

**THE REPUBLIC OF AZERBAIJAN**

**KHAZAR UNIVERSITY**

**MEASURING EFFECTIVENESS OF RISK MANAGEMENT PRACTICES IN  
BANKING SECTOR**

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## **ABSTRACT**

**The modern banking market is unimaginable without risk. Risks are present in every transaction, but they are of different sizes and can be "mitigated" and compensated for in a variety of ways. Finding a banking option that completely eliminates the risk and guarantees certain financial results in advance is very simple. For banks, an effective risk management has become an inevitable necessity for ensuring and maintaining financial stability in both national and international financial markets. While the risks that banks are exposed to in terms of their transactions diversify, it is a necessity to use advanced methods to monitor and measure these risks. Methods and approaches developed for risk-based public supervision in the banking sector should be able to respond to the risk diversification brought by today's globalization and liberalization in financial markets. For this reason, it is important that the risk-based supervision approaches to be implemented by the supervisory authorities are compatible with the international supervision standards as well as the characteristics of the banking sector of the country.**

**Key words: Risk Management, Banking Sector, Risk Measurement, E-Banking**

## **ABBREVIATIONS**

<b>ABIS:</b>	Automated Banking Information System
<b>AELE:</b>	Average Expected Life Expectancy
<b>LEPP:</b>	Life Expectancy of Primitive People
<b>LID:</b>	Level of Integral Danger
<b>NPS:</b>	National Pay System
<b>RPLL:</b>	Reserves for Possible Losses on Loans

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## INTRODUCTION

### **Background**

Banks, in addition to their core business, also operate in the area of managed risk. Therefore, it is very important to be able to predict and manage banking risks, to assess risks in the financial market in a timely manner. A methodology for analysing and forecasting banking risks is needed so that the factor of uncertainty of the future, as a source of increased risk in the financial market, is a source of high income. Particular attention should be paid to the consideration of the elements of the portfolio approach in credit management and investment management, the problem of forming the structure of the bank's assets and liabilities in terms of the optimal combination of two mutually exclusive tasks - maximizing income and minimizing risk.

### **Significance of Research**

The relevance of the theme of this thesis is that the bank is exposed to a number of risks, as the bank, in addition to its commercial functions, also performs functions of social importance and monetary policy orientation. Knowledge, definition and control of banking risks are of interest to a large number of shareholders: central banks, shareholders, financial market players, customers. In the study of risks, it is recommended to distinguish between two key areas – identifying and assessing the level of risk and decision making in the area of risk.

The modern banking market is unimaginable without risk. Risks are present in every transaction, but they are of different sizes and can be "mitigated" and compensated for in a variety of ways. Finding a banking option that completely eliminates the risk and guarantees certain financial results in advance is very simple.

Risk is often identified as the possibility, or rather the threat, of a bank losing resources, losing revenue, or incurring additional costs as a result of certain financial transactions. Risk management is essential in the banking sector. The credit risk management process deserves special attention because the success of the bank depends on its quality.

The key elements of good governance are:

- well-developed credit policies and procedures;
- good portfolio management;
- effective control over credits;
- personnel well trained to work in this system.

For banks, an effective risk management has become an inevitable necessity for ensuring and maintaining financial stability in both national and international financial markets. While the risks



that banks are exposed to in terms of their transactions diversify, it is a necessity to use advanced methods to monitor and measure these risks.

Supervisory authorities operating with limited resources are insufficient to monitor the risk profiles of banks in the process of financial globalization, with the effect of technological development. The audit approach that can measure the sensitivity of banks to changing risk factors and respond to the determination of the type, intensity and instruments of auditing according to this sensitivity remains on the agenda of the world countries. For this reason, the examinations to be made by the supervisory authority for banks to have instruments such as determining, measuring, monitoring and managing risks for the future form the basis of risk-based supervision.

Methods and approaches developed by supervisors for risk-based public supervision in the banking sector should be able to respond to the risk diversification brought by today's globalization and liberalization in financial markets. For this reason, it is important that the risk-based supervision approaches to be implemented by the supervisory authorities are compatible with the international supervision standards as well as the characteristics of the banking sector of the country.

### **Objectives of Study**

The purpose of this thesis is a detailed consideration of banking risks, determining the level of risks and minimizing them. To reveal that the classical bank supervision approach in the banking sector is insufficient today and to emphasize the importance of risk-oriented public supervision practices. The application is a new approach for risk-based supervision, which is recommended to be implemented by the public supervisory authority in the Azerbaijan banking sector, and includes the evaluation of the risk management system in banks. Within this framework, targets have been set for the effectiveness of auditing, and measures have been prepared and implemented to achieve these targets.

# 1. CHAPTER I. CONCEPTS AND PRINCIPLES OF RISKS AND RISK MANAGEMENT

## 1.1. Risks and types of risks

The word "risk", according to historians, originated on the territory of the ancient Spanish-Portuguese settlements among sailors and fishermen and meant an underwater rock. It is the danger of meeting with such an imperceptible sea obstacle, which could cause damage to the bottom, the death of the vessel, the loss of the catch and the death of sailors that has currently determined the properties of this most ambiguous concept. According to another version, the term "risk" comes from the Latin "risicare", meaning "to decide."<sup>1</sup>

The concept of "risk", in the modern interpretation, has more than sixty definitions, but almost always means a negative process associated with uncertainty, chance and damage. Risk, in any case, is defined predominantly in terms of a negative connotation, arises from the perceived threat or danger of a negative event occurring. However, to complete the picture, it must be remembered that the manifestation of risk in the general case can also have positive consequences, otherwise it is impossible to understand why people take risks. Risk-taking behaviour is a balancing act between random losses and random rewards<sup>2</sup>.

Risk is based on uncertainty. The causes that give rise to uncertainty are associated with phenomena related to a particular area of life. Therefore, both uncertainty and risks can be classified for these reasons. At the same time, it is important to separate the causes of a dangerous phenomenon and the dangerous phenomenon itself (Table 1.1.).

**Table 1.1. Classification of risks according to the object of influence of negative factors**

Type of risk	Object of influence	Negative consequences (nature of harm, damage)
Individual	Person, his health and life	Decreased performance, illness, injury, disability, death
Social	Society, population (social communities)	Social losses, LID
Technical	Techno sphere objects (techno social systems)	Damage, destruction, cessation of operation

<sup>1</sup> Zupanovic I. (2014) Sustainable Risk Management in the Banking Sector, Journal of Central Banking Theory and Practice, Vol.3 No.1, pp. 81

<sup>2</sup> Rehman, Amin Ur, and Muhammad Anwar. 2019. Mediating role of enterprise risk management practices between business strategy and SME performance. Small Enterprise Research 26: 207

Household (economic)	Organizations (socio-economic systems), their financial condition, the possibility of stable functioning	Losses of property, capital, manufactured products, expected benefits
Strategic or political	State (socio-political systems), its stable functioning and sustainable development (national security)	Harm to the vital interests of the individual, society, state
Ecological	Environment (eco-social systems), its quality	Pollution of water, air, soil, destruction of ecological objects and systems that harm the current generation of people and undermine the foundations for the development of future generations

Source: Gündüz V. (2018) Due Diligence for Bank M&A's: Case from Turkey, Emerging Trends in Banking and Finance, Springe

These criteria can be used to classify both the objects at risk themselves and the elements of the risk structure (cause, hazard, impact, loss). Moreover, elements of the same risk can fall into different categories.

However, the classification of objects, as a rule, does not mean the classification of risks. An analysis of only the main objects of risk cannot provide a sufficient picture for making a decision. No less important are the risks hidden in the depths of relationships, both within the risk objects themselves and in relation to the processes that arise between them. All sources of danger act on all objects of risk (except for "nature" on "nature", since "nature does not harm itself").<sup>3</sup>

All security subjects can also influence the risk objects to one degree or another.<sup>4</sup>

The subject of the risk is the party that bears the damage, i.e. a living being (primarily a person), a community of living beings, a way of their existence or activity, in relation to which the

<sup>3</sup> Коваленко О.Г., Медведева О.Е. Банковские риски: сущность, классификация//Вектор науки Тольяттинского государственного университета. 2013. No 3 (25). С. 340

<sup>4</sup> Beans, K.M., 2010. Risk Management After Crisis, The Journal of Enterprise Management, p. 24.

consequences of the risk arising from its implementation are applicable. For example, when analyzing a specific large industrial enterprise within the city, it is possible to identify parties interested in the quality of its functioning. These parties are subjects of risk.

