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## THE ROLE OF FINANCIAL ENGINEERING IN BANKING

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***Abstract:** This article analyzes financial engineering from the point of view of its place and role in the development and optimization of the banking system from the perspective of increasing the efficiency of its activities. As a methodological basis, a set of general scientific logical and heuristic methods was used - analysis and synthesis, induction and deduction, the principle of interdependence; as well as a comparative method that allows a synthetic study of economic concept of "financial engineering". Also, this article mentions the need to use financial engineering products and useful tools in banking, as they allow increasing of liquidity, reducing activity risks and attracting new customers. The impediments to the development of financial engineering in the banking system of the Republic of Moldova are analyzed.*

**Keywords:** banks, financial engineering, innovative banking, efficiency of banking system.

**JEL Classification:** G15, G21

**Introduction.** The development of technology in the 21st century is carried out exponentially. Technology and customer needs in the financial sector are changing rapidly at both the micro and macro levels, as evidenced by the development of industries such as financial engineering. We live in a time of total data collection, the skillful use of which can lead to an improvement in the quality of life for all people, as well as bring huge profits to those who can use it. The tools of computer science, economics, finance and engineering are merging on an unprecedented scale. The importance of financial engineering in the modern world is growing. It is used by investors and major financial institutions such as banks, insurance companies, etc. Choosing the right financing model for a new project today can decide the fate of billions of dollars of investment.

One of the factors that contribute to the development of the banking system is the development and implementation of new banking technologies. However, innovations in banking include not only technical developments, but also the introduction of new forms of business, methods of working on the market, new products and services, new financial instruments, that is, all the results and products of financial engineering.

Many key points of financial engineering have not yet been explored. So, although there is no evaluation of the economic efficiency of financial engineering in banking, there is no consensus on the goals, principles, functions of financial engineering and clear recommendations for the formulation of the concept of financial engineering, which indicates the lack of a developed methodological basis for the development and implementation of financial engineering products in banking practice.

All these points confirm the relevance of the research subject and its disputability.

**Subject.** According to some opinions, financial engineering is a derivative concept in relation to engineering and is closely related to innovations in the financial management of the company.

According to D. Finnerty, financial engineering includes the design, development and formation of a creative individual solution to problems in the field of finance (Finnerty, J.D., 1988).

D. F. Marshall and W.K. Bansal mentions that "Financial engineering includes the design, development and implementation of innovative financial tools and processes, as well as the search for new approaches to solving financial problems" (Marshall, D.F. *et al.*, 1998).

From the point of view of the financial market, the term "financial engineering" is used to describe the analysis of data collected on this market through the scientific approach (Hoda, A. I., 2013).

According to the International Association of Financial Engineers (IAFE), financial engineering is defined as the application of mathematical methods to solve problems in the field of finance (Koo, H.K. 2011).

I. A. Blank defines financial engineering as a process of developing new financial instruments or new procedures for carrying out financial transactions (Blank, I. A., 1998).

According to Russian researchers, financial engineering means the development of a financial management system and the minimization of financial risks ( Ropoport, B.M. *et al.*, 2001).

S. Ross noted that financial engineering is a technology for managing financial risks on the futures stock market with the help of hedging operations (Ross, S., 2000). In addition, financial engineering is understood as the combination or separation of existing financial instruments for the purpose of creating new financial products.

Modern approach define financial engineering or as "solving the problems of improving the efficiency of financial activity and reducing financial risks through not only the design of new products, but also the effective use of various combinations of existing financial instruments to achieve the goals set in the interests of the participants." in financial relations, regardless of the organizational legal form and the scope of their activities" (Bařînkina, H.P., 2000) or as "a process that adapts existing financial instruments and processes and creates new ones to allow financial market entities to adapt most effectively to a changing environment" (Ivanova, O.V., 2011).

