ABSTRACT

of the dissertation submitted for the degree of Doctor of Philosophy (PhD) in the specialty "6D050900 – Finance" by Azamat Auyezkhanuly on the topic "Bank Mortgage Lending to Individuals in the Republic of Kazakhstan: Theory and Practice"

The relevance of this dissertation research is determined by the fact that, despite the expansion of mortgage lending in the Republic of Kazakhstan, housing remains unaffordable for the general population. High interest rates, significant down payments, and the discrepancy between income levels and housing costs significantly limit opportunities for homeownership.

This issue is particularly significant in the context of the implementation of state policy aimed at increasing housing affordability. The President of the Republic of Kazakhstan has repeatedly emphasized the need to improve mortgage lending and expand its reach, demonstrating its priority status within the state's socioeconomic policy. Furthermore, given the digital transformation of the financial system, there is a growing need for a comprehensive study of the theoretical, methodological, and practical foundations for improving mortgage lending to individuals.

The aim of the dissertation is to develop proposals for improving the theory and practice of bank mortgage lending to individuals based on the study of its theoretical and methodological foundations.

To achieve the stated aim, the following **tasks** were accomplished in the dissertation:

– To scientifically define the conceptual foundations of the theory of mortgage lending to individuals based on the systematization of its economic nature, evolution, and key concepts;

– To conduct a comprehensive analysis of the institutional structure of the banking mortgage lending system for individuals, its operating principles, and the methodology for its evaluation;

– To examine international experience in mortgage lending to individuals and, on this basis, develop comparative scientific conclusions for adapting relevant models to the conditions of Kazakhstan;

– To analyze the macroeconomic determinants of mortgage lending to individuals in Kazakhstan, as well as key housing affordability indicators;

– To investigate the structural and dynamic transformation of the mortgage lending market for individuals in the Republic of Kazakhstan, including qualitative and quantitative indicators of banks, from the perspective of market segmentation and product lines;

– To carry out a comprehensive assessment of bank efficiency in mortgage lending to individuals using the two-stage DEA method and the Malmquist productivity index, and to identify changes over time;

– To develop scientifically grounded recommendations for integrating a two-level methodology aimed at improving the accessibility of banking mortgage lending into the implementation of mortgage programs;

– To explore promising directions for the development of the ecosystem of banking mortgage lending to individuals using artificial intelligence and blockchain technologies;

– To develop a financial model for implementing reverse mortgage lending for pensioners in Kazakhstan.

Object of the study. The object of the study comprises second-tier banks of the Republic of Kazakhstan and the mechanisms of mortgage lending to individuals.

The subject of the research is the financial and economic relationships arising in the process of bank mortgage lending to individuals, as well as the methodological, institutional, and technological mechanisms that ensure their regulation, efficiency assessment, and determination of accessibility.

The methodological framework of the study is based on both general scientific methods of inquiry and specialized methods. Among the methods employed are data collection and processing techniques, statistical methods of analysis, economic and mathematical modeling, comparative analysis methods, as well as efficiency evaluation methods, including Data Envelopment Analysis (DEA) and the Malmquist productivity index. These methods made it possible to obtain comprehensive and reliable information on the current state of bank mortgage lending to individuals in the Republic of Kazakhstan, as well as to form an empirical basis for analyzing its efficiency, assessing the accessibility of mortgage lending, and developing methodological approaches to its enhancement in the context of the implementation of state programs and digital transformation.

Main results of the study. The dissertation refines the theoretical and conceptual foundations of bank mortgage lending to individuals and identifies the institutional structure of the mortgage system, its key principles, and development factors. In the context of digital transformation, the transition from a traditional model to an ecosystem paradigm is scientifically substantiated, and a multi-level analytical platform for efficiency assessment based on the DEA method and the Malmquist productivity index is proposed. A comparative analysis of international mortgage lending models is conducted, and directions for their adaptation to the conditions of the Republic of Kazakhstan are identified.

