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ECONOMIC AND MATHEMATICAL MODELING AND QUANTITATIVE ANALYSIS OF THE DYNAMICS OF PRIVATBANK'S CREDIT OPERATIONS

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Abstract. *The article investigates the dynamics of PrivatBank's credit operations using methods of economic and mathematical modeling and quantitative analysis. Based on time series, alternative trend models are constructed and compared, which are evaluated by R^2 and MAPE indicators.*

It was found that the quadratic model best describes the nature of the change in the studied indicator. On its basis, point forecasting was carried out, confidence intervals were calculated and the variation of the residuals was estimated, which allowed determining the accuracy and reliability of the model. The obtained results confirm the feasibility of using quantitative methods and elements of applied econometrics for the analysis of banking processes and can be used in further studies of credit dynamics.

Key words: *credit operations, economic and mathematical modeling, quantitative analysis, applied econometrics, time series, trend model, forecasting, MAPE, confidence intervals, banking system.*

The purpose of the article is to analyze and model the dynamics of PrivatBank's credit operations based on methods of economic and mathematical modeling and quantitative analysis.

Research results. For the initial analysis of the dynamics and identification of general trends in the PrivatBank loan portfolio, a graph of the original time series was constructed (Fig. 2). Its analysis indicates the presence of a growing trend and the uneven nature of the dynamics. To implement the tasks set, a sample of original data was constructed, where y is the volume of the net loan portfolio of PrivatBank minus the formed reserves, which most fully characterizes the real lending activity of the bank (Table 1). To select the model, a comparative analysis of the constructed functions was carried out by the coefficient of determination R^2 and the mean absolute percentage error (MAPE) (Table 2). The calculation results showed that the quadratic model has the highest coefficient of determination ($R^2=0,95$) and the lowest MAPE value (5 %), which indicates a high accuracy of approximation. Thus, it was the quadratic model that was chosen for further forecast calculations of the loan

portfolio volumes of JSC CB “PrivatBank”.

Based on the quadratic model, a medium-term forecast of the net loan portfolio of JSC CB “PrivatBank” for 2025–2026 was made. The model predicts a steady growth of PrivatBank’s loan portfolio throughout the entire forecast horizon. By the end of 2026, the portfolio is forecast at UAH 171,48 billion, which means a cumulative growth of 46,56 % relative to the base. The quarterly growth rate gradually stabilizes at around 5 %, which is a consequence of the positive coefficient at t_2 in the model equation. The forecasted dynamics are consistent with the general trends in the development of the banking sector of Ukraine. The stable growth of PrivatBank’s loan portfolio in 2025–2026 can be supported by a combination of factors: a gradual decrease in the NBU discount rate from 25 % in 2022 to the current level, the continuation of state preferential lending programs, growing demand from the population for consumer and mortgage lending, as well as the expansion of the digital client base through “Privat24”.

The results obtained can be used to plan bank lending activities, evaluate loan portfolio development scenarios, and support management decisions in the field of credit risk management.

Reference

1. Liudkovska Yu., Abdullaieva A. Otsinka suchasnykh tendentsii bankivskoho kredytuvannia v Ukraini protiahom 2018-2023 rokiv. *Ekonomika ta suspilstvo*. 2023. Vyp. 56. DOI : <https://doi.org/10.32782/2524-0072/2023-56-109> [in Ukrainian]
2. Bondarenko L., Yaremkovych M. Tendentsii rozvytku bankivskoho kredytuvannia v Ukraini v umovakh ekonomichnoi nestabilnosti. *Ekonomika ta suspilstvo*. 2025. Vyp. 82. DOI : <https://doi.org/10.32782/2524-0072/2025-82-138> [in Ukrainian]
3. Shcherbiiuk A., Tkachuk N. Suchasni pidkhody do upravlinnia kredytnym ryzykom banku: teoretychni zasady ta praktychni instrumenty. *Ekonomika ta suspilstvo*. 2024. Vyp. 63. DOI : <https://doi.org/10.32782/2524-0072/2024-63-27> [in Ukrainian]
4. Modeling Bank Credit Risk Management Using Value at Risk and Fuzzy Logic Approaches. URL : <https://www.mdpi.com/1911-8074/14/5/211>
5. Emile du Plessis. Dynamic forecasting of banking crises with a Qual VAR. *Journal of Applied Economics*. 2022. Vol. 25, Is. 1. P. 477–503. DOI : <https://doi.org/10.1080/15140326.2020.1816132>
6. Khondokar Jilhajj. Forecasting Lending Interest Rate and Deposit Interest Rate of Bangladesh Using the Autoregressive Integrated Moving Average Model. *International Journal of Economics and Financial Issues*. 2023. Vol. 13(3), P. 169–177. DOI : <https://doi.org/10.32479/ijefi.14321>
7. Doan Van Dinh. Forecasting Domestic Credit Growth Based on ARIMA Model. *Management Science Letters*. 2020. Vol. 10. P. 1001–1010. DOI : <https://doi.org/10.14710/medstat.13.1.1-12>
8. Fallanca M. G., Forgione A. F., Otranto O. Forecasting the macro determinants of bank credit quality: a non-linear perspective. *The Journal of Risk Finance*. 2020. Vol. 21 No. 4. DOI : <https://doi.org/10.1108/JRF-10-2019-0202>
9. Masini R. P., Medeiros M. C., Mendes E. F. Machine Learning Advances for Time Series Forecasting. *Journal of Economic Surveys*. 2023. 37(1), P. 76–111. DOI : <https://doi.org/10.1111/joes.12429>
10. Advancing credit risk assessment using time series and machine learning techniques. URL : <https://www.sciencedirect.com/science/article/pii/S0169023X25000850>
11. Minfin: PryvatBank splatyt do derzhbiudzhetu ponad 40,9 mlrd hrn podatku na

prybutok za rezultatamy 2024 roku. URL :
https://mof.gov.ua/uk/news/minfin_privatbank_splatit_do_derzhbiudzhetu_ponad_409_mlr_d_grn_podatku_na_pributok_za_rezultatami_2024_roku-5018 [in Ukrainian]

12. Malomu ta serednomu biznesu. URL : <https://privatbank.ua/business> [in Ukrainian]

13. Nahliadova statystyka. Ofitsiine internet-predstavnytstvo Natsionalnoho banku Ukrainy. URL : <https://bank.gov.ua/ua/statistic/supervision-statist#1> [in Ukrainian]

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