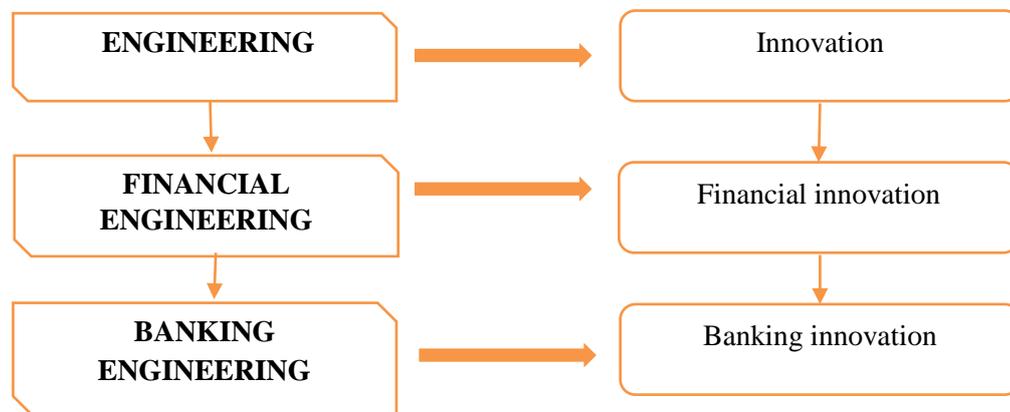
So, researchers in the field have been addressing the issue of determining the essence of financial engineering since 1985, and this topic has not lost its relevance to this day.

The analysis of the existing concepts of financial engineering allows us to distinguish two types of activity inherent in it:

- development of new financial products;
- improving the efficiency of financial activities, including by minimizing risks.

Given the events of recent years, it can be argued that financial engineering is of particular interest to banking institutions. Financial innovation in the form of new financial and investment products and the development of effective risk management procedures are essential for the viability of banking institutions in the light of recent developments.

According to the analysis of literary sources, in foreign practice, as a rule, they do not highlight a separate concept of "banking engineering". According to Fig. 1, banking engineering is considered as a derivative of financial engineering.



**Figure 1. Connection and links between engineering and innovation**

According to Figure 1, banking innovations are analyzed as a separate group arising from financial ones, which is true, since banks are financial institutions that develop and implement financial products, including innovative ones.

In our opinion, separating the category "banking engineering" from financial engineering, we observe a specific concept with its own unique structure and composition. After all, on the one hand, banks are active participants in the financial market and use the tools of the stock, foreign exchange and money markets to minimize risks and maximize profits at least by reducing costs, which is essentially the purpose of banking engineering, and on the other hand, banks have specific products that can be generated and implemented exclusively by them, and therefore we can highlight a particular theoretical methodology and practical outline for their implementation, which confirms the existence of a special field of knowledge such as engineering banking.

The design of new banking products to meet the increased requirements of banks and their counterparties in terms of profitability, liquidity and risk management seems to be the dominant direction in the development of the banking system at the current stage.

Banking engineering as an economic concept reflects, on the one hand, the process of design, development and practical implementation of innovative competitive business tools, products and processes, and on the other hand, mastering the method of a systematic approach to economic processes in the context of creative search and solving the relevant problems of banking practice. The essence of banking engineering is the creation of innovative banking products and services that are used by banks to redistribute financial resources, risks, liquidity, profitability and information in accordance with their own interests, the specific needs of counterparties and macro-level changes and the bank's environment.

The main goal of banking engineering is to extract additional profit based on the skillful use of market "white spots" (free segments and imperfections) by achieving an optimal balance between competing characteristics (risk, profitability and liquidity) in innovative banking products.

Thus, banking engineering faces the target tasks of designing such parameters of a banking product, in which, on the one hand, the structure of the banking product and the cash flows generated by it correspond to the greatest extent to the main interests of the issuer, and on the

other hand, the maximum possible investment attractiveness of the product is guaranteed, which is ensured by the best ratio of risk, profitability and liquidity of the product created. This goal is achieved through a reasonable choice and careful design of each individual parameter of a banking product, which requires the skillful application of certain banking engineering methods and the use of its tools.

