. High levels of foreign currency deposits can incentivize banks to issue loans in foreign currency, leading to a feedback loop that reinforces both phenomena. However, research on financial dollarization in Ukraine has primarily focused on macroeconomic factors, leaving prudential regulations and institutional strengthening understudied. This study takes a more systematic approach, considering the perspectives of businesses, individuals, banks, and regulators to test hypotheses on the effects of exchange rate and inflation volatilities on dollarization rates. The paper also discusses de-dollarization strategies proposed by Alvarez-Plata and Garcia-Herrero (2008), leaving room for further research on their efficiency in the Ukrainian context.

Research goals and questions. The purpose of this article is to examine the peculiarities of financial dollarization during martial law in Ukraine and the effect of the macroeconomic environment and monetary policy on deposit dollarization (DD) and loan dollarization (LD), identify leverage points to tackling dollarization, and develop a Ukraine-tailored market-based and administrative-based de-dollarization strategy.

Main findings. The high levels of DD and LD during the crisis years of 2008-2009 and the subsequent economic and political challenges faced by Ukraine worsened the already precarious macroeconomic situation. However, since then, the implementation of effective inflation-targeting policies and the anchoring of expectations of economic agents have led to a gradual decrease in dollarization rates (Fig. 1). This decrease can be attributed to the low exchange rate volatility and relatively predictable and moderate inflation rates, resulting in lower demand for FX loans and deposits. Additionally, the past experiences of high currency risk have made hryvnia-denominated loans more attractive, further reducing demand for FX loans. As of February 2022, the share of FX loans in the net portfolio dropped to 30 %, and the share of FX deposits was 36 %, with banks setting FX deposit rates close to zero. Overall, the declining dollarization rate of the banks' balance sheet over the last 6 years reflects the success of the inflation-targeting policies and the gradual shift towards a more stable financial system with lower levels of dollarization. NBU took administrative measures to limit the rapid increase of DD and LD since the start of the full-scale invasion in order to ensure financial stability.

The systematic approach in assessing dollarization provides a more accurate and comprehensive analysis of the interdependent economic system, than statistical analysis. It also gives flexibility when performing scenario analysis, which is essential for policymakers.

The developed system of simultaneous equations (SSE) consists of 5 equations of main macro-economic variables and dollarization ratios. The dependent variables in the system are the consumer price index (CPI), the exchange rate of UAH to USD on the FX market (ER_MARKET), the key policy rate of NBU (KEY_R), deposit dollarization as a fraction of FX deposits in total deposits of residents (DD), and loan dollarization as a fraction of FX loans in total loans to residents (LD).

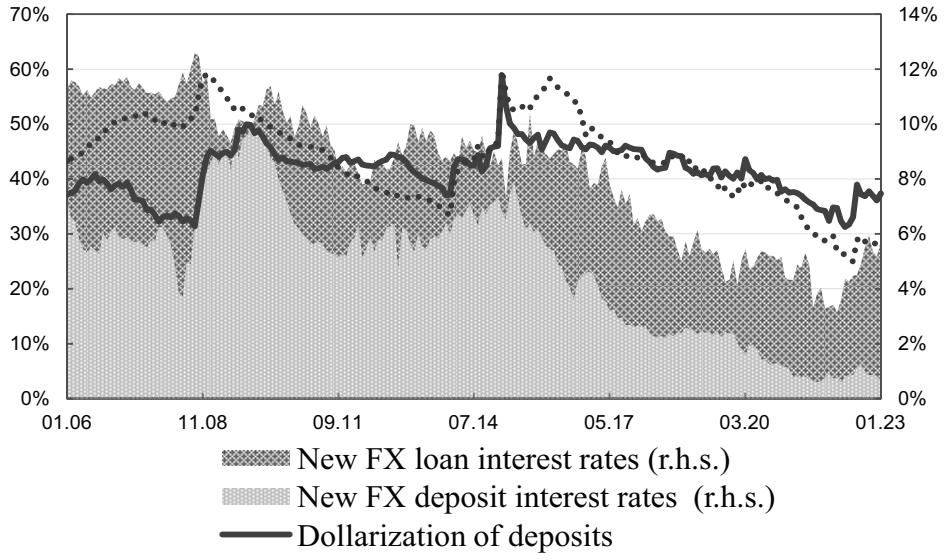

Fig. 1. Share of FX loans and deposits from 2006 till 2022 (NBU, 2022)
Source: developed by the authors based on NBU data

