

**HIGHER SCHOOL FOR INSURANCE AND FINANCE
(VUZF UNIVERSITY) – SOFIA**

Finance Department

**ABSTRACT
OF DISSERTATION**

**INNOVATIONS IN RETAIL BANKING AND
THEIR APPLICATIONS IN BULGARIA –
PERSPECTIVES AND TRENDS**

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The dissertation consists of 226 pages, of which 198 pages are main text, 8 tables and 58 figures, the literature used contains 300 titles and sources.

The defense of the dissertation will take place on June 22nd, 2022 at 15:00h in VUZF University at an open meeting of the scientific jury with members:

1. Prof. Dr.Econ.Sc. Virginia Zhelyazkova – VUZF University
2. Prof. Dr. Maria Vidolova – Sofia University
3. Prof. Dr. Stanimir Kabaivanov – Plovdiv University
4. Assoc. Prof. Dr. Irina Petkova – University of National and World Economy
5. Assoc. Prof. Dr. Stanislav Dimitrov – VUZF University

Reserves:

1. Assoc. Prof. Dr. Daniela Ilieva – VUZF University
2. Assoc. Prof. Dr. Stefan Raychev – Plovdiv University

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Title: ***INNOVATIONS IN RETAIL BANKING AND THEIR APPLICATIONS IN BULGARIA – PERSPECTIVES AND TRENDS***

I. General Characteristics of the Dissertation

Banking and financial industry faces emerging challenges and opportunities related to innovations in digital technologies – payments, loans, remittances, investment management and more. At the same time, innovative digital ways of attracting, servicing and administering customers allow banks to improve their efficiency through reducing costs by automating many processes in the front office, middle office and back office. Digital technologies allow completely new ways of remotely identifying, monitoring, evaluating and engaging the customers.

Object of this study are the commercial banks in Bulgaria.

Subject of the study are the innovations in retail banking, dictated by the technological development, and their applications in the banks in Bulgaria.

Objectives set in this study are:

- to establish the impact of the innovations on the banks' administrative costs, staff costs and fee and commission income;
- to define the risks arising from the implementation of the innovative technological solutions;
- to identify the factors influencing the households' loans – consumer and mortgage loans, and to evaluate the effectiveness of the innovations in the retail banking.

Tasks of the study are as follows:

- analysis and synthesis of the main theories of innovations in the economic area, particularly in retail banking;
- analysis of the main innovations in retail banking, driven by technological development, including determining the trends in the development of the banking branch in the modern distribution mix of the banks;
- systematization and classification of the main groups of factors determining the implementations of the innovations in retail banking;
- critical analysis of the used econometric models for evaluation and identification of the factors in the field of retail credits, as evaluating their applicability to the Bulgarian banking system. On this basis, appropriate tools and a set of factor variables are selected;

- analysis of the relation between mortgage and consumer loans and the GDP. The analysis is conducted for Bulgaria and for each euro area country. Correlation analysis is used to study the relationship between the variables.

Due to the specifics of the Bulgarian financial and economic system, particularly the consumer habits of the population, it can be expected that the direct applicability of a model, already created for another economy, will not lead to adequate results. For this purpose, a limited range of macroeconomic factors is selected, and with appropriate tools (applicable according to the specifics of the input data) are outlined and analyzed the significant factors influencing consumer credits and mortgage loans in Bulgaria.

The defended *research thesis* is that innovations and technological development become a significant factor for a considerable change in the traditional commercial banking.

In connection with the main thesis of the study, two hypotheses are formulated and tested, namely:

Hypothesis 1 – The innovations in banking and the new technological solutions significantly change the business model in the traditional retail banking.

Hypothesis 2 – The technological innovations significantly affect profitability and efficiency of the banks. The need for significant investments in the implementation of the banks' digital transformation leads to a change in the banks' strategies in retail banking.

The research *methodology* is a unity of traditional scientific methods and two specially developed econometric models. The methods of induction and deduction are also applied. The analysis is based on a study of the academic literature on the subject, regulatory documents and statistical information from official sources. A content analysis is made, as well as a comparative analysis of the business strategies of the banks, and general criteria for systematization and classification of empirical indicators are derived.

The study uses also scientific methods of qualitative and quantitative analysis. Qualitative analysis predominates in studying the theory of innovations and retail banking, while quantitative analysis is widely used in studying the state and dynamics of the retail banking, the individual indicators for the development of digitalization and in defining and calculating the significance of the various factors.

The testing of the research thesis uses correlation econometric analyses of the impact of the innovations on administrative costs, staff costs and fee and commission incomes of the banks.

Especially selected are variables expressing the applied innovative solutions, and their impact is evaluated using a correlation model. The same methodology is used to study and evaluate the factors influencing banks' lending in the households segment – consumer credits and mortgage loans.

The time horizon of the historical data of the econometric analysis of the factors influencing the lending to households is for the period 2004-2020, covering a full economic cycle. The econometric analysis of the impact of the innovations on the banks' administrative costs, staff costs and fee and commission income is for a period of 6 years (2015-2020), characterized by the rapid entry of innovative digital solutions for households.

II. Volume, Structure and Contents of the Dissertation

The dissertation consists of introduction, three chapters and conclusion. The introduction defines the object, the subject, the thesis, the hypotheses, the objectives and the tasks of the study. Chapter One studies the theory in the field of innovations and considers the main theoretical positions and conclusions of different authors. Based on a review of the literature on the subject, from ancient times to the present day, the essence of the innovations phenomenon, the management of non-innovation activity and innovations in retail banking are systematized. The types of banking innovations are systematized and classified, according to the literature on the subject and based on the banks' practice. The various financial technologies and their applications in retail banking are described in detail. Chapter Two examines, systematizes and describes the banking models of distribution and innovations in the lending to households. The dynamics of mortgage and consumer lending in Bulgaria is analyzed. For the first time in the literature, the approaches to the formation of interest rates on mortgage loans through its own reference interest rate are analyzed. The relations between the granting of mortgage and consumer loans and the GDP are analyzed. The analysis is conducted for each euro area country and for Bulgaria. Correlation analysis is used to study the relationship between the variables. The available data are annual, by country, for the period 2004-2020. Chapter Three presents a study of the factors influencing innovation activity and its efficiency, as well as the role of digitalization in the development of innovations in banking. Critically, various existing models of other authors are evaluated. Then, based on the conclusions concerning the applicability of the various analyzed approaches, the author presents own way of measuring the effectiveness of the innovations using statistical tools and key indicators for bank performance. The focus is placed on the role of digitalization in the development of innovations in the retail banking in Bulgaria. Own model for evaluating the factors influencing mortgage and consumer loans is also developed. Based on a descriptive analysis of the products offered by the banks in Bulgaria in the mortgage and consumer loans and sales channels, the trading strategies of the studied banks are defined.