The main subjects of risk include:

- organized community (company, enterprise, firm);
- territorial community (state, region);
- a group of persons (individuals and legal entities) associated with the sphere of production, industry, line of business, etc.;
- people as the general population;
- people as employees of the company;
- person - a specific individual;
- a group of persons connected by factors and circumstances (passengers of a faulty vehicle, hostages, etc.);
- a group of persons – an organized group, team, party, union, etc.;
- other living beings and their communities.<sup>5</sup>

The formation of a list of risk subjects is an important and necessary work that precedes the start of operation of the risk management system. If this is not done, the list of risks will be incomplete, which means that there is a real opportunity to overlook risks, the consequences of which may lead to serious losses.<sup>6</sup>

In the course of their activities, banks and other enterprises are faced with a combination of different types of risk, which differ in the place and time of occurrence, the totality of external and internal factors that affect their level and, therefore, in the way they are analysed and described.<sup>7</sup>

As a rule, all types of risks are interrelated and affect the activities of the bank or other enterprise. At the same time, a change in one type of risk can cause a change in most of the others.

### **1.1.1. Market risks**

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<sup>5</sup> Khattab A. A. (2011), The Role of Corporate Risk Managers in Country Risk Management: A Survey of Jordanian Multinational Enterprises, "International Journal of Business and Management", vol. 6, no 1, [https://www.researchgate.net/publication/49596193\\_The\\_Role\\_of\\_Corporate\\_Risk\\_Managers\\_in\\_Country\\_Risk\\_Management\\_A\\_Survey\\_of\\_Jordanian\\_Multinational\\_Enterprises](https://www.researchgate.net/publication/49596193_The_Role_of_Corporate_Risk_Managers_in_Country_Risk_Management_A_Survey_of_Jordanian_Multinational_Enterprises) (accessed: 12.05.2022)

<sup>6</sup> Chornous G. & Ursulenko G., (2013), Risk Management In Banks: New Approaches To Risk Assessment And Information Support, ISSN 1392-1258. Ekonomika Vol. 92(1), <https://pdfs.semanticscholar.org/9c43/12f792b9ccf5da86e49f7b4bf2ee846a0c39.pdf>

<sup>7</sup> Khattab A. A. (2011), The Role of Corporate Risk Managers in Country Risk Management: A Survey of Jordanian Multinational Enterprises, "International Journal of Business and Management", vol. 6, no 1, [https://www.researchgate.net/publication/49596193\\_The\\_Role\\_of\\_Corporate\\_Risk\\_Managers\\_in\\_Country\\_Risk\\_Management\\_A\\_Survey\\_of\\_Jordanian\\_Multinational\\_Enterprises](https://www.researchgate.net/publication/49596193_The_Role_of_Corporate_Risk_Managers_in_Country_Risk_Management_A_Survey_of_Jordanian_Multinational_Enterprises) (accessed: 12.05.2022)

The term "market risk" refers to the risk an investment may face due to market fluctuations. It covers all risks of financial losses in result of changes in market prices. The risk is that the value of the enterprise will decrease. Also known as systematic risk, this term can also refer to a particular currency or product.<sup>8</sup>

Systematic risk is different from specific risk, also known as business risk or non-systematic risk. It is directly related to the market sector or the performance of a particular company. In other words, we are talking about the general economy or securities markets, while the specific risk includes only a part.

Thus, the investor needs to keep an eye on various small variables associated with the commercial market. These include inflation, interest rates, the state of the balance of payments, financial debts, geopolitical factors, etc.<sup>9</sup>

Types of market risks are the following:

*1. Interest risk*

This is the risk associated with an increase or decrease in interest rates. The risk arises from unexpected changes in interest rates due to monetary policy measures taken by the central bank.

*2. Commodity Risk*

Some commodities, such as oil or food grains, are essential to any economy and help in the production process of many commodities. This is due to their use as secondary inputs. Any change in the prices of these goods, as a rule, affects the performance of the entire market. This often leads to a demand crisis.

*3. Currency risk*

Currency risk is also known as exchange rate risk. This refers to the possibility that foreign exchange rates will rise or fall. This risk is taken into account when investing internationally.

To reduce the risk of losing foreign investment, many emerging markets maintain high foreign exchange reserves. Thus, ensuring that any possible losses can be cancelled by selling reserves.

*4. Country risk*

Many small variables beyond the control of the financial market can affect the rate of return on investment. These include the level of political balance, the level of financial debt, exposure to natural disasters, ease of doing business, etc. The degree of risk associated with such factors must be taken into account when deciding on international investments.

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<sup>8</sup> Durán Santomil, Pablo, and Luis Otero González. 2020. Enterprise risk management and Solvency II: The system of governance and the Own Risk and Solvency Assessment. *Journal of Risk Finance* 21: 317

<sup>9</sup> Тедеев А.А. (2005). *Банковское право: Учебник*. Москва

### 5. *Stock risk*

This is the risk that stock prices will change. This is the financial risk associated with holding shares in a particular investment. Equity Risk often refers to equity in companies through the purchase of shares. This does not usually refer to the risk associated with investing in real estate or creating assets in a property.

### 6. *Inflation risk*

Inflation risk is the likelihood that the cash flows from an investment will not be worth the same in the future. This is the result of a change in purchasing power due to inflation. Another name for inflation risk is purchasing power risk.

#### **1.1.2. Liquidity risks**

Liquidity risk is the possibility that an entity will not be able to meet its maturity obligations or can only do so by borrowing funds at a high price or disposing of assets at a low price. The following are some definitions of liquidity risk:

- Liquidity risk is the risk of large and sudden withdrawals of bank deposits and other liabilities that force a bank to sell its assets at low prices in the short term to counter these withdrawals.

- Liquidity risk is the difference in net income and the market value of capital arising from the difficulties the Bank faces in obtaining funds at a reasonable price, either by selling assets or by acquiring new deposits<sup>10</sup>.

- Liquidity is the ability to meet expected and unexpected cash needs without any (or very minimal) loss. Liquidity risk is inherent in the financial services industry and it is necessary to understand, measure, control and manage these risks<sup>11</sup>.

- Liquidity risk is the inability to meet financial obligations when current cash flows occur or assets are sold at fair market value. Which can result in lower returns than fair market value<sup>12</sup>.

Forms of liquidity risk in banks are:

- Funding liquidity risk or call risk: this is due to the need to replace net outflows resulting from unexpected/non-renewal of deposits (wholesale and retail). The risk of financing depends on how risky the market perceives the issuer and what it is.

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<sup>10</sup> Hammad, T, A. (1999). Evaluation of Commercial Banks Performance - Risks and Return Analysis, p.72

<sup>11</sup> Jenkins, L. & M, Anderson. (2003). A multivariate statistical approach to reducing the number of variables in data envelopment analysis. European Journal of Operational Research, 147(1): p. 51

<sup>12</sup> Crowe, K. (2009). Liquidity risk management—more important than ever. Harland Financial Solutions, 3(1), p.

- Funding policy. An institution that enters the market with an unexpected and frequent need for funds sends negative signals that may limit the willingness to lend to that institution. The cost of funds also depends on the creditworthiness of the bank. If the credit situation worsens, financing becomes more costly.