In the second chapter, based on empirical analysis, it is established that the development of mortgage lending in Kazakhstan is closely linked to macroeconomic factors and is accompanied by the formation of a procyclical relationship between the mortgage market, housing prices, and household incomes. Despite the significant growth of the mortgage portfolio during the period 2015-2024, an intensification of regional disparities in debt burden relative to income dynamics is identified, while a decline in housing affordability is confirmed by the PIR, MPI, and HAI indicators. It is determined that the market exhibits a cyclical nature, is dependent on government programs, and is characterized by the dominance of the state-owned Otbasy Bank. The application of the DEA-Malmquist approach made it possible to identify the key factors influencing banks' efficiency in the mortgage market and to substantiate the role of digitalization in enhancing their productivity.

In the third chapter of the study, a two-level methodology for the effective implementation of mortgage programs is developed. At the first level, an integrated housing affordability index combining PIR, MPI, and HAI indicators is proposed. At the second level, a methodological approach based on income segmentation using decile analysis results is introduced. Measures for differentiating state support for low-income groups are proposed, along with a mechanism of cooperation between the state and employers for middle-income groups, drawing on the experience of China. An integrated technological model is developed, based on the integration of artificial intelligence, machine learning, blockchain, and banking scoring technologies. A financial model of reverse mortgage lending is proposed as a tool to increase the incomes of older population groups.

The dissertation presents the following results characterized by **scientific novelty:**

1) In the context of digital transformation, a theoretical framework has been developed that substantiates the transition of bank mortgage lending from a traditional "system-based" paradigm to an "ecosystem" paradigm; a conceptual platform for the comprehensive analysis of the mortgage ecosystem, as well as an integrated framework for assessing the efficiency of its actors, has been proposed;

2) An original methodology for evaluating the efficiency of second-tier banks operating in the mortgage segment has been proposed, based on a two-stage DEA model and the Malmquist productivity index; key factors influencing bank efficiency have been systematized and their impact empirically validated;

3) An integrated index for assessing mortgage affordability, combining MPI, PIR, and HAI indicators, has been developed, which enabled a comprehensive identification of deep structural disparities across regions of Kazakhstan;

4) An approach to income-based segmentation grounded in decile analysis of mortgage products has been proposed, within which mechanisms of state support targeted at different income groups have been scientifically substantiated;

5) An integrated technological model for the development of the mortgage lending ecosystem for individuals has been developed, based on the integration of AI- and machine learning-driven scoring systems with blockchain technologies, enabling the formation of a conceptual platform for the full digitalization and automation of all stages of the mortgage process;

6) A financial model of reverse mortgage lending adapted to the conditions of Kazakhstan has been proposed, and the potential to enhance the welfare of pensioners through the transformation of housing capital into a source of income, as well as the introduction of a new financial instrument with limited risks for banks, has been scientifically substantiated.

Provisions submitted for defense:

1) In the context of digital transformation, it has been established that the mortgage lending system is not merely a simple interaction between banks and borrowers, but rather a complex, interconnected structure involving multiple participants. It is scientifically substantiated that considering the mortgage lending system within the traditional "system" paradigm is insufficient, and the necessity of interpreting mortgage relations as an "ecosystem" evolving through close interaction among its participants has been demonstrated. A conceptual framework for the comprehensive analysis of the mortgage ecosystem and an integrated methodological approach enabling a holistic assessment of the effectiveness of its participants have been proposed.

2) Despite the significant growth of the mortgage market in Kazakhstan, it has been demonstrated that housing affordability remains low. The indicators analyzed by the author (PIR, HPI, HAI, MPI) show that mortgage lending remains inaccessible for most individuals. It has been established that mortgage affordability is relatively higher in the western regions, whereas the situation is more challenging in the southern regions and major cities. It is also clarified that the development of the mortgage market is cyclical in nature and largely dependent on government programs. The results obtained substantiate the need to develop a regionally differentiated and income-oriented state mortgage policy.

3) The methodology for assessing the efficiency of second-tier banks in the mortgage market, based on a two-stage DEA model and the Malmquist productivity index, made it possible to demonstrate that bank efficiency directly depends on the quality of resource management, the structure of operating expenses, the quality of the loan portfolio, and

technological efficiency. This allowed the following conclusions to be formulated: A) operating expenses, including excessive staff expansion, significantly reduce bank efficiency, whereas the expansion of the deposit base has a positive effect; B) the Malmquist index revealed heterogeneous productivity dynamics over time: universal banks exhibit relatively stable growth, while specialized and transforming banks demonstrate pronounced cyclical fluctuations; C) in the mortgage segment, the key factors for improving bank efficiency are the optimization of operating expenses, the development of a digital mortgage ecosystem, the efficient use of the resource base, and the strengthening of risk management.