III. Short Presentation of the Dissertation

CHAPTER ONE. FORMATION, DEFINITION AND MANAGEMENT OF INNOVATIONS

The experience of many countries shows that the main mechanism for increasing the competitiveness of the national economy is the innovation activity, associated with improved processes, radical growth of technological level and a significant increase in the share of high-tech enterprises. This technological modernization is determined by the receptivity of the economy to innovation activity. Innovations and technological development are the pillars of the modernization of the economy and the modern banking.

1. Nature of the Innovation Phenomenon

The roots of the modern philosophy of innovations are set in the classical philosophy theories, with Plato and Aristotle as their main authors. For the development of the modern ideas about the innovation phenomenon, Aristotle's view of the dynamics of the processes, their movement and change, is closest to the dynamic approach defined nowadays. Plato presents the world as a combination of the physical world of things and the invisible world of ideas. When the ideas are realized through investments in favor of the things, there is a product ready for realization, which today is called innovation. If this statement is identified with Plato's theory, then innovations are a combination of intangible ideas and material investments for their implementation.

The consideration of the innovation phenomenon in the scientific context is important for its studying. The question of the relation between traditions and revolutions in science, particularly between old and new scientific knowledge, is rooted in the work "Structure of Scientific Revolutions" of the American historian and philosopher Thomas Kuhn. There, he draws attention to the mechanism for the transformation and change of leading ideas in the science, particularly the movement of the scientific knowledge. A key finding in Kuhn's studies is that the change of the paradigm prevailing at a given stage of time determines the dynamics of science and scientific studies.

In technical and economic aspect, innovation phenomenon is directly related to radical changes in the usual principles of work and to reaching the next horizon of operational achievements through direct use of emerging technologies or by developing new production and business models. Innovations are a phenomenon that is not only measured in the present, but also contains a reference point for the future, which makes it extremely important for the social area. Through the prism of the social area, innovations are not only measured by significant social changes related to increasing the benefits of the population, but also by new social and cultural norms and examples of awareness and behavior of the people in the society. The specifics of the understanding of the innovations in the social area is the need to evaluate their impact by putting people first, as well as their attitude and reaction to the challenges of the time.

2. Defining the Innovations

The term innovation carries a great variety of meanings for different authors and is a typical example of a modern word used in different time periods. Since the term, derived from the Latin word “innovare”, has appeared for a first time in prints in the early 15th century, it has been the subject of many interpretations. The substantial set of literature sources clearly defines the role of the innovations in the dynamics of the economic growth and the socio-economic development. Innovations are described as the purposeful evolution of humanity, explained in terms of the creative capacity of the invention as a source of technological, social and cultural changes. At the same time, innovations are at the core of the programs for growth and sustainability globally. The main driver behind business innovations is to open new horizons by increasing efficiency, increasing productivity, gaining competitive advantage and expanding market share and, by adding improved products, performing efficient processes and entering promising markets. All these changes lead to lower costs, increased productivity and increased sales growth. According to Peter Drucker, “innovations are the specific tool of entrepreneurship – the action that gives resources a new capacity to create wealth”. Scott Berkun believes that “innovations are a significant positive change”. According to Tim Kastelle, “innovations are not just an idea, but a realized idea that creates value”. Joe Dwyer defines innovations as “the process of creating value by implementing new solutions to significant problems”. Based on these definitions of innovations, it is appropriate to look at innovations from the perspective of creating, absorbing and disseminating novelties as a result of a set of scientific, technical, organizational, financial and marketing activities, which are carried out by interrelated participants in the innovation process who have a specific goal and the means to achieve it.

As a result of the review of the literature sources on the subject, innovations can be classified into the following main groups:

A. according to the field of realization;

B. according to the degree and nature of the change;

C. according to the originating reasons: driven by needs, by scientific and technological progress.

A. The most common classification is according to the field of realization, according to which innovations are classified into 4 main groups:

- product;
- technological;
- market, marketing;
- organizational and managerial.

B. According to the degree and nature of change, innovations are classified into the following groups:

- radical;
- applied;
- added;
- pseudo-innovations.

C. According to the originating reason, innovations are classified into:

- pull;
- push.

3. Management of the Innovations

According to Peter Drucker, “innovations are a real activity and can and should be managed just like any other main corporate function” (Drucker, 2002). In the modern world, innovation activity is a mandatory condition for market positioning of the business. The difficulty in understanding the practical significance of the management of the innovations relates to the understanding that, in principle, any new development in the organization can be considered

related to innovation. The management of the innovation activity is classified and discussed individually for each of the key aspects related to the management, namely:

- *capabilities or resources* – general term used to cover the various potentials that an organization has for creating and managing innovations. The capabilities aspect revolves mainly around people, since innovations rely heavily on the capabilities of both individuals and teams. It concerns mainly the abilities, know-how and practical skills of the people working for the organization;
- *structure* – the difference between structures and capabilities is that structures allow the effective use of these “capabilities”. In practice, this means the organizational structure, processes and infrastructure of the organization. The proper structures can work as a multiplier of the efforts, which allows the organization to work and innovate much more efficiently and quickly;
- *organizational culture* – if the structures allow efficient use of resources, culture is what enables the organization to harness its human potential into the innovation process. With the proper kind of innovation culture, the business has a much greater opportunity to select, develop and keep the right employees in the organization;
- *strategy* – the plan that the organization has for achieving long-term success, and the innovation policy should be an integral part of it. It is critical to understand that the strategy makes a deliberate pre-analyzed choice between a number of possible alternatives.

4. Innovations in the Financial Sector

Financial sector does not stay aside from the global innovation processes. Financial innovations, like the already defined methodology, can be classified as new products, new services, new processes, or new organizational forms. Based on the literature on the subject and the banks’ practice, the following types of innovations in retail banking can be distinguished:

1. According to the type of the innovations:

- technological;
- product;
- combined;
- related to operation and management processes.

2. *According to the main financial objectives of the innovations:*

- income increase;
- cost reduction;
- combination of the above two objectives;
- transfer of the type of costs depending on the bank's strategy, respectively from OPEX to CAPEX, and vice versa;
- change in the type of costs and incomes depending on the bank's strategy and economic situation (for example, from fixed to non-fixed costs);
- transformation of costs (for example, source of incomes – from interest income to fee and commission income), which is again a result of the regulatory and strategic decisions.

3. *According to the innovation direction in the bank's organization:*

- innovations in the front office;
- innovations in the middle office;
- innovations in the back office;
- innovations used by the banks but supplied by external organizations and suppliers.