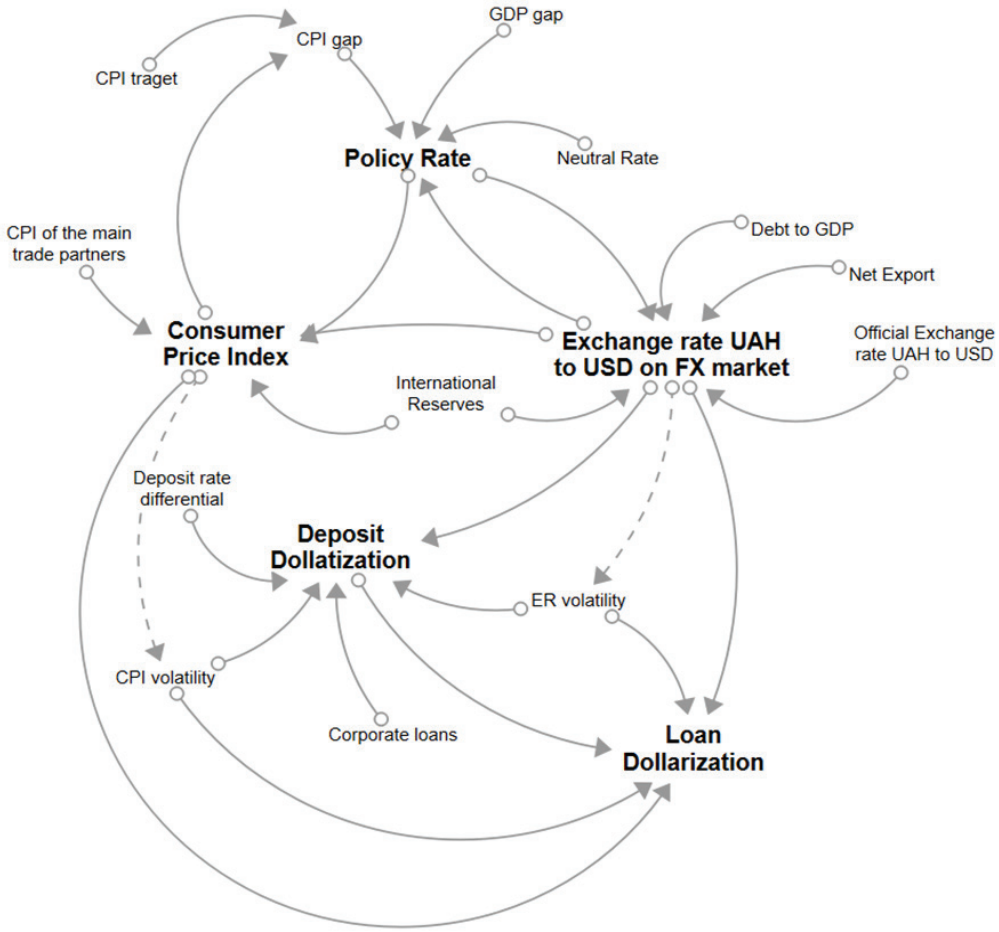

Fig. 2. Causal diagram of the SSE, where a solid line depicts connections inside the system, while a dotted line presents the estimations outside the system
Source: developed by the authors in Stella Architect Software

The following are the basic underlying assumptions of the model:

a) Deposit dollarization is influenced by both banking sector-specific indicators (such as different deposit rates denominated in various currencies and corporate lending) and macroeconomic indicators (such as the exchange rate on the FX market and CPI), based on investors' preferences.

b) Loan dollarization is affected by deposit dollarization as a redistributive function of banks, and by macroeconomic factors like the exchange rate and CPI.

c) The policy rate is determined by the modified Taylor Rule, which considers the CPI gap, output gap, and neutral interest rate.

d) As a small open economy, Ukraine's CPI is dependent on the levels of CPI in its main trading partners and the UAH-USD exchange rate. The monetary policy instrument of NBU, the policy rate, determines CPI as an inflation-targeting country.

e) The UAH-USD exchange rate on the FX market is used instead of the official rate due to its more realistic representation of market conditions. The exchange rate is influenced by the policy rate, debt to GDP, and international reserves level.