4) The author's integrated housing affordability index, combining MPI, PIR, and HAI indicators, made it possible to identify significant structural disparities across regions. Higher levels of affordability were recorded in Aktobe Region – 0.5875, West Kazakhstan Region – 0.5705, and Mangystau Region – 0.5685, whereas in the southern regions the levels are considerably lower: Shymkent – 0.348), Turkistan Region – 0.4315, and Almaty Region – 0.4265. The results obtained indicate the need to develop a regionally differentiated mortgage policy. The feasibility of adapting mortgage lending limits, subsidy mechanisms, and down payment requirements to regional specificities has been substantiated.

5) The income segmentation approach based on decile analysis made it possible to substantiate that mortgage products are concentrated in high-income groups, while individuals with low (1st-3rd deciles) and middle (4th-6th deciles) income levels are effectively excluded from the mortgage market. To reduce this inequality, a system of appropriate instruments has been identified. For socially vulnerable groups, the introduction of regional coefficients and government subsidy mechanisms is proposed, while for middle-income groups, a framework for cooperation between the state and employers has been developed.

6) The proposed integrated technological model aimed at developing the mortgage lending ecosystem has demonstrated the effectiveness of improving the scoring process based on artificial intelligence, machine learning, and blockchain technologies. A conceptual platform for the full digitalization of the mortgage process has been developed, covering stages such as scoring, risk management, document verification, underwriting, valuation, fraud detection, and execution through smart contracts. As a result, it has been scientifically substantiated that the implementation of this model contributes to reducing banks' operating costs and enhancing the efficiency of risk management, ensuring the transition of the national mortgage ecosystem to a qualitatively new level.

7) The financial model for the implementation of reverse mortgage lending provides a scientific basis for enhancing the financial well-being of pensioners through the transformation of housing capital into a source of income. It has been established that the proposed model has the potential to increase retirees' monthly income by up to two times, while for owners of high-value real estate it offers additional opportunities for further income growth. It has also been demonstrated that the LTV ratio in reverse mortgage products ensures the preservation of banks' financial stability.

The theoretical significance of the research lies in the advancement of the theoretical and methodological foundations of bank mortgage lending to individuals in the Republic of Kazakhstan, as well as in the scientific substantiation of the patterns underlying the transition from a traditional "system-based" model to an "ecosystem-based" model in the context of the digital transformation of the financial sector. The findings expand scholarly understanding of the structure of the mortgage market, the degree of its

dependence on government programs, its cyclical nature of development, and the relationship between housing affordability and the imbalance between household income levels and real estate prices.

The application of non-parametric analytical methods (DEA and the Malmquist index) contributes to the improvement of tools for assessing banks' performance, while the developed system of integrated indicators (MPI, PIR, and HAI), together with the two-level methodology, provides a scientific basis for a comprehensive analysis of mortgage lending affordability.

The practical significance of the study is determined by the applicability of its results in the activities of public authorities, financial institutions, and second-tier banks. The proposed two-level methodology enables the formulation of mortgage policy while accounting for regional and income-specific characteristics of individuals, facilitates the evaluation of the effectiveness of government programs, and supports the development of measures for their improvement. The DEA-Malmquist methodology is oriented toward enhancing banks' operational efficiency, optimizing resource utilization, and strengthening risk management practices. The digital model of the mortgage ecosystem promotes process automation, cost reduction, and increased transparency. The research outcomes can be employed in the development of strategies to improve housing affordability, as well as in the introduction of new financial instruments, including reverse mortgages.

Publication of research results. The main results and conclusions of the dissertation research have been published in 10 scientific works: 2 articles in journals indexed in the SCOPUS database, and 8 articles in publications recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan.

Structure the dissertation. The dissertation consists of an introduction, three chapters, a conclusion, and a list of references. The dissertation includes 46 tables, 53 figures, and a list of references comprising 261 sources.