4. *According to the impact of the innovations on the consumer behavior:*

- adaptive;
- functional;
- fundamental.

5. *According to the degree of novelty:*

- new at global level;
- new on the local market.

6. *According to customers' needs:*

- aimed at satisfying the existing needs;
- aimed at satisfying new needs.

The correct classification of the innovations allows for a precise study of the effects of their implementation and better targeting of the appropriate innovations in practical terms.

CHAPTER TWO. DEVELOPMENT OF INNOVATIONS ON THE BULGARIAN MARKET OF CONSUMER CREDITS AND MORTGAGE LOANS

The analysis of the products, offered by the banks concerning the mortgage loans, defines five main groups of mortgage loans, determined according to:

- *purpose of the loan;*
- *type of repayment plan, including mortgage overdraft, savings mortgage loan (offset mortgage), fix interest rate mortgage loan, mortgage loan with flexible repayment options;*
- *loan currency;*
- *level of responsibility of the customers, according to art. 24, para. 2 of the Consumer Credits Related to Immovable Property Act;*
- *reference interest rates.* The analysis of the used methodologies for the formation of the reference interest rates shows three main strategies of the banks for reflecting the market changes in the repayment plans for the mortgage loans of the costumers:
 - *change of the reference interest rates monthly, without interest rate buffers;*
 - *change of the reference interest rates twice a year, without interest rate buffers;*
 - *change of the reference interest rates twice a year, with the so-called interest rate buffers.*

Trading Strategies, Sales Channels and Distribution Mix

For the successful positioning of the mortgage loans, banks invest significant resources in developing sales channels to expand their access to specific customer groups. For the purposes of the analysis of the trading strategies, a content analysis and a qualitative analysis of the sales channels for mortgage loans are made. The study evaluates the number, diversification and type of the distribution mix of certain banks and the market as a whole. After reviewing the trading policies of the banks and synthesizing the information obtained from the analysis, two main trading strategies and three types of sales channels can be defined depending on their specific function, namely:

- *orthodox trading strategy for sales of mortgage loans*, with the bank's branch network as the main distribution channel and developed various capabilities for directing customers to it;
- *omni-channel sales strategy* – includes the integration of multiple channels for the distribution of mortgage loans.

The sales channels used in the implementation of the strategies can be grouped into three main types:

1) *physical sales channels* – characterized by relatively high fixed costs and longer breakeven and payback period:

- branch network;
- housing centers;
- premium centers/zones;
- mobile bankers;
- apply by phone/call center/telemarketing.

2) *partner networks for sales and referral/targeting of mortgage loans* – structures external to the bank:

- credit intermediaries;
- construction companies and real estate agencies.

3) *digital channels for sales of mortgage loans*:

- online application for a mortgage loan on the bank's website and/or in the mobile banking;
- online application, loan request or chatbot meeting;
- video consultation;
- digital housing center;
- other technological solutions.

Innovations in Consumer Credits in Bulgaria

As one of the drivers of the household consumption, consumer credits play a significant part in the balance of the universal commercial banks and are the driving forces behind the profitability of the credit institutions. Unlike with mortgage loans, more than 150 companies specializing in consumer credits are active in addition to banks. Consumer credit is a highly regulated and well-known product for a large part of the active population. This essentially limits the opportunities for a significant diversification between the various products of the banks that can be summarized as follows:

- standard consumer credits;
- consumer credits with fixed interest rate;
- consumer credits for large amounts;
- consumer credits for customers with net income over 1100 BGN;
- fast consumer credits with characteristics of product innovation;
- consumer credits secured by cash;
- consumer credits for cash pooling;
- car credits;
- student loans and study loans;
- consumer credits for retirees;
- consumer credits for sailors and freelancers.

Sales Channels for Consumer Credits, Innovation and Digital Solutions in the Trading Strategies of the Banks in Bulgaria

The omni-channel approach to mortgage loans applies in full to consumer credits too. As a popular, affordable product widely used by households, consumer credit is one of the product categories in which banks invest significant resources to increase their sales, portfolios and market positioning. As a result, there is a well-developed trading infrastructure, including both traditional sales channels, such as the branch network, and many innovations, such as fully digital application, evaluation and granting of consumer credits, namely:

- branch network;

- specialized centers for consumer credit sales;
- mobile bankers;
- online End-to-End;
- online consumer credit applications;
- call center, telemarketing;
- partner networks/business eco-systems;
- access to consumer credits in self-service zones, digital sales zones;
- video channel for sales of consumer credits, technological innovation.

Correlation Analysis of the Dependence between Consumer Credits and Mortgage Loans on the GDP of the Euro Area Countries and Bulgaria

For the purposes of this study, the relations between granting of mortgage loans and consumer credits and GDP are analyzed. The analysis is conducted for each euro area country and for Bulgaria. Correlation analysis is used for studying the relationship between the variables. In relation to the requirement for absence of development trend in the input data, the calculations are performed with the first differences of the variables. The available data are annual, by country, for the period 2004-2020.

According to the results for the euro area as a whole, the correlation for consumer credits is significant and at the same time higher than the correlation for mortgage loans. The values for Bulgaria are close to the euro area average and again show a significant correlation in the relationship between consumer credits and GDP, which is stronger than that of mortgage loans and GDP.

In general, countries can be grouped into three categories according to the values of their coefficients:

- first category – countries with similar value correlation for both consumer credits and mortgage loans: Austria, Cyprus, Finland, Greece, Italy, Lithuania, Slovakia, Slovenia, Spain, Bulgaria. In these countries there is a moderate to medium correlation for both types of loans; for them the increase in loans is in direct correlation with GDP growth;

- second category – countries with a higher correlation for consumer credits and lower (or absent) for mortgage loans: Belgium, France, Germany, Malta, the Netherlands, Portugal;
- third category – countries with a higher correlation for mortgage loans than consumer credits: Ireland and Luxembourg;
- Estonia and Latvia are single cases. In Latvia, both correlation coefficients are negative, which indicates a significant correlation in the opposite direction. In Estonia, there is no relationship between GDP and the two types of credit.