The top-down view of the SSE is presented in Fig. 2.

The described specification of the SSE includes 5 equations of main macroeconomic and financial variables: consumer price index (CPI), the exchange rate (ER_MARKET), key policy rate (KEY_R), and deposit (DD) and loan dollarization (LD), which are endogenous variables. It also includes exogenous variables, which are the CPI of the main trading partners (PCPI), the official exchange rate (ER_OFF), international reserves (INR_RESERV), debt to GDP ratio (DEBT_TO_GDP), net export (NX), GDP gap (GDP_GAP), inflation target (CPI_TARGET), neutral interest rate (NR), volatilities of CPI (CPI_VOL) and exchange rate (ER_MARKET_VOL), lending to business (CREDIT_TO_BUSINESS), deposit rate differential (DEPOSIT_RATE_DIFFERENTIAL). Determined (lagged) variables in the system are key policy rate,

Table 1. **System's equations specification**

№	Specification of the system's equations	Determination coefficient
1	Consumer price index equation, %	
	CPI = 36.74 - 0.82*D(KEY_R(-6)) + 95.66*D(LOG(ER_MARKET(-3))) + 2.17*PCPI(-1) + + 0.16*CPI(-4) - 4.3*LOG(INR_RESERV(-7))	90,33 % DW = 2.15
2	Exchange rate equation, UAH/USD	
	LOG(ER_MARKET) = -0.09 - 0.015*D(KEY_R(-1))*DUMMY1 - - 0.005*D(KEY_R(-1))*(1-DUMMY1) + 0.073*LOG(INR_RESERV(-6)) + + 0.162*LOG(DEBT_TO_GDP) + 0.762*LOG(ER_OFF(-1)) - 9.212e-06*D(NX)	85,69 % DW = 2.14
3	Key policy rate equation, %	
	KEY_R = 2.26 + 0.76*KEY_R(-1) - 4.76*D(GDP_GAP(-1)) + + 0.14*(CPI-CPI_TARGET) + 3.19*(D(ER_MARKET(-1)))*DUMMY2 + + 1.06*(D(ER_MARKET(-1)))*(1-DUMMY2) - 1.09*D(NR(-2))	88,72 % DW = 1.45
4	Deposit dollarization equation	
	DD = -2.77 + 0.66*DD(-1) + 0.14*DLOG(ER_MARKET) + + 0.000404*ER_MARKET_VOL(-3) + 9.489e-05*CPI_VOL(-4) + + 0.21*LOG(CREDIT_TO_BUSINESS) + 0.0035*DEPOSIT_RATE_DIFFERENTIAL(-4)	91,59 % DW = 2.2
5	Loan dollarization equation	
	LD = -0.118 + 0.94*LD(-1) + 0.32*DD + 0.11*DLOG(ER_MARKET) – – 0.00013*CPI_VOL(-2) - 0.00056*ER_MARKET_VOL + 0.00086*CPI(-1)	98,24 % DW = 1.82

