

REVIEW

by **Assoc. Prof. Shteryo Stefanov Nozharov, PhD**,

Associate Professor in Professional Field 3.8. "Economics", scientific specialty "Political Economy (Microeconomics, Macroeconomics, Economic Policy and Sustainable Development)" at the University of National and World Economy (UNWE), PhD in Professional Field 3.8. "Economics", scientific specialty "Political Economy" – UNWE

(name, middle name, surname – academic position in a scientific organization, academic degree)

of a dissertation for the award of the educational and scientific degree "Doctor" (PhD)

in Field of Higher Education 3. Social, Economic and Legal Sciences

Professional Field 3.8. Economics

Doctoral Program "Finance, Insurance and Social Security"

Author: **Anna Jatczak**, independent doctoral student at VUZF;

Topic: “Применение математических моделей в деятельности банков Польши” (Application of mathematical models in the operations of banks in Poland)

Scientific Supervisor: **Prof. Igor Britchenko, D.Sc.**

(name, middle name, surname – academic position in a scientific organization, academic degree)

1. General Description of the Submitted Materials

By Order No. 297 dated 15.07.2026 of the Rector of the University of Insurance and Finance, Cor. Mem. Prof. Boris Velchev, D.Sc. (Law), I have been appointed as a member of the scientific jury to conduct the defense procedure of a dissertation titled “Применение математических моделей в деятельности банков Польши” (Application of mathematical models in the operations of banks in Poland) for the acquisition of the educational and scientific degree "Doctor" (PhD) in Field of Higher Education 3. Social, Economic and Legal Sciences, Professional Field 3.8. Economics, Doctoral Program "Finance, Insurance and Social Security". The author of the dissertation is Anna Jatczak – an independent doctoral student at the Department of Finance and Insurance, with Prof. Igor Britchenko, D.Sc. as scientific supervisor.

The materials submitted by the candidate Anna Jatczak include documents according to the provided inventory:

A copy of the dissertation, an abstract (autoreferat), a completed checklist for the fulfillment of the minimum national requirements for the "Doctor" (PhD) academic degree, a declaration of originality, a summary of dissertation contributions, a list of the doctoral student's publications, an inventory of scientific publications, a curriculum vitae (CV), and a plagiarism detection software check report. The doctoral student has enclosed 3 articles published in non-refereed but peer-reviewed journals included in the NACID (National Centre for Information and Documentation) list.

2. Brief Biographical Data of the Doctoral Student

- **Education and Qualification:** She graduated with a Master's degree in Mathematics from the Maria Curie-Skłodowska University in Lublin in 1990, specializing in Applied Mathematics. In 2005, she completed a postgraduate qualification in "Organization and Management of Education" at the University of Humanities and Natural Sciences in Sandomierz.
- **Professional Experience:** From 1990 to the present, she has been working continuously as a Mathematics teacher at School Complex No. 3 "King Jan III Sobieski" in Stalowa Wola. In 1996, she acquired the first degree of professional specialization, and since 2004, she has held the highest professional rank of "certified teacher".
- **Expert and Public Activity:** Since 2001, she has been registered as a Mathematics examiner with the Central Examination Board in Warsaw and regularly evaluates secondary school leaving exams (matura) at basic and advanced levels. Over the years, she has actively collaborated with the Ministry of National Education on the "New Matura" program, participated in Mathematical Olympiad committees, and contributed to the organization of the "Mathematical Kangaroo" International Competition.
- **Publication Activity:** Since 2003, she has been actively collaborating with the "OPERON" Pedagogical Publishing House in Gdynia, co-authoring 20 books and educational materials in Mathematics, some of which have been officially approved by the Ministry.
- **Awards:** For her pedagogical achievements, she has been awarded numerous times by the school management and local authorities (Starosta's Award in 2009), and in 2013, she was honored with the Silver Medal for Long Service.
- **Research Interests:** The candidate's scientific research is focused on the applications of mathematics in economics, with the current doctoral dissertation being a direct result and the culmination of this long-standing professional and research interest.