CHAPTER THREE: EVALUATION OF THE FACTORS AND THE EFFICIENCY OF THE INNOVATIVE ACTIVITY AND DIGITALIZATION OF BANKS IN BULGARIA

Measuring and Evaluating the Efficiency of the Innovations, Key Performance Indicators and Models for Evaluating the Efficiency of the Banks' Innovations

There is a widespread understanding that innovations are entirely creative process of inspiration that requires natural genius or innate talent. In practice, however, the success of the innovations is much more subject to and related with structured approaches to creation, evaluation and implementation than based solely on creative talent or ingenious ideas. Peter Drucker argues that “most innovations, especially successful ones, are the result of a conscious, focused search for innovations opportunities” (Drucker, 2002). So, if an innovation is a conscious and purposeful practice, it means that it can and should be measured constantly, just like any other metric in the business. There are three main approaches that allow evaluation of the economic efficiency of the banking operations (Berger, Hunter, Timme, 1993; Mead, 2016) and can be used in the current context of the study. The models determining the banks' performance in their various operations can be summarized as follows:

- financial and accounting models that allow to evaluate the performance on the basis of financial and accounting reports;
- econometric models that allow to evaluate the efficiency of the bank on the basis of econometric analysis using different econometric models;
- expert models based on evaluation, including highly qualified specialists from the financial sector.

Evaluation of Innovations and Digitalization in Retail Banking in Bulgaria

The analysis covers the period 2015-2020, a dynamic period with a number of consolidations in the banking sector, economic recovery, new regulatory regimes, including at European and global level, including GDPR, PSD2, IFRS9 and others. For the period 2015-2020, the seven largest banks in Bulgaria – Unicredit Bulbank, DSK Bank, United Bulgarian Bank (UBB), Postbank, Raiffeisenbank and Central Cooperative Bank (CCB), forming 80% of the assets of the banking system, have announced a total of 94 innovations.¹

Table 1. Classification of the announced innovations by the seven largest banks in Bulgaria

	2015	2016	2017	2018	2019	2020	Total	Total, %
Innovation types								
Remote banking	4	5	-	6	4	16	35	37
Payments	3	3	5	2	9	13	35	37
Lending	2	-	2	1	1	7	13	14
Other	2	-	1	-	1	1	5	5
New products	1	-	3	-	-	-	4	4
Robotization	-	-	-	-	1	1	2	2
Total (number)	12	8	11	9	16	38	94	100
Total (%)	13	9	12	10	17	40	100	-
According to the effect on the financial statements of the banks, innovation types with a strong focus on:								
Cost optimization	7	7	4	6	9	23	56	60
Income increase	5	1	6	3	7	9	31	33
Income increase / cost optimization	-	-	1	-	-	6	7	7
Total (number)	12	8	11	9	16	38	94	100
Total (%)	13	9	12	10	17	40	100	-

Source: Own calculations based on data from annual reports and websites of the seven largest banks.

Innovations are broken down by year and classified into the following groups (Table 1):

- remote banking;

¹ Data based on information from the annual reports and the websites of the studies banks.

- payments;
- lending;
- new products;
- robotization and other.

According to the effect on the financial statements of the banks, innovations are defined and classified into three groups, with a strong focus on:

- cost optimization;
- income increase;
- combined effect between cost optimization and income increase.

The most active year in innovations is 2020, with a total of 38 announced innovations (40% of all innovations), followed by 2019 with 16 innovations (17% of all innovations). In this regard, it can be concluded that the pandemic and the measures for social distance accumulate many innovations in the field of remote banking. Out of a total of 35 innovations in the group of remote banking, 16 innovations are announced in 2020 (46% of all in the group). Concerning the analysis of the innovations, the consolidation in the banking sector should not be missed; it definitely takes away from the focus and resources of the banks and directs it to the successful merger and retention of the customer bases of the acquired banks. This can be a reason for the relatively smaller number of innovations in the period 2015-2018. Remote banking, related mainly to internet and mobile banking platforms, digital and video banking zones, including enriching the functions of ATM terminals, is one of the large groups of innovations where large banks in Bulgaria invest to enrich their sales and service channels, forming their omni-channel strategies and providing a specific advantage. A significant group of innovations announced by the banks in Bulgaria are related to lending, which does not differ from the general trend of other market participants. With the innovations, banks address also solutions related to cost optimization as a result of process automation, 60% of innovations focus on their administrative costs. Innovations associated with income increase account for 33% of all innovations, with 1/2 of them concentrated in the last 2 years (2019-2020). Obviously, banks take into account the market realities in Bulgaria and still refrain from investing significant resources in the development of innovative and digital business initiatives, assuming that the investment return process will be unreasonably long.

Econometric Model for Evaluating the Effect of Innovations on Bank Performance

To evaluate the impact of banks' innovations on "*Net fee and commission income*", "*Administrative costs*" and "*Staff costs*", it is appropriate to use a regression model for assessing the impact of different parameters considered in the model. The motivation for the specific choice of evaluated indicators is based on the conclusions and the classification from the content analysis of the innovations of the leading banks in Bulgaria for the period 2015-2020, mainly related to cost optimization and innovations covering remote banking and payments, which, in turn, have a financial impact on fee and commission income.

The main task of the study is to evaluate the factors influencing the work of the subject of the study. Despite its relative simplicity, the regression model can be an effective way to measure the results of the financial institutions. Based on the review of the literature sources and expert assessment, evaluated is the degree of innovations in the banks according to three main indicators for which there is sufficient public and regulatory data – "*Net fee and commission income*", "*Administrative costs*" and "*Staff costs*", with source supervisory statistics of Bulgarian National Bank on the banking system. For the purposes of the analysis, the three result values are modeled as a result of a number of specific indicators characterizing the innovative banking activity. Unfortunately, the national banking statistics does not provide data on investments in developing innovations, capital costs on digitization, specification of depreciation deductions or other type of data for considering the financial expression of innovations and digitalization in the sector. There are also no benchmark data on the share of investments from innovations in incomes or capital costs, for more clear identification of the financial expressions of the announced innovations and digitalization in the sector. There are also no data on the share of sales of certain products and services in the various distribution channels of the banks.

The analysis uses the net fee and commission income as a result value depending on the following variables:

- *DC – debit cards (number in thousand)*
- *CC – credit cards (number in thousand)*

Source of information is Bulgarian National Bank, the data are annual. The data on the bank cards in the system are used as variables in the analysis as one of the indicators for the development of the innovations. A significant part of the digital payments, digital wallets and remote banking relates to the use of bank cards.

- *ATMs – ATM terminals in Bulgaria (number)*
- *POSs – POS terminals in Bulgaria (number)*

Source of information is Bulgarian National Bank, the data are annual. Data on the number of POS and ATM terminals are used as variables in the analysis as one of the indicators for the development of the infrastructure for providing innovations.