Source: developed by the authors in EViews 12

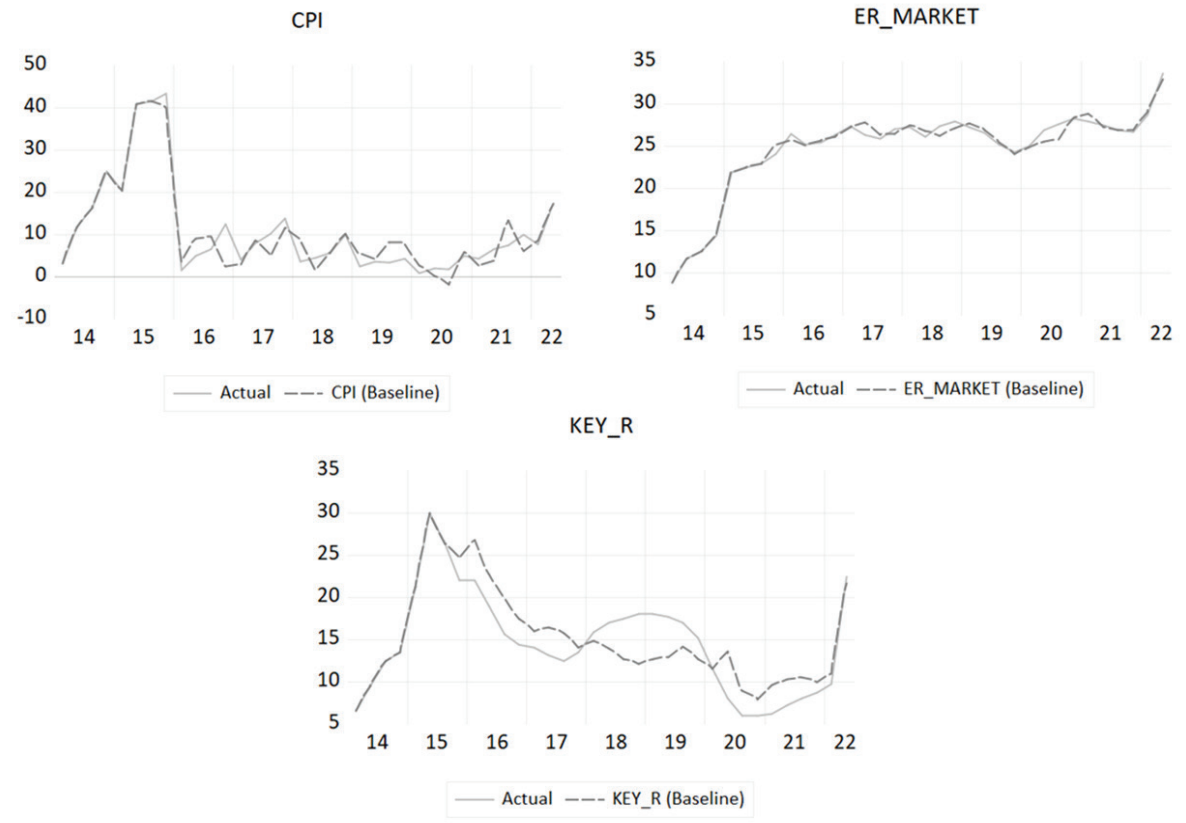

Fig. 3. Historical and simulated results for consumer price index, exchange rate, and key policy rate
Source: developed by the authors in EViews 12

exchange rate, CPI, international reserves, and deposit and loan dollarization ratios. The developed model allows to include the transmission of macroeconomic variables and monetary instruments' effects on financial dollarization. Including lagged variables enables one to account for delays in the system based on the strength of particular monetary transmission channels.

The empirical analysis was performed on the dataset of 34 quarterly observations from 2014 till 1st half of 2022 with short-term forecasting of 4 quarters ahead.

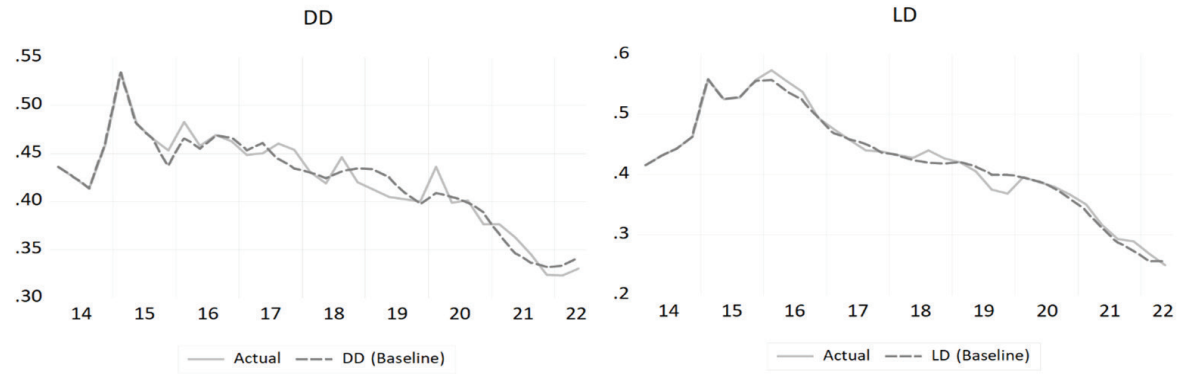

Fig. 4. Historical and simulated results for deposit and loan dollarization
Source: developed by the authors in EViews 12

Specifications of the equations of the system estimated on real data and respective determination and Durbin-Watson coefficients are presented in Table 1.