3. Relevance of the Topic and Expediency of the Set Goals and Tasks

- **Relevance in Scientific and Scientifically Applied Terms:** The relevance of the dissertation by Anna Jatzak, MA, is determined by the critical role of mathematical modeling in the modern financial sector. Under the conditions of market dynamics, banking institutions in Poland face the necessity of continuously optimizing their efficiency and risk management. The dissertation successfully addresses this problem by linking the theoretical concepts of financial mathematics with real banking practice.

- **Degree and Levels of Relevance:** The study possesses a high degree of applied relevance, as it analyzes empirical data for key Polish banks (Nadsan Co-operative Bank and Pekao S.A.) over an exceptionally specific and challenging period (2017–2025/2026), marked by the consequences of the Covid-19 pandemic, inflationary processes, and sharp shifts in interest rates (the variable WIBOR rate).
- **Expediency of the Goals and Tasks:** The main goal set – to present the practical application of selected mathematical models in the operations of specific banks in Poland – is fully expedient and logically linked to the formulated research hypotheses. The tasks are clearly defined and consistently resolved through a transition from theoretical foundations (simple and compound interest models, discounting) to in-depth empirical and index analysis. The development of simulation models for accounting for inflation in debt repayment is of particular expediency and high scientifically applied value.

4. Knowledge of the Problem

- **Knowledge of the State of the Problem:** The doctoral student demonstrates an in-depth and detailed knowledge of the researched subject matter. The work successfully integrates both the fundamental principles of financial mathematics (interest models, discounting, capitalization) and the specific legal and structural framework of the Polish banking system (the acts on the NBP, the Bank Guarantee Fund, and the WIBOR rates).
- **Creative Evaluation of the Literary Material:** The literature used is analyzed critically and creatively, rather than through simple compilation. The candidate, Anna Jatczak, skillfully views the theoretical mathematical formulations through the prism of contemporary economic realities in Poland (the impact of the Covid-19 pandemic and inflationary processes), which allows her to progress from the analysis of sources to the formulation of her own innovative simulation models.

5. Research Methodology

- **Adequacy of the Methodology:** The chosen methodology is adequate and methodologically sound. It successfully combines a deductive approach (transitioning from general theoretical mathematical models to specific banking case studies) with scientifically applied index and statistical analysis.
- **Achievement of Goals and Tasks:** The methodology fully enables the achievement of the work's objective. The quantitative tools used – such as financial ratio analysis of profitabil-

ity (ROA, ROE, PM) and simulation models for assessing the impact of WIBOR and inflation – allow the doctoral student to objectively analyze the operations of the researched banks and to test the formulated research hypotheses with a high degree of accuracy.

6. Characteristics and Evaluation of the Dissertation

The dissertation is structured into an introduction, three chapters, a conclusion, and a bibliography. The main text extends up to page 163, and the list of literature used begins on page 164, with the work spanning a total of 168 pages, which demonstrates good research discipline and a solid theoretical foundation. The exposition presents numerous tables and figures (including the author's own graphic diagrams of the mathematical models and the banking structure) that support the analytical argumentation and visualize key quantitative dependencies.

The structure of the dissertation is logically consistent: the first chapter builds the theoretical framework of the banking system and the methodology of interest rate models, the second presents the financial analysis of specific banking institutions, and the third develops the empirical and simulation analysis in a real economic environment. The theoretical part is comprehensive and examines in detail the legal and prudential regulatory framework in Poland, though in some places an excessive expansion of the regulatory background is observed (detailed citation of legal sections) at the expense of a clearer focus on the specific economic problem. The analytical second chapter is structured correctly, with clearly derived profitability indicators (ROA, ROE, PM), but it could have offered a more in-depth discussion regarding the methodological limitations when directly comparing a small cooperative bank (SANBank) with a large joint-stock company (Pekao S.A.).

The empirical and simulation analysis in the third chapter is the most strongly developed part of the work: it is based on real market financial data (the 2017–2023/2025 period) and proposes integrated mathematical models to investigate the impact of the WIBOR rate and post-Covid-19 pandemic inflationary processes. The proposed simulation models for debt indexation under accelerated inflation hold clear practical value. Although the focus on two specific institutions to some extent limits the generalizability of the results to the scale of the entire European banking sector, the exposition is consistent, mathematically well-argued, and fully complies with the requirements for a doctoral dissertation in Professional Field 3.8. "Economics".