- *Transfers – credit transfers (number in million)*
- *e-transfers – credit transfers initiated electronically (number in million)*
- *Card_paym – card payments with cards issued by residents (number in million)*
- *Card_pay_POS – card payments initiated via physical POS terminal (number in million)*
- *Card_pay_internet – card payments initiated remotely (via internet) (number in million)*

Source of data on payments is again statistical information from Bulgarian National Bank, since the type, number, trajectory and dynamics of the various types of payments largely outline the level of use of innovations and the expectations for future development. As a result of the digital innovations, an increasing part of the bank transfers are done through digital channels.

- *Internet_penet – access of households to internet (%)*

Source of data is Eurostat, the data are annual. It provides the level of accessibility of the solutions to digital banking, lending.

- *Inflation*

Source of the annual data is Eurostat. Inflation indicates the movement of the consumer prices, including bank fees that may affect the use of digital channels in price differentiation between physical and digital transactions.

- *AVE_Salary – average gross monthly salary of employees by labor and official legal relationship (BGN)*

Source is National Statistical Institute, the data are annual.

- *New_Vol_BL – volumes of new business loans, other than overdrafts, for non-financial corporations sector by initial maturity (thousand BGN)*
- *New_Vol_CL – volumes of new business consumer credits (thousand BGN)*
- *New_Vol_ML – volumes of new business mortgage loans (thousand BGN)*

- *Ind_Deps* – volumes on balances on overnight deposits, deposits redeemable at notice, deposits with agreed maturity and repo transactions of household sector (thousand BGN)

Source is the statistical information from Bulgarian National Bank, the data are annual.

Data on average salaries and new volumes of loans to business and households and deposits of households are used as an indication of the country's business development.

- *Inov* – announced innovations, total

Source of the calculations are annual reports and websites of the TOP 7 commercial banks in the country. They are used as variables to determine their impact on net fee and commission income.

- *Cost_optim_inov* – innovations for cost optimization
- *Income_Inov* – innovations for income increase
- *Mix_Inov* – innovations for income increase and cost optimization.

Methodology of Empirical Research

To provide results for the empirical study, a two-stage methodology is adopted. *First stage* is the selection of factors and variables. Based on the compiled theoretical model, each factor variable is tested for inclusion in the empirical model. Correlation analysis and differential method are used for this purpose. *Second stage* is the evaluation of the empirical model, after selection of the variables.

Evaluation Results according to the Model

Based on the developed theoretical model, evaluated is the effect of the innovations in the banks on the following three main indicators – “*Net fee and commission income*”, “*Administrative costs*” and “*Staff costs*”.

Results for “Net fee and commission income”

The results of the correlation analysis show that the factors with a significant impact on the values of “*Net fee and commission income*” (with a correlation of over 0.5) are the following:

- 1) POS terminals in Bulgaria;

- 2) volumes of new business consumer credits;
- 3) volumes on balances on overnight deposits, deposits redeemable at notice, deposits with agreed maturity and repo transactions of household sector;
- 4) announced innovations;
- 5) innovations for cost optimization;
- 6) innovations for income increase and cost optimization.

The theoretical model of the dependent variable “*Net fee and commission income*” is reduced with the listed six factors with significant influence. In the second stage, with the selected factors and result value is performed cointegration analysis to evaluate the parameters of the empirical model. For the purposes of the analysis, the variables are logarithmic. The determination of the model is significantly high (97%).

Coefficients in the cointegration model show the following dependence:

- Change of 1% in the number of POS terminals in Bulgaria leads to 1.35% change in the same direction of the net fee and commission income, while maintaining the levels of the other factors. This shows that the developed infrastructure for cashless payments is of key importance for the expansion of the innovations in payments.
- Change of 1% in the volume of new business consumer credits leads to 0.49% change in the same direction of net fee and commission income, while maintaining the levels of the other factors. This conclusion is also noted by many other analysts in the field. The increase in new business consumer credits leads to an increase in fee and commission income as a result of cross-selling of related banking and financial products.
- Change of 1% in the volume on balances on overnight deposits, deposits redeemable at notice, deposits with agreed maturity and repo transactions of the household sector, leads to 0.91% change in the opposite direction of net fee and commission income, while maintaining the levels of the other factors.
- Change of 1% in the volume of announced innovations leads to 0.06% change in the same direction of net fee and commission income, while maintaining the levels of the other factors.
- Change of 1% in the volume of innovations for cost optimization leads to 0.05% change in the same direction of net fee and commission income, while maintaining the levels of the other factors.

- Change of 1% in the volume of innovations for income increase and cost optimization leads to 0.02% change in the same direction of net fee and commission income, while maintaining the levels of the other factors.

Results for “Administrative costs”

The results of the correlation analysis show that the factors with a significant impact on the values of “*Administrative costs*” (with a correlation of more than 0.5) are the following:

- 1) credit cards;
- 2) card payments with cards;
- 3) average gross monthly salary of employees by labor and official legal relationship;
- 4) volumes of new business loans, other than overdrafts, for non-financial corporations by initial maturity.

The theoretical model of the dependent variable “*Administrative costs*” is reduced with the listed four factors with significant influence. In the second stage, with the selected factors and result value, a cointegration analysis is performed to evaluate the parameters of the empirical model. The determination of the model is high (57%).

The coefficients in the cointegration model show the following dependence:

- Change of 1% in the number of credit cards leads to 0.3% change in the opposite direction of the administrative costs, while maintaining the levels of the other factors.
- Change of 1% in the amount of card payments with cards leads to 0.001% change in the opposite direction of the administrative costs, while maintaining the levels of the other factors.
- Change of 1% of the average gross monthly salary of employees by labor and official legal relationship leads to 0.063% change in the same direction of administrative costs, while maintaining the levels of the other factors.
- Change of 1% in the volumes on new business loans, other than overdrafts, for the non-financial corporations sector with initial maturity, leads to 0.0007% change in the same direction of administrative expenses, while maintaining the levels of the other factors.

Results for “Staff costs”

The results of the correlation analysis show that the factors with a significant impact on the values of “*Staff costs*” (with a correlation of more than 0.5) are the following:

- 1) debit cards;
- 2) credit cards;
- 3) card payments with cards;
- 4) card payments initiated remotely;
- 5) average gross monthly salary of employees by labor and official legal relationship;
- 6) volumes new business mortgage loans;
- 7) volumes on balances on overnight deposits, deposits redeemable at notice, deposits with agreed maturity and repo transactions of household sector;
- 8) announced innovations;
- 9) innovations for income increase.

The listed nine factors have a significant impact. Due to the limitations imposed by the length of the study period and the resulting requirements of the cointegration approach, it is necessary to reduce the factors to seven. For this purpose, the two factors with limit values around 0.5 are not taken into account. In the second stage, a cointegration analysis is performed with the logarithmic values of the selected factors and the resulting value. The determination of the model is significantly high (90%).