Based on the identified objectives of banking engineering, its areas of functional responsibility are segments of banking activities related to risk management, development and implementation of speculative strategies when trading securities, financial derivatives and, most importantly, innovative banking products.

Banking engineering, acting as the art of creating innovative products, expands the possibilities of managing liquidity, risk and profitability of banking operations. This is a multifaceted way of solving problematic tasks related to the formation and movement of monetary capital.

Banking innovation justifies its design if it satisfies the interests and needs of at least one of the parties - the buyer or the seller. It can be a higher return for an investor or a lower cost of capital for an issuer, a reduction in the tax base, circumvention of regulatory requirements, hedging of risk - in a word, all those aspects related to intra-banking activities. At the same time, the benefit of the innovation should exceed the costs of its creation and promotion, or at least be equal to them.

In the banking market, investors' doubts are even more acute: firstly, in the absence of a circulation history of any innovative banking product, the expected credit risk for it is high; even a good reputation as a borrower does not always mean minimal credit risk; secondly, in the early stages, the liquidity of the innovation market is very low: what kind of liquidity can we talk about if the market is just forming? In addition, many banking innovations are difficult for potential investors to understand. First, it can be difficult for an investor to assess the benefits of using a novelty; second, to understand the honesty of the transaction, to assess the risks assumed as a result of such a transaction. Often an investor or issuer does not use an innovation simply because they are not aware that they could achieve the same financial results at a lower cost. Investment banks are not, in principle, obliged to inform clients about the best investment alternatives (in particular the alternatives of their competitors). In many cases, companies could find a better investment solution, but face transaction costs, information gathering costs, and legal restrictions that prevent them from taking advantage of the better opportunity. These circumstances make it possible for banking innovations to be called an experience commodity. Innovations must be used before their benefits become apparent to most consumers.

The guarantee of the effectiveness of banking engineering is adapted to the conditions of banking realities, considering its consideration as a process that successively goes through the following stages:

**Following the first stage**, the issuing bank of an innovative product must determine the target settings for which the banking "magic" is performed. These may include, first of all, the mundane extraction of additional profit in various forms (margin, issue premium, commissions for opening and maintaining a credit account, etc.). By "launching" an innovative banking product, targets for improving the liquidity management of the issuing bank, accumulating additional loanable resources and increasing the bank's capitalization can be achieved. The bank can also, as

a sub-objective of the introduction of a new product, propose the securitization of the most problematic assets to "disperse" credit risks to third-party investors.

**At the second stage**, the specific needs of potential counterparties are analyzed, which can be expressed in the following forms: the need for attracted borrowed resources; reduction of different types of risk; ensuring the liquidity of the counterparty's debts and assets; optimization of equity management (attracting new capital investors, maintaining a controlling stake, mergers and acquisitions of new enterprises); making a profit through a highly profitable asset allocation; taking into account legislative restrictions in banking activities (legal reduction of the tax base, exceeding restrictions in settlements with counterparties, exceeding restrictions in the circulation of capital).

**The third stage** of the banking engineering process provides for a complete risk assessment by type, level, required assessment methods and financial consequences for the bank and counterparty from the introduction of an innovative banking product. To implement the requirements of this stage, a group of methods is used. The assessment of the possibility of losses, based on the theory of probability and extrapolation of past events (past experience) to the future, has become widespread.

**In the fourth stage**, one or more alternative banking products (or their various combinations) are selected. As a rule, at this stage, several banking products (financial instruments) are selected, their various modifications are taken (or an "idea" is created that includes what a new banking product should be, how it should work and what tasks they should solve).

**The fifth stage** of banking engineering is designed to solve the problem of compliance of the innovative banking product with the procedures and methods of internal risk control in the bank, i.e. testing "coexistence" with the system of banking relationships. Based on the analysis carried out, certain adjustments are made either to the instruments of the newly created banking product or to banking risk management. As a rule, banking engineering tools depend on the bank's risk management strategy. Risk tolerance can be aggressive, moderate or conservative, which sets certain limits when creating an innovative banking product.