- Time risk (asset liquidity risk): time risk arises from the need to compensate for the failure to deliver expected inflows of funds. In this case, the lack of liquidity is related to the nature of the assets, and not to market liquidity. The use of a number of liquid assets serves as a means of protecting the volatile liquidity of the market; liquid assets allow you to meet short-term obligations without recourse to external financing. The liquidity ratio in banks makes it mandatory to hold short-term assets rather than short-term liabilities in order to meet short-term liabilities. To achieve this role, liquid assets must have a short-term maturity, as the market prices of long-term assets are more volatile, which can lead to large losses in the event of a sale. Moreover, some assets are less traded than others are because their trading volume is low.

- Market liquidity risk: arises when the ability to raise funds at a reasonable price is impaired. Linked to a crisis due to a lack of volume as prices become very volatile and are sometimes associated with high discounts from par when counterparties are unwilling to trade. To some extent, funding risk interacts with market and asset liquidity, as failure to meet payment obligations leads to the sale of assets, possibly at low prices.

Liquidity risk affects the performance and reputation of the bank. The bank may lose the trust of customers if the funds are not provided to it in a timely manner. A bank can go bankrupt if it does not have acceptable liquidity, even if it has stable asset quality, sufficient capital and stable profits. Most banking operations are based on deposits, if depositors begin to attract their deposits, this can lead to the creation of a liquidity trap for the bank<sup>13</sup>. This will force the bank to borrow from the central bank or the interbank market at a higher price<sup>14</sup>. On the other hand, a bank with adequate deposits will not face this crisis, but may lose profitability if the liquidity gap widens. The bank may be forced to increase its cash reserves in order to reduce liquidity risk, but this can be very costly<sup>15</sup>.

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<sup>13</sup> Jeanne, O. & L, E, Svensson. (2007). Credible commitment to optimal escape from a liquidity trap: The role of the balance sheet of an independent central bank. *American Economic Review*, 97(1): 474-490.

<sup>14</sup> Diamond, D, W. & R, G, Rajan. (2001). Liquidity risk, liquidity creation, and financial fragility: A theory of banking. *Journal of political Economy*, 109(2): 287-327.

<sup>15</sup> Holmström, B. & J, Tirole. (2000). Liquidity and risk management. *Journal of Money, Credit and Banking*, 32: 295-319.

Banks can avoid this crisis by focusing on ratios such as liquid liabilities to total liabilities and liquid assets to total assets<sup>16</sup>. Liquidity is an important basis for banking activities.

### **1.1.3. Credit risks**

Credit risk is the possibility of loss due to a debtor's inability to make payments on any type of debt. Risk management is the practice of reducing losses by understanding the adequacy of equity and loan loss reserves at any given time, a process that has long been a problem for financial institutions.

Types of credit risks are:

*Concentration risk.* Industry risk arises from excessive exposure to any one industry or sector.

*Institutional risk.* Associated with a violation of the legal structure or organization that controls the contract between the creditor and the debtor.

*Political risk.* The political crisis in the country, corruption affect the financial portfolio of loans.

*Macroeconomic risk.* Stagnation of the economy, economic crisis, deflation associated with the decline in economic sectors.

Effective methods of measuring credit risk reduce potential losses and help you choose the best terms for loans.

What companies pay attention to when concluding a loan agreement are:

- credit history,
- creditworthiness, ability to pay credit,
- capital,
- pledge,
- compliance with the terms of the loan.

*Credit history.* The specialist studies qualitative input data, such as feedback from colleagues, communities, suppliers who have had economic relations with a potential client in the past, as well as objective input data - the history of his interaction with banks, previous economic activity.

*Creditworthiness* is the ability to repay debt based on a projected income and expense profile (including other debt). Key indicators used in assessing creditworthiness: debt-to-income ratio, current income, length of service, income stability.

There are two important approaches to creditworthiness analysis:

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<sup>16</sup> John, G. & P, Molyneux & J, O, Wilson. (2009). The financial crisis in Europe: Evolution, policy responses and lessons for the future. *Journal of Financial Regulation and Compliance*, 17(4): 362-380.



- recent years' cash flow performance compared to projected debt servicing;
- projected cash flows include new project, new employment status, subject to greater uncertainty.

Higher solvency means less chance of late payments.

*Capital* is the base (net value) of assets and a certain amount of the total loan, which is paid as a down payment.

When a loan relates to a specific project, equity refers to the equity (equity) that is invested in the project: a mortgage down payment for homeowners, a portion of equity.

Capital:

- provides a buffer in case revenue deteriorates;
- harmonizes the interests of the borrower with the interests of the lender.

A relative measure of equity (usually used for corporate clients) is the ratio of debt to equity. A high amount of allocated capital is a guarantee of threat reduction.

Pledge - any assets that are pledged as security for their borrowed funds. Assets can be investment (for example, securities) or immovable (apartment, house).

The presence of collateral depends on the product, used in general mortgage-backed lending, when purchasing specific assets, such as houses or cars for individuals, commercial real estate, transport equipment (aircraft, ships, etc.).<sup>17</sup>

#### **1.1.4. Commodity price risk**

Commodity risk refers to the uncertainty of future market values and the amount of future income caused by fluctuations in commodity prices. These goods can be grain, metals, gas, electricity, etc. For a commercial enterprise, the following types of risks must be considered:

Price risk, which is associated with adverse changes in world prices, exchange rates, the ratio between local and world prices. Factors that may affect commodity prices include political and regulatory changes, seasonal fluctuations, weather, technology and market conditions.

- The risk of quantity and volume.
- Cost risk (incoming price risk).
- Political risk.

Commodity risk can have a negative impact on commodity prices resulting in losses. Commodity prices tend to be volatile and can change quickly in the short term. It is also possible that

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<sup>17</sup> Gündüz V. (2018) Due Diligence for Bank M&A's: Case from Turkey, Emerging Trends in Banking and Finance, Springe

prices will be volatile for extended periods of time, a phenomenon known as the “commodity super cycle”. Many industries use commodities as their base material and are highly sensitive to price changes.<sup>18</sup>

When a company is exposed to commodity (commodity) markets, it must decide how to manage the financial risk associated with price movements. Commodity risk is complex, and the responsibility for risk mitigation can be assigned to different departments of the company, such as purchasing, treasury, etc.

#### **1.1.5. Foreign exchange rate risk**

Currency risk is the probability of one or more events occurring due to changes in exchange rates or actions of public authorities, the object of which is currency values, leading to a positive or negative change in the economic situation of a business entity.

Currency risk, being a broad category, arises through the implementation of one or several factors simultaneously.

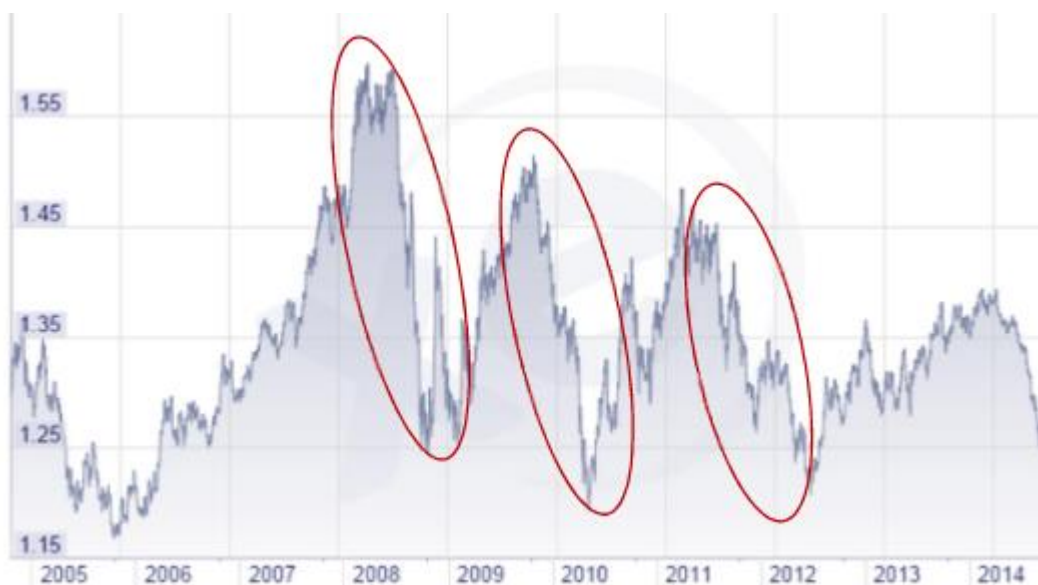
Factors affecting the currency risk can be broadly divided into two categories: external and internal. External include mainly fluctuations in the exchange rate and the actions of public authorities, the object of which are currency values. Internal, in turn, are divided into characteristic features inherent in the subject and object of risk as key components of currency risk.