The coefficients in the cointegration model show the following dependence:

- Change of 1% in the number of debit cards leads to 0.965% change in the same direction of staff costs, while maintaining the levels of the other factors.
- Change of 1% in the number of credit cards leads to 0.06% change in the opposite direction of staff costs, while maintaining the levels of the other factors.
- Change of 1% of the average gross monthly salary of employees by labor and official legal relationship leads to 0.136% change in the same direction of staff costs, while maintaining the levels of the other factors.
- Change of 1% in volumes on new business mortgage loans leads to 0.19% change in the same direction of staff costs, while maintaining the levels of the other factors.

- Change of 1% in volumes on balances on overnight deposits, deposits redeemable at notice, deposits with agreed maturity and repo transactions of the household sector leads to 0.169% change in the same direction of staff costs, while maintaining the levels of the other factors.
- Change of 1% in the volume of announced innovations leads to 0.013% change in the opposite direction of staff costs, while maintaining the levels of the other factors.
- Change of 1% in the volume of innovations for income increase leads to 0.011% change in the opposite direction of staff costs, while maintaining the levels of the other factors.

Along with the transactional business and remote banking, the focus of the innovations of the banks in Bulgaria is on lending to households. The innovations and the results in the lending are analyzed in details in Chapters Two and Chapter Three of the dissertation. The evaluation of the factors influencing retail lending allows a fuller understanding of the foundations and drivers of the development of mortgage and consumer lending, which in turn is essential in the selection and implementation of innovations, including digital solutions related to lending to citizens.

Approaches in Modeling Mortgage and Consumer Lending

The object of the study is bank mortgage and consumer lending with subject the factors influencing the commercial banks and households in their activity in consumer and mortgage lending in Bulgaria. The objective is to identify and evaluate the factors influencing the household lending. To achieve this objective, a critical analysis of the used econometric models for evaluation and identification of the factors in the field of retail lending is conducted, and an evaluation of their applicability to the Bulgarian banking system is made. On this basis, appropriate tools and a set of factor variables are selected.

Data, Sources and Methodology of the Econometric Study of the Factors Influencing Household Loans

The empirical analysis is based on dynamic annual data for the period 2004-2020, series with annual frequency. The analysis uses various macroeconomic and bank-specific variables obtained through publicly available data from statistical databases of Bulgarian National Bank (BNB), National Statistical Institute (NSI), Eurostat, Registry Agency. New consumer and mortgage loans, based on BNB interest rate statistics, are used to express lending volumes and

dynamics. The measuring of the economic activity is done with the GDP dynamics, the annual growth rate of the harmonized index of consumer prices, and the annual growth rate of house prices (NSI). The main part of the studied variables, specific for the banking system, relate to the interest rates and the volume of newly granted loans by the respective types and spreads between interest rates on deposits and loans on them, with data source statistical and financial reports of BNB. The BNB monthly data on the interest rate statistics are transformed into annual ones, thus avoiding seasonal effects in the data analysis.

Factors Affecting Household Loans

Due to differences in some of the factor variables affecting them, two categories of loans are considered here – consumer credits and mortgage loans.

- Based on the literature review and expert assessment, it is believed that the new **consumer credits** are influenced by macroeconomic and banking indicators. The levels of new consumer credits can be considered as a function of: GDP, inflation, unemployment, average wage level, loan receivables from companies specializing in lending, interest rates on new business loans, volumes of consumer, mortgage and business loans, effective annual interest rates on loans and deposits, volumes on balances on overnight deposits. The mathematical type of dependence is as follows:

$$CR_p = f(GDP_g; GDP_{pcg}; INFL; EMPL_c; EMPL_r; UNEMPL_c; UNEMPL_r; SALARY; FC_p; IR_b; CR_b; IR_{Dv}; IR_{Dr}; IR_p)$$

where:

CR_p is the volume of new business consumer credits;

GDP_g – GDP (% growth);

GDP_{pcg} – GDP per capita (% growth);

$INFL$ – consumer price index (annual change);

$EMPL_c$ – employed persons aged 15+;

$EMPL_r$ – employment rate of population aged 15+;

$UNEMPL_c$ – unemployed persons aged 15+;

$UNEMPL_r$ – unemployment rate of population aged 15+;

SALARY – average gross monthly salary of employed by labor and official legal relationship;

FCp – receivables from loans of companies specializing in lending / consumer credits;

IRb – interest rates on new business loans other than overdrafts for the non-financial corporations sector at initial maturity;

CRb – volumes of new business loans, other than overdrafts, for non-financial corporations sector by initial maturity;

IRDv – volumes on balances on overnight deposits, deposits redeemable at notice, deposits with agreed maturity and repo transactions of household sector;

IRDr – interest rates on balances on overnight deposits, deposits redeemable at notice, deposits with agreed maturity and repo transactions of households;

IRp – effective annual percentage of consumer credits for new business.

- Based on the literature review and expert assessment, the levels of new **mortgage loans** can be considered as a function of: GDP, inflation, unemployment, average salary level, loan receivables from companies specializing in lending, interest rates on new business loans, volumes of consumer, mortgage and business loans, effective annual interest rates on loans and deposits, volumes on balances on overnight deposits. The mathematical type of dependence is as follows:

$$CRh = f(GDPg; GDPpcg; INFL; EMPLc; EMPLr; UNEMPLc; UNEMPLr; SALARY; Hpi; FCh; IRb; CRb; IRDv; IRDr; IRh; NEWBUILD)$$

where:

CRh is the volume of new business mortgage loans;

Hpi – housing price index – national level, 2015=100;

FCh – loans receivables from companies specializing in lending / mortgage loans;

IRh – effective annual percentage of loans secured by residential property on new business;

Newbuild – started construction of new residential buildings / total built-up area (m²).

Evaluation Results according to the Econometric Model of Mortgage and Consumer Lending in the Bulgarian Banking Sector

The methodology of empirical study used for the analysis here is the same as for the analysis of the effect of the innovations. Based on the developed theoretical models for studying the mortgage and consumer lending, two models are built – “*Volumes of new business consumer credits*” and “*Volumes of new business mortgage loans*”.

Results for “Volumes of new business consumer credits”

The results of the correlation analysis show that the factors with a significant impact on the values of “*Volumes of new business consumer credits*” (with a correlation of over 0.5) are the following:

- 1) GDP growth;
- 2) inflation;
- 3) employment rate of population aged 15+;
- 4) unemployment rate of population aged 15+;
- 5) housing price index;
- 6) loan receivables from companies specializing in lending / mortgage loans;
- 7) volumes of new business loans, other than overdrafts, for non-financial corporations sector by initial maturity;
- 8) effective annual percentage of consumer credits for new business;
- 9) effective annual percentage of loans secured by residential property for new business;
- 10) interest rates on balances on overnight deposits, deposits redeemable at notice, deposits with agreed maturity and repo transactions of the household sector;
- 11) volumes of new business mortgage loans.