Every regression is estimated and tested separately for compliance with the classical assumptions of the regression analysis, the best specification is provided after several iterations and modifications. The identity test confirmed that every equation is overidentified, consequently, the system is overidentified as well. Based on the decrease of the determinant residual covariance value when switching from the two-stage to three-stage least square method, the latter was chosen for final system estimation.

To evaluate the accuracy of the forecast, the first step is to compare the simulated model results with historical data, as shown in Figures 3 and 4. The model's ability to accurately replicate the behavior of macroeconomic variables is evident from the analysis of the results. It not only captures the trends but also accurately reproduces turning points, such as the changes in the economy resulting from the Russian invasion and subsequent actions by the NBU. For instance, the model accurately predicted the increase in the key policy rate, which led to a sudden increase in the market exchange rate and an upward trend in inflation. The model's high level of accuracy in forecasting recent periods suggests that it is reliable for short-term forecasting of future periods.

In order to conduct scenario analysis, additional modeling techniques have been applied. Exogenous variables predictions have been calculated using ARIMA models, and GARCH models for volatilities of inflation and exchange rate, as well as using published by Trading Economics open-source data forecasts.

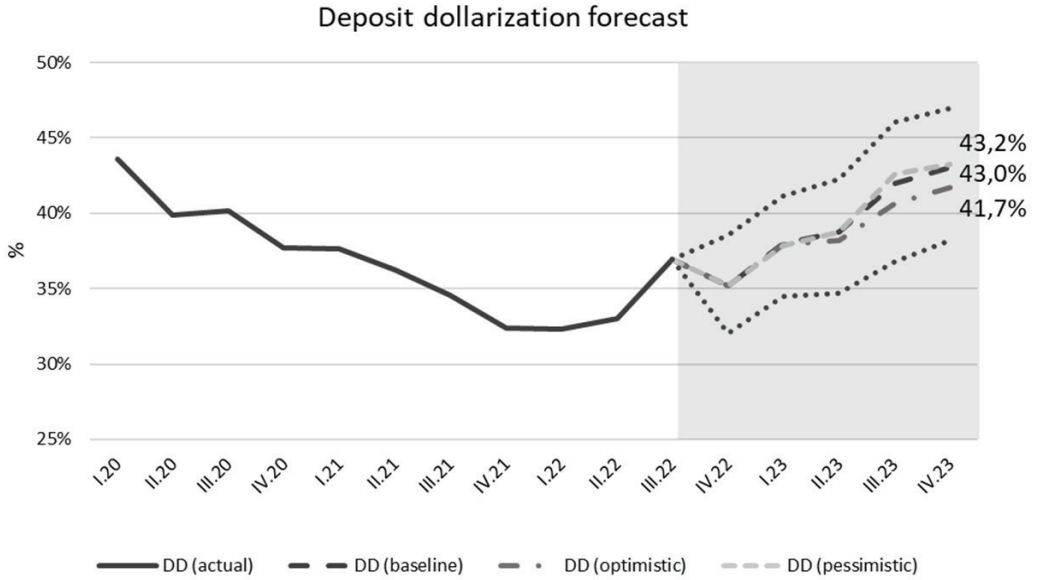

Fig. 5. Deposit dollarization forecast under baseline and alternative scenarios
Source: developed by the authors

Two alternative pessimistic and optimistic scenarios have been developed. The baseline scenario considers that the inflation of the main trading partners will reach its peak at the end of 2022, and then will gradually decrease each quarter. The trade situation will stabilize due to business recovery and adjustment, while macro-financial aid will add up to the increase in international reserves and a more stable exchange rate. The optimistic scenario considers faster disinflation and economic recovery, greater macro-financial aid, and a less volatile exchange rate. The pessimistic scenario assumes worse terms of trade, slower than