The main external factor in the occurrence of currency risk, without a doubt, are fluctuations in exchange rates. Many researchers believe that only the currencies of developing countries are characterized by a high amplitude of fluctuations due to the significant instability of their economic and political environment. However, statistics also show that the exchange rates of national currencies of even the most highly developed countries, such as the USA, Great Britain, Germany, are subject to high volatility, especially in times of crisis. (Figure 1.1.)

#### **Figure 1.1. The dynamics of the US dollar against the euro**

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<sup>18</sup> Chen, Jinhua, Lu Jiao, and Graeme Harrison. 2019. Organisational culture and enterprise risk management: The Australian not-for-profit context. *Australian Journal of Public Administration* 78: 432–48



**Source:** Дмитриева, 2015, p. 2423.

Exchange rate fluctuations can be both long-term and short-term. The main factors of long-term fluctuations in exchange rates are:<sup>19</sup>

- interest rates (their reduction will lead to the refusal (sale) of investors from this currency in favour of currencies that bring large profits (i.e. capital outflow), which will lead to a weakening of the exchange rate);

- inflation rate (the higher the inflation rate, the less attractive the currency is considered among investors due to the high rate of its depreciation);

- the structure of the balance of payments of the “home” country of the currency (for example, large volumes of exports lead to an increase in demand for the currency and, consequently, to an increase in its exchange rate);

- qualitative structure of the country's exports (competitiveness of goods produced in the country in comparison with similar goods of foreign countries in world markets, which, in turn, is determined by the level of technological development of the country);

- degree of development of the foreign exchange market in the country (presence/absence of foreign exchange restrictions, convertibility, etc.)

- the role of the state in the foreign exchange regulation of the market (a high degree of state intervention leads to a drop in demand for foreign currency due to the low predictability of the exchange rate dynamics - for example, foreign exchange interventions of the Central Bank);

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<sup>19</sup> Банковский менеджмент: учебник / под ред. Ю.Ю. Ровенского, Ю.Ю. Русанова. – Москва : Оригинал-макет, 2016. – 384 с.

□ degree of confidence in this currency in world markets.

Short-term fluctuations are associated with similar factors, however, they are often the result of players overestimating the "cocktail" of long-term factors<sup>20</sup>. Short-term factors also include fluctuations in business activity in the country, the political and military-political situation, natural disasters, forecasts of leading market participants, rumours and insider information, and speculation.

Another key external factor in the emergence of foreign exchange risk is the actions of the authorities, manifested, among other things, in the introduction of administrative restrictions on foreign currency values or the implementation of foreign exchange interventions by central banks, which has recently become particularly relevant.

As mentioned earlier, internal factors include the characteristic features of objects and subjects of currency risk. The key characteristic feature of the currency risk object is the size of the open currency position, which is the difference between the organization's assets and liabilities (including off-balance sheet) denominated in foreign currency, and arising on the dates of the conclusion of a transaction in foreign currency and crediting/debiting from the account of funds in foreign currency.

Internal factors also include the characteristics of subjects of currency risk, which are divided into managerial and organizational. Managerial ones include inaccuracies in forecasting the dynamics / changes in the exchange rate, errors in choosing a risk management strategy, incorrect assessment of the expected costs for the implementation of the chosen and / or alternative risk management strategies, and others. Organizational ones include, for example, the absence of persons responsible for risk management in the organization, the lack of proper control over the risk management system in the organization, and others.

#### **1.1.6. Equity price risk**

Every security is associated with risks. Major financial and political crises affect the economy, the stock exchange and, as a result, stock prices. Such global events affect all investment instruments, but each individual has its own risk factors.

The yield on bonds is known in advance and is paid in a certain period. The owner of the bond receives coupon income, that is, a percentage of the face value of the bond, usually every six months or quarterly. A bond has a price, and you can make money on changes in its value - but it is quite stable. The main risk of a bond is the default of the issuer. In this case, the company or the state may refuse to pay its debts.

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<sup>20</sup> Потапова, Е.В., Житникова, Е.А., Александрова, Е.Ю. (2011). Оптимизация валютных рисков на предприятиях внешнеэкономической торговли. Научные записки ОрелГИЭТ, 1, 318-323

The yield is usually higher than that of bonds, but it largely depends on the performance of the company. For example, a company has reported a decrease in profits in its financial statements.

Investors expect such dynamics to continue in the future, so they are selling shares. As a result, the share price also decreases.

Another company may not distribute profits among shareholders in the form of dividends, but direct it to business development.

In addition, the profit depends on the skills of the investor: his experience of trading on the stock exchange and understanding of the economic situation.

#### **1.1.7. Central Bank Liquidity Risk**

The liquidity of the Central Bank has a direct impact on the liquidity of the country's commercial banking sector. Acting as a creditor, by issuing low-interest loans, the Central Bank allows solving the problem of banks' liquidity.

The use of financial markets to finance long-term assets has become widespread among banks. In addition, two alternative methods are used to increase liquidity - this is the use of interbank markets, where banks request resources for financing from banks, as well as the use of innovative financial instruments such as credit derivatives. Bank liquidity has a huge impact on the liquidity of financial markets. Market liquidity is an important aspect for measuring the conditions of the markets, as it is the central point of the stability of the financial system.

#### **1.1.8. Market Liquidity risk**

Modern trends in the field of risk management are characterized, firstly, by the gradual inclusion of new types of risks in the list of necessary elements for calculating capital adequacy and, secondly, by the widespread use of a rather complex mathematical apparatus in the analysis of banking risks. In many countries, the use of "advanced" risk management tools is enshrined in regulatory documents. The assessment of the MLR is caused by the need to form a risk management system that most fully covers all types of risks of a financial institution.<sup>21</sup>

MLR, inherent to all participants in the financial market, is the expected loss in a transaction for the purchase and sale of a financial asset, which arise in result of a change in the transaction price when transactions are carried out in significant volumes in a short period of time. This is caused, first of all, by the limited volume of assets, the peculiarities of the preferences of the parties (sellers-buyers) to make transactions with an asset in certain volumes and in a situation of a certain market situation

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<sup>21</sup> Blanco-Mesa, Fabio, Julieth Rivera-Rubiano, Xiomara Patino-Hernandez, and Maribel Martinez-Montana. 2019. The importance of enterprise risk management in large companies. *Technological and Economic Development of Economy* 25: 600–33.

(for example, in the case of a high profitability/risk ratio of an asset, reluctance to sell such an asset prevails, in the case of low - unwillingness to acquire it). One of the indicators of the absence of absolute liquidity (in other words, a sign of the presence of a non-zero MLR) in the financial markets is the existence of a non-zero spread (difference) between the bid and offer prices of a financial asset. Therefore, it is proposed to consider the spread as an indicator of MLR. Since the spread between the bid and offer prices of a particular financial asset is its numerical characteristic (i.e., a measured value), it is possible to quantify the MLR.<sup>22</sup>

When measuring MLR, it is customary to single out three of its main factors: the risk of viscosity, depth, and market recovery, which can be defined as follows:

*Market viscosity* - determines the amount of deviation of the price of an individual transaction (bid price or offer price) from the average market price for already completed transactions. In our methodology, viscosity is measured using the spread value;

*Market depth* - reflects either the maximum volume of the transaction, in which the operation is possible without a significant impact on the current market price, or the volume of orders from the market maker at a given point in time. A quantitative assessment of the market depth is necessary to determine the maximum volume of a transaction that can be carried out without the appearance of a price deviation from the average market;

*Market recovery* - shows the speed with which either the price volatility caused by transactions disappears, or the price imbalance between supply and demand is eliminated. So far, there are no generally accepted indicators to measure the recovery of the market. We propose to consider it as indicators of the rate of recovery of the demand and offer spread, as well as the volume of orders after the transaction.