7. Contributions and Significance of the Work for Science and Practice

- **Substantive Analysis and Characterization of the Main Achievements:** The main achievements in the dissertation of the candidate Anna Jatzak are expressed in the successful systematization, software-simulation modeling, and quantitative evaluation of financial

processes in the banking sector. The work substantively builds upon the existing concepts of applied financial mathematics by transferring abstract models of simple and compound interest and discounting into the context of a highly volatile macroeconomic environment.

- **Scientifically Applied Contributions:**

- **Proving substantial new aspects of existing problems and theories using new instruments:** The doctoral student investigates classical interest models in an innovative way, empirically proving their sensitivity to unforeseen macroeconomic shocks – the Covid-19 pandemic and the subsequent inflationary waves in the Polish market.
- **Creation of new simulation models and schemes:** An indisputable contribution of the dissertation is the development of two simulation models for accounting for inflation in debt repayment. The author proposes and mathematically substantiates schemes for increasing the interest rate by the inflation level, as well as for the indexation of the debt itself.
- **Obtaining and proving new facts:** Through an in-depth index and comparative analysis for the 2017–2023/2025 period, new empirical data on operational efficiency and profitability (via ROA, ROE, and PM) of two financial institutions fundamentally different in scale and structure – Nadsan Co-operative Bank (SANBank) and the joint-stock company Pekao S.A. – have been derived.

- **Nature of Contributions for Implementation and Practical Significance:** The contributions possess a distinct scientifically applied and practical character. The developed simulation calculations regarding the impact of the interbank WIBOR rate on consumer loans represent a methodological tool ready for implementation. Their application would assist bank managers in forecasting liquidity risk and making strategic decisions on the pricing of deposit and credit products under high inflation conditions.

8. Evaluation of the Publications on the Dissertation

The doctoral student, Anna Małgorzata Jatzak, submits 3 scientific articles published in specialized editions, which fully and in detail reflect the main theoretical models and empirical results of the dissertation. The publications do not have any unjustified overlap and are classified according to the following indicators:

- **By Type and Significance:** All 3 publications are scientific articles printed in the reputable international scientific journal *VUZF Review* (Sofia), which is indexed in global databases and provides high research visibility of the results.

- **By Language and Place of Publication:** The three articles are written in English and are published abroad (relative to the doctoral student's country of origin – Poland), which meets modern standards for the internationalization of science.
- **By Number of Co-authors:** The three scientific articles on the dissertation are entirely individual (100% personal contribution), which is indisputable evidence of the candidate's research autonomy.
- **Thematic Distribution:** The publications strictly follow the logic of the dissertation. The first article (2021) formalizes the simple interest model, the second (2022) develops the theoretical aspects of compound interest, and the third (2022) implements the tools of ratio analysis to assess the financial condition of banks.

9. Assessment of the Fulfillment of the Minimum National Requirements

- **Compliance with the Minimum Requirements:** Based on the submitted materials, scientific publications, and the dissertation abstract, the doctoral student Anna Jatczak fully meets and exceeds the minimum national requirements under the Development of Academic Staff in the Republic of Bulgaria Act (DASRBA) and the Regulations for its implementation for acquiring the educational and scientific degree "Doctor" (PhD) in Professional Field 3.8. Economics.
- **Scientometric Indicators and Publications:** The doctoral student presents the required number of scientific publications on the topic of the dissertation, which popularize the obtained results in specialized editions and scientific forums. Particular note should be made of her exceptionally rich prior creative and expert capacity – she is the co-author of 20 mathematical books and educational materials approved by the Ministry of National Education of Poland, which is evidence of high scientific and research productivity. The candidate gathers the required number of points under the respective groups of indicators, which provides full grounds for the successful completion of the procedure.