The listed eleven factors have a significant impact. Due to the limitations imposed by the length of the study period and the resulting requirements of the cointegration approach, it is necessary to reduce the factors to seven. For this purpose, the two factors with limit values around 0.5 are not taken into account.

The coefficients in the cointegration model show the following dependence:

- Change of 1 percentage point in GDP growth leads to 589 657 thousand BGN change in the same direction in the volumes of new business consumer credits, while maintaining the levels of the other factors.
- Change of 1 percentage point in inflation leads to 173 620 thousand BGN change in the same direction in the volumes of new business consumer credits, while maintaining the levels of the other factors.
- Change of 1 percentage point in the employment rate leads to 133 542 thousand BGN change in the same direction in the volumes of new business consumer credits, while maintaining the levels of the other factors.
- Change of 1 percentage point in the housing price index leads to 9317.40 thousand BGN change in the opposite direction in the volumes of new business consumer credits, while maintaining the levels of the other factors.
- Change of 1 percentage point in the interest rates on household deposits leads to 2 431 500 thousand BGN change in the opposite direction in the volumes of new business consumer credits, while maintaining the levels of the other factors.
- Change of 1 percentage point in interest rates on consumer credits leads to 2 475 500 thousand BGN change in the opposite direction in the volumes of new business consumer credits, while maintaining the levels of the other factors.
- Change of 1000 BGN in the volume of new business mortgage loans leads to 2 475 050 thousand BGN change in the opposite direction in the volumes of new business consumer credits, while maintaining the levels of the other factors.

Results for “Volumes of new business mortgage loans”

The results of the correlation analysis show that the factors with a significant impact on the values of “*Volumes of new business mortgage loans*” (with a correlation of over 0.5) are the following:

- 1) GDP growth;
- 2) inflation;
- 3) employment rate of population aged 15+;
- 4) housing price index;

- 5) loan receivables from companies specializing in lending / consumer credits;
- 6) loan receivables from companies specializing in lending / mortgage loans;
- 7) volumes of new business loans, other than overdrafts, for non-financial corporations sector by initial maturity;
- 8) effective annual percentage of consumer credits for new business;
- 9) volumes of new business consumer credits.

The listed nine factors have a significant impact. Due to the limitations imposed by the length of the study period and the resulting requirements of the cointegration approach, it is necessary to reduce the factors to seven. For this purpose, the two factors with limit values around 0.5 are not taken into account.

The coefficients in the cointegration model show the following dependence:

- Change of 1 percentage point in inflation leads to 65 494 thousand BGN change in the opposite direction in the volumes of new business mortgage loans, while maintaining the levels of the other factors, which shows households' caution to take long-term significant credit obligations in the face of rising inflation.
- Change of 1 percentage point in employment rate leads to 50 278.2 thousand BGN change in the same direction in the volumes of new business mortgage loans, while maintaining the levels of the other factors.
- Change of 1 percentage point in housing price index leads to 46 630.6 thousand BGN change in the same direction in the volumes of new business mortgage loans, while maintaining the levels of the other factors.
- Change of 1000 BGN in loan receivables from companies specializing in consumer credits leads to 458 BGN change in the same direction in the volumes of new business mortgage loans, while maintaining the levels of the other factors.
- Change of 1000 BGN in the volumes of new business loans, other than overdrafts, for the non-financial corporations sector with initial maturity, leads to change of 170 BGN in the same direction in the volumes of new business mortgage loans, while maintaining the levels of the other factors.

- Change of 1 percentage point in effective annual percentage of consumer credits for new business leads to 149 528 BGN change in the opposite direction in the volumes of new business mortgage loans, while maintaining the levels of the other factors.
- Change of 1000 BGN in volumes of new business consumer credits leads to 171 BGN change in the same direction in the volumes of new business mortgage loans, while maintaining the levels of the other factors.

CONCLUSIONS

Conclusions of Chapter One

There is no doubt that innovations and technological development are changing profoundly the financial products, services and processes globally. Irreversible processes of innovations and digitalization force the banks to develop and change vigorously, not only to ensure and protect existing income sources, but also to reach potential new ones. An additional complication to the challenges the banks face is that customers have the opportunity to take increasing control of their personal finances. The banks of the future should not only manage competition between each other, but also meet the regulatory requirements and face a new type of competitors, such as BigTech and FinTech companies, which aggressively enter the field of retail banking. In order for traditional banks to remain on this highly competitive market, they should quickly provide the products desired by the customers, via a distribution channels preferred by the customers. With this in mind, several areas should be considered extremely important for the retail banking:

- deepening the customer relations, which in the practice means that the banks should offer solutions that go beyond the banking products;
- development of digital platforms to provide the customers with real-time and any-time access to products, services, support and advice;
- use of the vast amount of information on the customers in order to build relationships that are delivered without problems across all trading and communication channels of the banks;
- information and banking security is and will be one of the most important priorities for the banks; more than mandatory are proactive steps to protect customers' data, privacy, and to manage the cybersecurity threats to the banks;

- new financial technologies will play a key role in the future, for both the banking system and the international banking regulations; financial technologies can contribute to a significant transformation of the financial system and the regulatory rules.

Conclusions of Chapter Two

Mortgage and consumer lending in Bulgaria will continue to increase, mainly as a result of the following:

- There is a need for more modern, larger and better quality housing – the outdated housing stock and its renovation/replacement will move the curve of mortgage and consumer lending in a positive direction.
- The growth of household incomes and the high employment enable households to afford more consumption, including bigger and better housing; the deepening of the convergence of Bulgaria to the European structures will lead to the convergence of incomes and interest rates on mortgage loans to the average European ones, which will have a positive effect on demand.
- Competition between banks and other market participants guarantees a high level of innovations, quality of products and service.
- Maintaining historically low levels of household credits, combined with mentioned macro elements of the environment, will provide a strong incentive for households to increase their consumption, which in turn will increase the competition between the banks and will accelerate the innovations in retail banking.
- Innovations and digital solutions drive the lending and, above all, the access to loans at customer-friendly places. The bank branch is no longer a mandatory element in lending to households. The expectation of the consumers is that more and more loans will be granted at the so-called place of origin of need or purchase, which requires the banks to reformulate their processes and operating procedures of lending;
- The new technological companies aggressively entering the industry will force the banks to invest more and more resources in technological development and innovations, which will inevitably force them to vigorously search for the most effective business and trading strategies.