### **1.1.9. Operational risk**

Operational risk is the risk of loss as a result of inadequate or erroneous internal processes, actions of employees and systems, or external events. This definition includes legal risk but excludes strategic and reputational risk. In more detail: operational risk is the risk of losses as a result of inconsistency with the nature and scale of the activities of the credit institution and (or) the requirements of the current legislation of the internal procedures and procedures for conducting banking operations and other transactions, their violation by employees of the credit institution and (or) other persons (due to unintentional or intentional actions or omissions), disproportion

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<sup>22</sup> Bailey, Cristina, Denton Collins, and Lawrence Abbott. 2018. The Impact of Enterprise Risk Management on the Audit Process: Evidence from Audit Fees and Audit Delay. *Auditing—A Journal of Practice & Theory* 37: 25

(insufficiency) of the functional capabilities (characteristics) of the information, technological and other systems used by the credit institution and (or) their failures (disturbances in functioning), as well as in result of the impact of external events.<sup>23</sup> Operational risk is inherent in all banking products, activities, processes and systems, and effective operational risk management is always one of the main elements of a bank's risk management system. In the global banking practice, operational risk management is a key and paramount task.

The main operational risk factors are related:

- with accidental or deliberate actions of people or organizations directed against the interests of the organization, including non-compliance with the requirements of the law and the provided internal rules and procedures;
- with the imperfection of the organizational structure (distribution of duties of departments and employees), procedures and procedures, as well as their documentation, inefficiency of internal control, etc.
- with failures in the functioning of systems and equipment
- with external circumstances beyond the control of the organization.

## **1.2. The Concepts of Risk Management**

Regardless of the reasons for the emergence of economic risk, the desire of each subject to reduce the possible losses associated with the realization of this risk is natural. This desire is realized through appropriate (management) decisions, in result of which risk management takes place, which is called risk management in the context of business.

Risk management (risk management) is the process of making and implementing management decisions that minimize the adverse impact on an organization or person of losses caused by random events.

Key words in this definition include:

- "process" - risk management is not a one-time act, it must be "embedded" in the overall process of making managerial decisions;
- "random events" - risk management is associated with unforeseen events (realization of economic risk), the occurrence of which cannot be known in advance with complete certainty;

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<sup>23</sup> Подходы к оценке системы управления рисками в банках (международный опыт) Т.Ю.Морозова, к.э.н., доцент кафедры «Экономика и антикризисное управление»(2007). Вестник финансовой академии при Правительстве Российской Федерации №5, (стр. 20).

- "adverse impact" - random events are not important in themselves, but only when the consequences of these events adversely affect the results of the researched person or organization;
- "minimize" - the result of management efforts should be a reduction in the negative effect caused by unforeseen events (realization of economic risk).

The degree of risk can be influenced through the formation and implementation of a strategy, the use of certain means, principles, that is, through the creation of a kind of risk management mechanism - risk management.

Accordingly, risk management is a risk management system, including the strategy and tactics of management, and is aimed at achieving the main business goals of the organization.

Effective risk management includes: a management system; identification and measurement system; tracking system (monitoring and control).<sup>24</sup>

The complex of actions for risk management aims to ensure the achievement of the following goals: 1) risks must be understood and understood by the management of the organization; 2) the decision to accept the risk must be specific, clear and consistent with the strategic objective of the company; 3) the expected return must compensate for the accepted risk; 4) the distribution of capital should correspond to the size of the risks to which the company is exposed; 5) incentives to achieve high performance should be consistent with the level of risk tolerance.

Protecting against the possible negative impact of risks is managing them.

This definition is formulated in the most general form, regardless of the specifics of the risk. Therefore, risk management, understood in this way, can be carried out at different levels:

- at the state level (e.g. civil defence system);
- at the level of a firm or other economic entity (in particular, a program of measures to ensure the sustainability of their business);
- at the individual level (primarily personal insurance and personal property insurance).

Although risk management is based on general principles, this process has its own specifics at each level. In particular, it manifests itself both in the form of special decision-making procedures and in the form of specific risk management measures. For example, for these levels, decisions are made by persons who have different attitudes towards the risk carrier: at the state level, this is an official (civil servant), for a company, a hired manager, and at an individual level, the person himself or his closest relative (for example, wife).

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<sup>24</sup> Chen D. X., Damar H. E., Soubra H. and Terajima Y. (2012), An Analysis of Indicators of Balance-Sheet Risks at Canadian Financial Institutions, Bank of Canada Review, <https://www.bankofcanada.ca/wp-content/uploads/2012/08/review-summer12-chen.pdf>



Risk management is based on the general universal properties of the risk management system, which can be represented as basic principles. These should include:<sup>25</sup>

- systemic nature of risk management - a comprehensive consideration of the totality of risks as a whole, taking into account all the relationships and possible consequences;
- compliance of the risk management system with the general goals and objectives of the risk carrier, which implies the absence of contradictions between the risk management system and other goals and objectives of the functioning of the state, the business of the company or the life of an individual;
- taking into account the external and internal limitations of the risk management system, which means the coordination of relevant special measures with the institutional capabilities and conditions for the functioning of the state, the company's business or the living conditions of an individual;
- maintaining the dynamic nature of the risk management system, which is associated with the continuous nature of decision-making regarding risk management.

These basic principles characterize the features of the risk management system and, in general, are manifested in practice in all cases. However, risk management has certain specifics associated with the characteristics of the object, goals and management methods, so that the specific implementation of the above principles may be different.

***The systemic nature of risk management*** is a comprehensive consideration of the totality of all risks as a whole, taking into account all the relationships and possible consequences, which implies a highly specialized nature of decision-making regarding risk management, as well as the implementation of a unified risk management policy.

As a rule, a government agency, firm or individual faces not just one risk, but rather a wide range of them. This means that risk management should provide a single integrated system of effective measures to overcome the negative consequences of each element of the specified set, i.e. measures to overcome the negative consequences of the entire portfolio of risks.

***Risk portfolio*** is a set of all risks faced by a legal or natural person in the course of its activities.

A synonym for the phrase "risk portfolio" is the concept of "set of risks" or "complex of risks".

The risk portfolio is some specific description of the management object itself. It has a number of characteristics associated, for example, with the peculiarities of the manifestation of possible

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<sup>25</sup> Bağırov M.M. (2003). Bank və bank əməliyyatları. Bakı (Ali məktəblər üçün dərslik).

negative consequences. Such a set of characteristics can be summarized in terms of "risk profile" and "risk passport".<sup>26</sup>

*A risk profile* is a systematic, comprehensive view of the risks faced by a legal or natural person, as well as the nature of the damage they cause and the features of the relationship between them.

*A risk passport* is a specific, often formalized, description of the risks faced by a legal or natural person, which is a documented expression of the risk profile.

The requirement for a unified risk management policy leads to the fact that risks are examined at two levels:

- *risk analysis* separately, which creates conditions for the risk manager to understand the features of a particular risk situation or the specifics of the adverse consequences of its implementation. Such an analysis makes it possible to choose the most appropriate management tools for each specific risk;

- *study of the risk portfolio as a whole*, which allows you to establish the overall impact of risks on the functioning of government agencies, the business of the company or the life of an individual. It means the creation of an appropriate risk profile in the form of non-formalized or formalized (risk passport) representations of the decision maker. This level provides a single point of view on the risk portfolio, and therefore determines the features of the policy for its management.

Obviously, the risk management system should be based on both of these levels and combine the tools and methods specific to each of them. Failure to comply with this condition will lead to the loss of the adequacy of the current policy and, as a result, to additional financial losses.