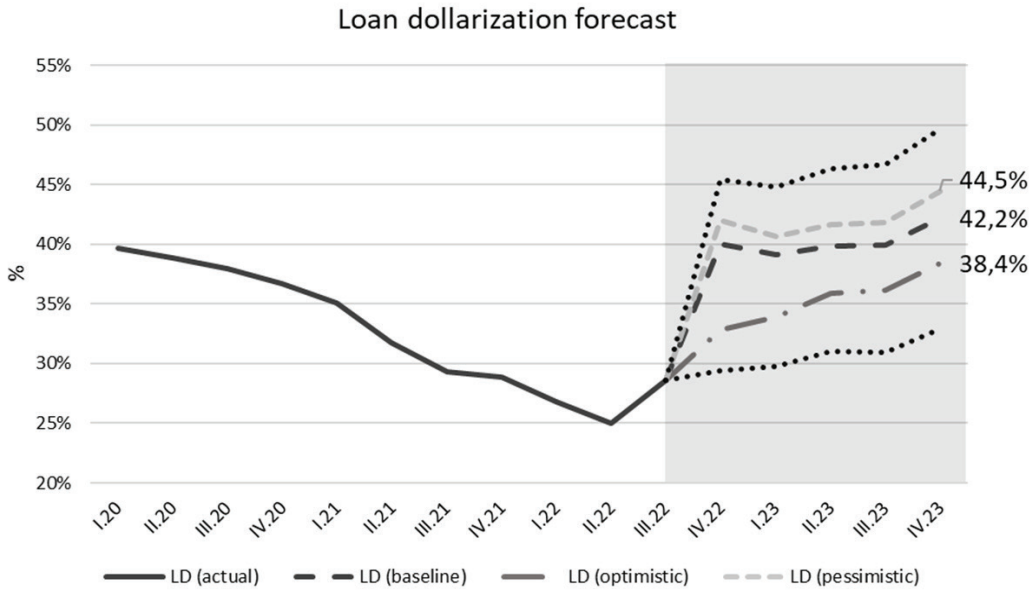

Fig. 6. Loan dollarization forecast under baseline and alternative scenarios
Source: developed by the authors

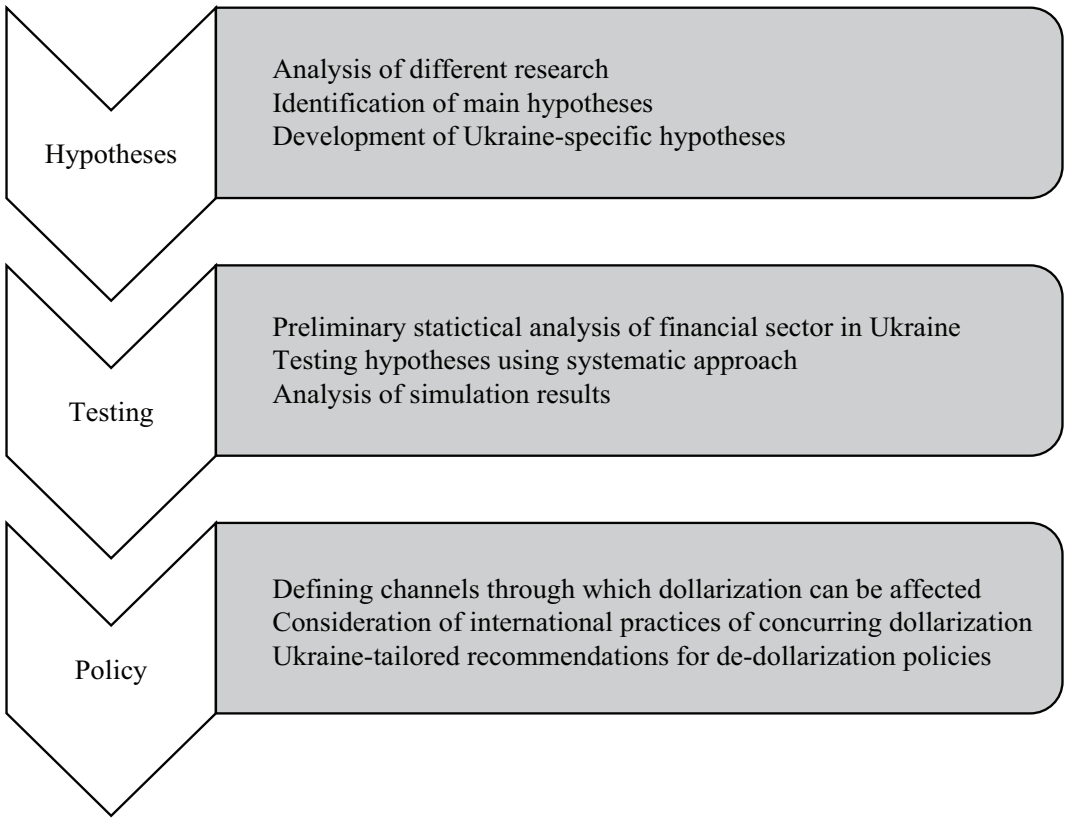

Fig. 7. Framework for identifying the most effective policies for affecting financial dollarization in Ukraine
Source: developed by the authors

under the baseline scenario recovery of business activities, as well as that world inflation, which will continue slowly increasing throughout 2023 as it has not reached its peak yet.