- Bulgaria, as part of the EU, has a set of laws, recommendations and other regulations, of both the Bulgarian and EU regulators, which protect costumers, regulate the business environment and create opportunities for market growth in mortgage and consumer lending.

The analyses of the distribution channels and the trading strategies of the banks in Bulgaria outline the following trends:

- Investments in innovations in the distribution channels of leading banks in mortgage and consumer lending provide them with a dominant opportunity to dynamically increase their market share, compared to their smaller competitors, which will be forced to compete mainly in price and aggressive credit policy (they will have to take bigger risk). In the medium term, such strategy will reduce costs and will increase the cost of devaluation and collection of overdue loans, which will further limit the opportunities for investments in business development of mortgage loans (marketing, products and sales channels).
- It is obvious that the large banks dominate in the distribution mix and innovations, they have 2 times more sales channels and opportunities to attract customers than the other banks, which guarantees them a dominant role in the expected market growth.
- Though digital sales channels still have a limited share in the total distribution mix of mortgage and consumer loans, banks will continue to invest and position themselves in the digital environment, in order to limit the possibility of aggressive strategies for entering this specific niche and to improve their effectiveness.

Conclusions of Chapter Three

The conclusions from the econometric analysis of the innovations and the consumer and mortgage lending in retail banking can be summarized as follows:

- The developed econometric model proves that the number of POS terminals, while maintaining the levels of the other factors, has the strongest impact on fee and commission income, which is an expected conclusion and is directly associated with the increased access to financial transactions with bank cards, digital portfolios, and as a whole the investments in payments and remote banking.
- Consumer lending is the other strong driver of the positive change in fee and commission income; in essence, the conclusion is expected.

- As expected, innovations also have a positive impact on fee and commission incomes, yet more limited one compared with the number of POS terminals and new business consumer credits, but visible enough to allow the econometric model to evaluate their impact on net fee and commission income.
- As expected, the average gross salary affects the administrative costs in the same direction. There is still no significant impact of the innovations on the administrative costs that can be identified by the used econometric model.
- Based on the used econometric model, the thesis that innovations have opposite effect on staff costs is proved. This is an expected conclusion and proves that one of the main objectives of innovations is met – to affect the banks’ costs for salaries.
- The used econometric model shows that the main driver of consumer credits is the positive economic development, measured by the country’s GDP, employment rate and housing prices. The model shows that inflation processes also have a significant impact on the new business consumer credits, and the change is in the same direction as the new business. The question of whether GDP growth is driven by consumer lending growth or vice versa remains debatable. According to the Annual Report on Economic Development and Policies in Bulgaria, prepared by Economic Research Institute at the Bulgarian Academy of Sciences, the 2020 data unequivocally show that “domestic consumption is increasingly outlined as a main factor in growth. In the last few years, this has been largely due to the growing trust of both consumers and producers”, which in turn means that GDP growth is driven by consumer credits, not the other way around.
- Important conclusion from the analysis is that with an increase in consumer prices, while maintaining the rest of the market situation, households do not limit the use of credits, and vice versa.
- As expected, the increase in interest rates on consumer credits and household deposits has the opposite effect on consumer lending. The econometric model proves the paradigm of the elasticity of the volume of the demand in price changes, which shows that the conclusions of the used model are stable.
- While maintaining the levels of the other factors, the growth of the inflation processes, leading to a change in the opposite direction of the volume of new business mortgage loans, clearly shows that in long-term loans, such as mortgage, households keep their investment

plans driven by cautiousness, taking into account the planning of future essential costs with priority.

- It is no surprise that with the increase in employment and housing prices there is a change in the same direction of the volumes of new business mortgage loans.
- The growth of new business mortgage loans is usually combined with economic growth and increasing well-being of the households, which determines also the parallel growth of business and consumer credits.
- It is important to note that in economic reality, in addition to isolated influence (maintaining the levels of the other factors), to a large extent many factors have a joint action that would change some of the results of the study.

The achieved results give a reason to believe that this study has discussed important scientific, theoretical and practical issues and fully proves the defended *research thesis* that innovations and technological development become a significant factor in a considerable change in the traditional retail banking.

The conclusions from the analyses prove the hypotheses of the dissertation, namely:

- Innovations in banking and the new technological solutions have the potential to significantly change the business model in the traditional retail banking.
- Technological innovations significantly affect the profitability and efficiency of the banks. The need for significant investments in the implementation of digital transformation of the banks leads to a change in the banks' strategies.

IV. Scientific and Applied Contributions of the Dissertation

This study outlines some aspects that are novelty or contribute to the Bulgarian economic literature, as follows:

- According to the literature on the subject and based on the banking practice, the types of banking innovations are systematized and classified. They are in addition to those already defined in the larger analysis and classification of innovations.
- The various financial technologies and their applications in retail banking are described in detail.
- For the first time in the literature, there is an analysis of the approaches to the formation of interest rates on mortgage loans through own reference interest rate.
- Developed is own model for evaluating the factors influencing mortgage and consumer loans.
- Developed is own model for evaluating the factors influencing banks' fee and commission income, administrative costs and staff costs.
- Bulgarian specialized literature still misses a comprehensive study of the distribution channels in retail banking and their relation with the banks' results. This study establishes this relation and explores the main components that characterize it.
- Based on descriptive analysis of the products offered by the banks in Bulgaria in the mortgage and consumer lending and sales channels, the trading strategies of the studied banks are defined.

The practical contributions of the dissertation encourage the commercial banks that are active in retail banking to:

- classify clearly the product and sales strategies with a focus on rapidly evolving technologies and customer expectations;
- evaluate critically and, if necessary, change their models of reference interest rates on mortgage loans based on the expected market changes and the strategies of their competitors;
- form and formulate a detailed strategy and vision for digitalization with a focus on customers' needs, regulatory requirements and efficiency and profitability goals they have;

- evaluate their current distribution mix of service and sales channels and plan future changes in the strategy based on the outlined specifics and benefits of the various service and sales channels, including the omni-channel approach;
- evaluate the results of the already applied innovations and digital solutions with the model used in the dissertation and compare the individual results with the average for the industry.

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AUTHOR'S PUBLICATIONS RELATED TO THE DISSERTATION

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AUTHOR'S DECLARATION

I, the undersigned:

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DECLARE,

that my dissertation and its abstract on the topic:

INNOVATIONS IN RETAIL BANKING AND THEIR APPLICATIONS IN BULGARIA –
PERSPECTIVES AND TRENDS

presented to the Scientific Council are written entirely by me.

All literature sources I have used are cited in accordance with the regulations.

Sofia

2022