The study of the risk portfolio as a whole means that, along with the sources of uncertainty associated with the behaviour of individual risks, one more aspect is included in the study of the risk situation - the degree of interconnection between risks. In most cases, complete information about it is not available (for example, it is known that the risks in the portfolio are correlated, but it is not clear how or what the nature of their relationship is). Therefore, this aspect can also be a powerful source of uncertainty that the risk management system has to deal with.

In addition, risks can be of a different nature, which makes the process of managing a portfolio of such risks complex and requires taking into account specific internal relationships between them. In this regard, risk management, especially for large and complex objects, is often extremely difficult, which requires the involvement of specialists from various fields of science and technology.

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<sup>26</sup> İqtisadi təhlil – Mahmudov İ.M., Zeynalov T.S., Quliyev F.M

In addition to these advantages of a single point of view on the totality of risks, the following can be additionally mentioned:<sup>27</sup>

- a comprehensive organization of information flows, carried out from the standpoint of the entire risk portfolio, will improve the efficiency of risk management in general, at least by reducing the total cost of collecting and processing information and making a decision, taking into account the interconnections of all risks;

- Ensuring the security of decisions taken taking into account the entire portfolio of risks will improve the efficiency of risk management by identifying possible points of information leakage, primarily due to the interconnection of the risks themselves;

- taking into account the entire portfolio of risks when making decisions on any other areas of activity of a state body, firm or individual will also increase the efficiency of the entire management, primarily due to the correct assessment of the resources required to cover the entire portfolio of risks, and taking this assessment into account, for example , when using resources.<sup>28</sup>

The combination of all these advantages, taking into account the specifics of specific risks at the level of their individual analysis, makes the risk management system more adequate and flexible.

### **1.3. Risk Management Tools**

According to the theory of risk management, the risk management of an investment project in its most general form is based on a number of methods. Each method includes a set of certain measures (tools) - specific organizational, technical, financial, legal and other actions carried out by project participants to manage project risks.<sup>29</sup> The number of such specific measures (tools) available in the arsenal of project participants can be quite large. The most common ones are presented in next sub-chapters.

#### **1.3.1. Risk Assessment Template for IT**

The risk matrix is a square matrix and some linear transformation must correspond to it. This fact does not depend on the method of obtaining the matrix and the ideas implemented in the specific method of obtaining the matrix.<sup>30</sup> It is important that the determinant of the matrix is not equal to zero. These are the requirements of a method that provides a canonical representation of a matrix. Further,

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<sup>27</sup> Галанов В.А, (2012). Рынок ценных бумаг. Учебник. Москва: ИНФРА-М- 378 с. (Qalanov V.A. (2012).

<sup>28</sup> NBA (Koninklijke Nederlandse Beroepsorganisatie van Accountants) (2019) Rapport oorzakenanalyse OOB accountantsorganisaties. <https://www.nba.nl/projecten/in-het-publiek-belang/uitkom-sten-oorzakenanalyse>

<sup>29</sup> Almeida, Rafael, Jose Miguel Teixeira, Miguel Mira da Silva, and Paulo Faroleiro. 2019. A conceptual model for enterprise risk management. *Journal of Enterprise Information Management* 32: 843–68.

<sup>30</sup> Nolder CJ, Sunderland D (2020) Mapping firms' root cause analyses to audit behavioral research – A way forward. Working paper Suffolk University

it is shown that this is not just a limitation of the method, but a requirement that meets the needs of practice (Figure 1.2).

**Figure 1.2. Business Project Risk Assessment Sample**

**BUSINESS PROJECT RISK ASSESSMENT SAMPLE TEMPLATE**

PROJECT ID	PROJECT NAME	PROJECT MANAGER	ASSESSED BY	ASSESSMENT DATE
PROJECT DESCRIPTION			APPROVED BY	APPROVAL DATE

PROBABILITY KEY		IMPACT KEY	
1	Unlikely	1	Low
2	Likely	2	Medium
3	Very Likely	3	High

Rate Probability and Impact Levels on a scale of 1 to 3 — DO NOT ALTER —

REF ID	HAZARD DESCRIPTION	PROJECT PHASE	IMPACT DESCRIPTION <small>Time, Cost, Performance</small>	PROBABILITY	IMPACT	SCORE	RISK LEVEL	CURRENT RISK MITIGATION AND CONTROL MEASURES	ACTION PLAN	ACTION OWNER	STATUS	COMPLETION DATE
1.0	Supplier going out of business	Planning and Execution	Project disruption and server failure, which will delay progress and cost \$5,500 to set up new systems	3	3	9	HIGHEST	Systems are backed up every 30 minutes, and extra equipment is available	Form new partnerships with multiple suppliers	Annie Lee	In Progress	00/00/0000
				3	2	6	MEDIUM HIGH					
				2	2	4	MEDIUM LOW					
				1	3	3	LOW					
				1	2	2	VERY LOW					
				1	1	1	LOWEST					

Source: <https://habr.com>

### 1.3.2. Probability and Impact Matrix

The Probability and Impact Matrix contains combinations of Probability and Impact that rank risks as low, medium, or high. The matrix may contain descriptive terms or numerical designations (see Fig. 1.3) and is built on the basis of scales for assessing the likelihood and assessing the degree of influence of a possible risk. The left column of the matrix contains the risk probability values, the first row contains a scale with the values of possible consequences. The cells are filled with the results of multiplying the values of these scales<sup>31</sup>. By comparing the value of the matrix cell with the impact assessment scale, the risks can be divided into categories: small, medium and large. Consider the matrix of probability and consequences presented in fig. 1.3. Risks with a very high probability but low impact, as well as risks with a low probability and low impact, are considered risks with no impact (grey cells in the table). Risks with very high impacts but low probability, as well as risks with low impacts and high probability (light grey boxes), have a medium impact on the project. Risks that need special attention have a fairly high probability and significant consequences (boxes tables in dark grey).

<sup>31</sup> Gunduz V., Gonenc H. (2019), Credit Portfolio Diversification and Bank Performances During the Recent Crisis Period, 4th International Conference on Banking and Finance Perspectives

**Figure 1.3. Risk Impact (Probability and Consequence) Matrix**

Project goal	Values shown on relative and numerical scales				
	Very low 0,05	Low 0,10	Average 0,20	High 0,40	Very high 0,80
Cost	Slight increase	Increase < 5%	Increase 5-10%	Increase 10-20%	Increase > 20%
Duration	Slight increase	Increase < 5%	Increase 5-10%	Increase 10-20%	Increase > 20%
Content (volume)	Changes are not obvious	Slight change	Significant change	Unacceptable change for the client	Achieving the final results is impossible
Quality	Changes are not obvious	Slight change	Changes require customer consent	Unacceptable change for the client	Achieving the final results is impossible

Source: <https://studfile.net>

### 1.3.3. Risk Data Quality Assessment

Qualitative risk analysis requires reliable, accurate and unbiased data. Risk data quality analysis is a technique for evaluating the usefulness of risk data for project management. Analysis involves examining the accuracy, quality, reliability, and integrity of risk data, along with a deeper understanding of risk.

With poor quality risk data, the results of a qualitative risk analysis may be of little value to your project. In the absence of high-quality data, it may be necessary to collect new high-quality data. Gathering risk information is often difficult and requires more time and resources than originally planned.

The quantitative analysis is carried out in the context of a qualitative analysis of the risks in relation to the risks that are qualified as having a potential or significant influence on the competitive nature of the project. The quantitative risk analysis process assesses the impact of these risk events and assigns a numerical rating to these risks. This analysis also provides a quantitative approach to decision making under uncertainty. This process uses methods such as Monte Carlo simulation and decision tree analysis; they are used for:<sup>32</sup>

- Determination of the number of possible project outputs and their degree of probability
- Estimation of the likelihood of achieving specific project goals
- Identifying the risks requiring the most attention by quantifying their relative contribution to the overall risk of the project

<sup>32</sup> Chornous G. & Ursulenko G., (2013), Risk Management In Banks: New Approaches To Risk Assessment And Information Support, ISSN 1392-1258. Ekonomika Vol. 92(1), <https://pdfs.semanticscholar.org/9c43/12f792b9ccf5da86e49f7b4bf2ee846a0c39.pdf>

- Defining the realistic and achievable cost, schedule or scope targets, taking into account the risks of the project
- Determining the best project management solution in a situation where some conditions or outputs are left undefined.