The forecast results are presented in Fig. 5 and Fig. 6.

The difference in results between scenarios is best seen in the second half of 2023, with the pessimistic scenario showing slightly faster deposit dollarization growth than the baseline scenario, and the optimistic scenario showing smoother DD growth. Loan dollarization appears to be more sensitive to changes in assumptions and macroeconomic conditions. The baseline scenario already accounts for unfavorable economic conditions, resulting in the same trend for both baseline and pessimistic scenarios. The greatest increase in LD is observed in 4Q 2022, slowly increasing thereafter. The optimistic scenario has a slower LD growth rate than the other scenarios. Changes in deposit rate differentials are unlikely to affect the scenarios due to low lending trends and highly liquid banks.

Conclusions and further research proposals. Concluded analysis can be summed up in the framework for identifying the most effective policies for affecting financial dollarization in Ukraine (Fig. 7).

A de-dollarization strategy has been developed for Ukraine, focusing on three pillars: inflation-targeting, financial market deepening, and administrative measures. The National Bank of Ukraine's experience has shown that a comprehensive approach is needed to maintain low dollarization levels during times of conflict. The use of inflation targeting has been critical for stability. To promote the use of the national currency and reduce dollarization, the NBU can implement monetary policy tools, reduce foreign currency lending, improve financial literacy, and promote the benefits of using local currency. Israel's experience in promoting national currency bonds can serve as a reference for Ukraine. To incentivize investment in hryvnia bonds, the government can conduct public awareness campaigns, offer attractive interest rates, simplify the buying and selling process, and highlight tax incentives. Reducing dollarization requires a joint effort from the government, the central bank, and the public.

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ОСОБЛИВОСТІ ФІНАНСОВОЇ ДОЛАРИЗАЦІЇ В УМОВАХ ВОЄННОГО СТАНУ: ВИПАДОК УКРАЇНИ

Оцінено особливості доларизації банківського сектору України із застосуванням економетричного інструментарію та системного підходу, проведено сценарний аналіз розвитку доларизації під час воєнного стану, розроблено підхід для надання рекомендацій з урахуванням довгострокових цілей із забезпечення фінансової стабільності.

Результати дослідження свідчать про те, що із запровадженням режиму інфляційного таргетування рівень доларизації кредитів і депозитів поступово зменшувався, проте залишався на завищеному рівні. З початком повномасштабного вторгнення росії в Україну рекордно низький рівень доларизації за останні десятиліття та адміністративні обмеження Національного банку зменшили ризик зростання показника доларизації, який був значним під час попередніх криз.

Побудована система симультативних рівнянь дала змогу оцінити вплив макроекономічного середовища та монетарної політики на рівень доларизації банківського сектору. Зі зростанням інфляції та обмінного курсу і, відповідно, більшою волатильністю даних макроекономічних показників економічні агенти хеджуватимуть свої ризики й обиратимуть відносно стабільнішу валюту через ризик знецінення власних коштів. Інший висновок полягає в тому, що кредитна доларизація залежить від депозитної доларизації.

За допомогою системи симультативних рівнянь побудовано базовий і два альтернативних – песимістичний та оптимістичний – сценарії прогнозу, згідно з якими доларизація депозитів у період кризи, невизначеності та завищених очікувань економічних агентів і далі зростатиме. Рівень кредитної доларизації у 2023 році стабілізується і залишатиметься на відносно сталому рівні завдяки небажанню банків брати додатковий кредитний та валютний ризики.

Для забезпечення фінансової стабільності на довгострокову перспективу стратегія з дедоларизації має охоплювати монетарну політику, вертикальний розвиток фінансового ринку, зокрема розвиток ринку ОВДП та альтернативних гривневих інструментів, а також застосування макропруденційних інструментів.

Ключові слова: монетарна політика, фінансова доларизація, економетричний інструментарій, сценарний аналіз, доларизація банківського сектору, фінансова стабільність, трансмісійний механізм.

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