**At the sixth stage** of banking engineering, the problem of assessing the ratio between risk, profitability, liquidity and opportunity costs is solved when choosing the necessary banking instruments. Regarding the loan portfolio, relatively speaking, the most suitable, most diversified portfolio of assets is selected from a variety of reporting options. Possible opportunity costs are taken into account when creating an efficient portfolio (for example, obtaining loans from various credit institutions). The "time horizon" of the portfolio and its liquidity opportunities in the event of a change in the economic situation (errors in the choice of a portfolio, increased costs, etc.) are analyzed. If we are talking, for example, about a loan portfolio, the possibility of its securitization is taken into account.

**The seventh stage** provides a scenario analysis of the introduction of an innovative banking product. Banking activity is subject to the influence of several factors, which predetermine the multivariate nature of its development. Therefore, the bank must be able to predict the future of the newly created product when the external environment changes.

**In the eighth stage**, the alternative consideration of financial derivatives ends with the final choice of a banking product. Most often, this choice is made by a group of experts who evaluate

various factors and test a new banking product. Then the final decision is taken by a series of collegial bodies of the bank: legal, technological, credit, investment and financial committees.

**The ninth stage** of banking engineering involves organizational measures within the bank to create an innovative banking product: the allocation of financial and labor resources; the selection of authorized departments of the bank for the creation of a new product, the approval of their interaction procedure in the areas of responsibility of each one; drawing up a work program for the creation of an innovative banking product; drawing up the necessary documentation and accounting "schemes"; the "launch" of the newly created product in the current banking practice.

**The tenth stage** of bank engineering (selling), due to its record, should not be considered.

**At the eleventh stage**, the banking product is supported, its market is supported. There are times when a product needs to be supported in the market, for example, the share price, through a quotation system, a sales support system. Therefore, the bank is obliged to monitor the product on the market and, if necessary, make adjustments to it, of course, if possible.

Thus, the proposed banking engineering methodology is based on the sequential passage of eleven stages and can be used in all spectrums of banking activities for the production of a bank-specific "product" - an innovative banking product.

**Conclusions.** Today, in the economy of the Republic of Moldova, the banking sector is the key institution that can give a tangible boost to the innovative development of the country's economy.

Since the process of generating innovations is constant and practically continuous, we cannot talk about the list of innovative products of domestic or foreign banks as some kind of constant. Moreover, the banking systems of some countries are at different stages of development; therefore, innovations for some may be the services and products of other, more economically developed countries, which have long been used in banking practice and have become traditional.

Currently, in the domestic banking system, the use of financial engineering is at an embryonic and practical stage for risk assessment, asset and liability management, financial planning, portfolio optimization, etc. Therefore, a unified approach is required to ensure real and stable growth of the banking industry, which becomes possible due to the merging of financial engineering methods with the basic principles and strategies of banking management.

However, there is no single methodological framework regarding the development, training and implementation of banking innovations. And this creates problems and hinders the development of internal banking engineering. In our opinion, the reasons that prevent the development of financial engineering in the country can be divided into 3 groups:

- social (low level of real income; low interest in savings; low level of financial literacy and low susceptibility to learning; increase in the proportion of citizens of retirement age, etc.);
- economic (price volatility, economic stagnation, contradictory and declarative provisions of strategies and concepts of economic growth for the future, etc.);
- legal (weak regulatory framework for the protection of property rights; the need to optimize the financial law system, etc.).

According to the study, financial engineering is a process of producing financial innovations and banking engineering is a process of producing and adapting banking innovations. Obviously, it is impossible to produce banking innovations without affecting the financial sphere of relations,

which once again confirms the conclusion about the derivative nature of banking engineering in relation to financial.

Consequently, national banks must more actively implement the results of financial engineering in their current activities.

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