Although experienced project managers sometimes perform quantitative analysis immediately after identifying risk, quantitative risk analysis is usually performed after qualitative risk analysis. In some cases, quantitative risk analysis is not necessary to generate effective risk responses. The choice of analysis method(s) for each specific project is determined by the availability of time and budget and the need to explain the risks and consequences quantitatively or qualitatively. To determine how successful the overall risk mitigation of the project is, after planning the response to the risks, it is necessary to measure the risks again, as well as being part of the monitoring and risk management. Trend analysis can indicate the need for a greater or lesser risk management process. This is one of the inputs to the risk response planning process.

The most common methods of quantitative analysis are:<sup>33</sup>

- *Sensitivity analysis.* Sensitivity analysis helps determine which risk has the greatest potential impact on the project. The analysis process determines the extent to which the uncertainty of each project element is reflected in the research objective of the project when the remaining uncertainty elements take on significant values. A common way of presenting the results of sensitivity analysis is a tornado plot, which is useful when comparing the relative importance of variables with a high degree of uncertainty with other more stable variables.
- *Analysis of expected monetary value.* Expected Monetary Value (EVA) analysis is a statistical concept that calculates the average score when the future contains uncertain scenarios (i.e. analysis under uncertainty). EVA is usually expressed positively and risk negatively. EVA are calculated by multiplying each potential outcome value by its probability of occurrence and summing the outcome values. In most cases, this type of analysis is used in decision tree analysis. Simulation is recommended for cost analysis and schedule risk analysis because it is more efficient and less likely to be misused than expected monetary value analysis.

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<sup>33</sup> Домников А.Ю., Кондюкова Е.С., Шершнева Е.Г. Отраслевая диверсификация корпоративного кредитного портфеля в риск-менеджменте банка // Аудит и финансовый анализ. 2015. No 2.

- *Decision tree analysis.* The decision tree analysis structure is usually based on a decision tree diagram that describes the intended situation, taking into account all possible options and possible scenarios. The cost of each choice is a combination of the probability that each possible scenario will occur and the reward for each logical alternative path. Building a decision tree allows you to analyse ODS (or other activity of interest to your organization) to find alternatives when all relevant rewards and decisions have already been quantified.
- *Modelling and simulation.* Project modelling uses models to determine the impact of detailed uncertainty on the overall project outcome. Simulations are generally performed using the Monte Carlo method. When analysing risk costs, you can use a traditional WBS cost structure or a hierarchical cost structure as a modelling model. The risk analysis of the table uses graphs created in priority.<sup>34</sup>

The general principles of risk analysis are:

- universal coverage of the research field;
- taking into account the company's strategy;
- taking into account the time factor;
- reliability of the received information;
- efficiency of applied risk identification methods.

The risk analysis process includes the following steps:

1. Setting the goal and objectives of risk analysis.
2. Determination of the required array of information and development of reporting forms.
3. Collection of information:
  - analysis and forecast of the external environment of the enterprise;
  - analysis and forecast of the internal environment of the enterprise.
4. Providing the collected information in special reporting forms for analysis.
5. Analysis of the received information:
  - \* carrying out an enlarged and detailed analysis;
  - \* identification of sources of occurrence of specific types of risks;
  - \* Identification and analysis of internal and external factors that increase (reduce) a particular type of risk.

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<sup>34</sup> Бланк И.А. Управление финансовыми рисками: Библиотека Финансового Менеджера. Выпуск 12. К.: Ника-Центр, 2012. 600 с

6. Identification of possible risks in the options for solving a specific problem (at the stage of developing a solution).

7. Determination of the presence of risks in the alternative solution of a specific problem (at the decision-making stage).

8. Drawing up a list of risk analysis results in order to identify and classify them.

In order to save money and time, the array of information necessary for the purposes of risk analysis should be determined and the required reporting forms should be developed to provide the necessary information.

Risk analysis is based on the collection and processing of information of various kinds: information about the state of the external environment, the internal environment of the enterprise, etc. As noted above, a comprehensive process of collecting, transmitting and disseminating the necessary information (reliable, reliable and timely) is necessary for the relevant management links and levels. For ease of use, the collected information must be provided in special reporting forms; each enterprise can develop its own reporting forms. They depend on the scale and activities of the enterprise, its organizational structure, the number of management apparatus and personnel, etc.

#### **1.3.4. Risk Register**

A risk register is a document used as a risk management tool to identify potential obstacles within a project. This whole process is aimed at actively identifying, analysing and eliminating risks before they become problems. While risk management is typically done on projects, it is also relevant to new product launches and manufacturing. A document called a “risk register”, also called a risk register, records potential risks in a particular project. In addition, it provides information about the level of risk and its likelihood.<sup>35</sup> The project risk register not only identifies and analyses risks, but also prescribes specific mitigation measures. Thanks to this, if the risk develops into a serious threat, your team will be ready to solve problems.

There are many situations in which a risk register can be useful. Ideally, it should be applied or available when needed in any project. Such a register can be used for both small and large projects, and the risk log may look different depending on the scale and complexity of an initiative. When working on a small project, the registry may contain only basic information about risks, such as probability, priority, and decisions, but for more complex projects, there may be more positions. Some companies hire risk managers to maintain the risk register, but often this task falls to project managers

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<sup>35</sup> Жуков Е.Ф. Банки и банковские операции. М.: ЮНИТИ, 2010. 247 с



and team leaders. If you are not yet implementing a risk management process or an incident control process, it will certainly be useful for you to know what risks may arise in order to understand whether you and your team need a risk register.<sup>36</sup>

The following are examples of risks by priority:

- Low priority. Risks such as communication breakdown and planning errors expose projects to scope creep and failure to achieve expected results.
- Medium priority. Risks such as unscheduled or extra work can cause employees to struggle to maintain productivity at the required level and set themselves uncertain tasks.
- High priority. Theft and other risks associated with data security can result in loss of profits for your company, so they should be taken as the most serious ones.

When working on projects that may affect data security, it is essential to monitor potential risks and minimize their impact. Uncontrolled risks can lead to the following consequences:

- Data theft. Without proper protection, your company may be vulnerable to the theft of confidential information. The theft of client information has especially serious consequences.
- Fraud with bank cards. This is a dangerous incident for a number of reasons, which can lead to loss of profits and even to litigation.

The issue of data protection is of the greatest importance in terms of security in the long term, so it should be considered as a priority.

#### **1.4. Risk management principles by Basel committee**

During the global financial crisis that began in mid-2007, many banks undertook intensive measures to maintain the required level of liquidity. Central banks have provided unprecedented liquidity support to preserve the financial system, but many banks have gone bankrupt, merged or bailed out. During previous years, the financial system was characterized by an excess of liquidity, therefore, during this period, liquidity risk and its management received much less attention than other risks. The crisis has shown how quickly a liquidity crisis can manifest itself and how quickly sources of funding can dry up, exacerbating the problem of asset valuation and capital adequacy<sup>37</sup>.

The Basel Committee on Banking Supervision is a committee of banking supervisors established by the G-10 central bank governors in 1975. It includes representatives of the leadership

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<sup>36</sup> Z.Məmmədov- Pul, kredit və banklar (Dərslük Bakı 2006)

<sup>37</sup> Working Group 1 of the G20, Final report March 25, 2009, Enhancing Sound Regulation and Strengthening Transparency.

of banking supervisory authorities and central banks of Argentina, Australia, Belgium, Brazil, Canada, China, France, Germany, Hong Kong, India, Indonesia, Italy, Japan, Korea, Luxembourg, Mexico, Holland, Russia, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Turkey, England and USA. The meetings of the Committee are usually held in Basel, where its permanent secretariat is located.<sup>38</sup>

A characteristic feature of the financial crisis was inadequate and inefficient liquidity risk management. Recognizing the need for banks to improve their governance and liquidity risk controls, the Basel Committee on Banking Supervision (“the Committee”) released the Principles for Sound Liquidity Risk Management and Supervision in September 2008. These principles formulate the key elements of a sound system for managing liquidity risk in banking organizations, which are consistent with the views of banking supervision<sup>39</sup>. Said elements include:

- Oversight by the board of directors and management.
- Formation of policies and approval of risk tolerance limits.
- Use of liquidity risk management tools, such as a comprehensive cash flow forecast, limits and stress testing using certain scenarios in terms of liquidity changes.
- Development of robust comprehensive emergency financing plans.
- Maintaining a sufficient volume of highly liquid assets in case of emergencies associated with a lack of liquidity.