10. Personal Contribution of the Doctoral Student

All stages of the dissertation research – from the definition of the research hypotheses and the systematization of the theoretical interest rate models to the processing of the empirical material and the execution of the simulation calculations – appear to be the personal work of the doctoral student. The candidate, Anna Jatczak, demonstrates high software and mathematical competence. All tabular data, graphical visualizations, and comparative analyses of the financial indicators of SAN-

Bank and Pekao S.A. seem to be generated independently by the author. The formulated scientifically applied contributions, especially the two simulation models for accounting for inflation, appear to be her personal merit.

11. Dissertation Abstract (Autoreferat)

The dissertation abstract is formatted correctly and contains all mandatory elements stipulated in the regulations for the award of the educational and scientific degree "Doctor" (PhD). The structure is consistent, the exposition is clear and grammatically precise, and the main components of the dissertation – goal, tasks, methodology, results, and applicability – are presented in a synthesized and accessible manner. The document provides a good overview of the logic of the research and reflects the key highlights of the dissertation, including the theoretical framework and the empirical case study.

12. Critical Remarks and Recommendations

1. **Methodological Incomparability in the Comparative Analysis:** The second chapter offers a parallel ratio analysis of profitability (ROA, ROE, PM). However, the spatial comparison of a small, local cooperative bank (SANBank) with the scale and market influence of a large joint-stock company (Pekao S.A.) carries methodological risks. I recommend that in future research, the doctoral student define clearer boundary criteria or compare institutions of a similar rank to ensure a higher degree of comparability among macroeconomic indicators.
2. **Excessive Expansion of the Regulatory-Descriptive Background:** In the first part of the dissertation, an excessively detailed citation and re-narration of sections of Polish banking legislation (the Act on the NBP, the Act on the Bank Guarantee Fund, etc.) is observed. This strong descriptive focus comes at the expense of a deeper theoretical debate regarding the economic essence of the mathematical models themselves. I recommend that in future publications, the author balance the text by shortening purely regulatory references in favor of a conceptual focus on the research problem.
3. **Lack of Verification of Simulation Models with Forecast Data:** In the third chapter, the author proposes two highly interesting simulation models for accounting for inflation in debt repayment (through increasing the interest rate or indexation). However, these models remain predominantly at a theoretical and simulation level for a past period. I recommend that the doctoral student, in her future research activities, test the applicability of these models with forecast macroeconomic data for subsequent periods to verify their real-time resilience and long-term effect on bank profitability.

13. Personal Impressions

The presented dissertation is a natural culmination of the doctoral student's long-standing professional interest in applied mathematics in economics. The research bears a clear imprint of her personal analytical approach, software competence, and striving to link abstract mathematical theories with real banking practice.

14. Recommendations for the Future Use of Dissertation Contributions and Results

I recommend that the simulation calculations regarding the impact of the reference interest rate (WIBOR) and the debt indexation models under inflation, developed in the third chapter, be provided to the analytical departments of cooperative and commercial banks in Poland. They can serve as a ready-made methodological toolkit for stress-testing liquidity risk and for optimizing the portfolio of credit and deposit products during sharp macroeconomic shifts.

CONCLUSION

The dissertation contains scientific, scientifically applied, and applied results that represent an original contribution to science and meet the requirements of the Development of Academic Staff in the Republic of Bulgaria Act (DASRBA) and the Regulations for the implementation of DASRBA. The submitted materials and dissertation results comply with the specific requirements of the Regulations for the admission and training of doctoral students at the University of Insurance and Finance. The dissertation demonstrates that the doctoral student Anna Jatczak possesses in-depth theoretical knowledge and professional skills in Professional Field 3.8. Economics, exhibiting the qualities and abilities required to conduct scientific research independently.

In light of the above, I confidently give my positive evaluation of the research presented by the dissertation, abstract, achieved results, and contributions reviewed above, and I propose to the honorable scientific jury to award the educational and scientific degree "Doctor" (PhD) to Anna Jatczak in Field of Higher Education 3. Social, Economic and Legal Sciences; Professional Field 3.8. Economics.



6.9.2026 / September 6, 2026

Reviewer:

Assoc. Prof. Shteryo Nozharov, PhD

(academic position, academic degree, name, surname)