For their part, supervisors should determine how adequate the system for managing liquidity risk in banks and the level of exposure of banks to this risk. Supervisors should also take immediate action to correct deficiencies in banking risk management systems or risk mitigation measures to protect the interests of depositors and ensure the stability of the financial system as a whole.

In order to further unify international liquidity risk supervision, the Committee has developed a mandatory list of tools for the ongoing monitoring of liquidity risks in transnational banks and for the exchange of information about these risks between the supervisory authorities of countries of origin and host countries.

#### **1.4.1. Board and Management Oversight**

The Basel Committee on Banking Supervision was founded in 1974 under the Bank for International Settlements by the presidents of the central banks of the G10 countries. As of 2012, the members of the committee are high-ranking representatives of the central banks and financial

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<sup>38</sup> Basel Committee on Banking Supervision, BIS (2017), Finalising Basel III in brief, [https://www.bis.org/bcbs/publ/d424\\_inbrief.pdf](https://www.bis.org/bcbs/publ/d424_inbrief.pdf)

<sup>39</sup> Декларация об укреплении финансовой системы, Лондонский саммит, 2 апреля 2009 года

regulators of Argentina, Australia, Belgium, Brazil, Great Britain, Germany, Hong Kong, India, Indonesia, Spain, Italy, Canada, China, Luxembourg, Mexico, the Netherlands, Russia, Saudi Arabia, USA, Singapore, Turkey, France, Sweden, Switzerland, South Africa, South Korea and Japan. The European Banking Supervisory Authority, the European Central Bank, the European Commission, the Financial Stability Institute and the International Monetary Fund take part in the work on an observer basis.<sup>40</sup>

The main documents of the Basel Committee are:

- Basic Principles for Effective Supervision (1997, revised 2006).
- Basel-I (introduced in 1988), according to which the bank's capital for regulatory purposes should be divided into two categories - Tier 1 and Tier 2 capital, and all bank assets for regulatory purposes are divided into 5 groups depending on the degree of risk.
- Basel II (adopted on June 26, 2004). The Basel II approach is based on three components: minimum capital requirements (Basel I framework), supervisory procedures and market discipline. Thus, the mechanism for calculating the minimum level of capital adequacy that has existed since the adoption of Basel I, which has already proven its effectiveness, was supplemented by a system of supervision and interaction between banks and supervisory authorities, as well as an extensive system of information disclosure.

Basel III (adopted in December 2010), the standards of which are planned to be introduced from 2013 to 2018. The main changes in Basel III compared to Basel II are included in the calculation of banks' capital, prudential capital requirements, and prudential liquidity requirements. Basel III also introduces additional capital buffers: a conservation buffer (a capital reserve of 2.5% of the risk value, which must be maintained by the bank outside the stress period) and a countercyclical buffer.

Since the mid-1990s, the Basel Committee has been actively involved in improving the principles of regulation. This work was completed by 2004, which was marked by the publication of the next iteration of the agreement - Basel II. Basel III is a symbiosis of advanced risk assessment methods (credit, market and operational) and the creation of appropriate capital, meaningful supervision and market discipline. Only the combination of these three "pillars" can be called risk-based supervision, which, according to the idea of the Basel Committee on Banking Supervision, will be able to ensure financial stability. This is a new banking supervision paradigm that extends to the

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<sup>40</sup> Базель II: документы и комментарии (2007) М.: Бизнес и банки

entire financial system and is based on hundreds of financial and mathematical models built on the actual statistics of banks.<sup>41</sup>

The preparation of the Basel Principles for Effective Banking Supervision was directly related to the decision of countries to take measures to strengthen the stability of the global financial system. The draft document was developed during the year. The preparation of the principles was carried out by the Basel Committee on Banking Supervision in close contact with international organizations.

#### **1.4.2. Security Controls**

Section II of Basel Principles proposes two liquidity risk management standards designed for different but complementary purposes. The first goal is to ensure a reliable level of liquidity of banks in the short term by creating a reserve of highly liquid resources that allows them to continue their activities under stress for one month. To this end, the Committee has developed a liquidity indicator. The second goal is to ensure long-term sustainability by creating additional incentives for banks to attract funding from more reliable sources on a permanent structural basis. To achieve this goal, a net stable financing indicator has been developed that reflects the structural aspects of the choice of funding sources. These two indicators are characterized by specific parameters that are "harmonized" at the international level on the basis of specific values. Some of the parameters should be determined by national supervisory authorities, taking into account the characteristics of specific jurisdictions. For example, the percentage of possible outflow of deposits from the public depends, among other things, on the structure of the deposit insurance system in a particular jurisdiction. In these cases, transparent and clear designation of parameters in the regulations of each jurisdiction is required. This will provide certainty as to exactly what parameters banks are performing both within individual jurisdictions and transnationally. Regulatory standards should be disclosed by supervisors.

*The liquidity ratio* reflects the volume of unencumbered highly liquid assets at the disposal of the bank, due to which it is possible to ensure a net cash outflow based on the conditions of the scenario determined by the supervisory authorities for the short term. Supervisory scenarios include stress situations specific to specific banks, as well as to the system as a whole. Possible scenarios are being developed based on actual events that occurred during the global financial crisis. Scenarios include the following.

- Significant downgrading of institutions' credit ratings.
- Partial outflow of deposits.

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<sup>41</sup> IAASB (International Auditing and Assurance Standards Board) (2020) International standard on quality management 1 – approved by IAASB (Vol. 1). <https://www.ifac.org/system/files/meetings/files/20200914-IAASB-Agenda-Item-2-A.4-ISQM-1-Final-Approved-Draft-Updated-Marked-From-Agenda-Item-2-A.2-FINAL.pdf>

- Loss of unsecured large sources of funding (unsecured wholesale funding).
- Significant increase in haircuts.
- Growth of collateral replenishment requirements for operations with derivative financial instruments and for contractual and non-contractual off-balance sheet items, including extended credit lines and liquidity lines.

Under this indicator, banks are required to provide a list of contingent liabilities (contractual and non-contractual) and the corresponding terms of those liabilities.

*The net stable financing indicator* estimates the amount of long-term stable sources of financing depending on the level of liquidity of the funded assets and the likelihood of the need to search for sources of liquidity in connection with the fulfilment of off-balance sheet obligations. In accordance with the standard, a stable minimum amount of financing must be maintained for one year, calculated on the basis of coefficients applied to assets and off-balance sheet items, depending on their level of liquidity. Net Stable Funding is introduced to stimulate long-term structured financing of bank balance sheets, off-balance sheet items and capital market operations.

Currently, the supervisory authorities use a wide range of quantitative indicators to monitor the level of liquidity of banks. A survey conducted in early 2009 by members of the Basel Committee showed that over 25 indicators are being used by national supervisory authorities. These include estimates of cash flows and gaps in the timing of cash inflows and outflows over different time horizons based on contractual timing and bank estimates; assessment of the level of liquidity based on specific liquidity risk profiles based on the bank's balance sheet; using market data to monitor potential liquidity risks in banks. These indicators enable monitoring of trends in banking institutions and financial systems to strengthen macro prudential supervision.<sup>42</sup>

To increase the resilience of banks in the face of possible liquidity problems, the uniform application of standards in all countries is necessary. To this end, at the international level, most of the parameters of these indicators have been harmonized. Some of the parameters should be set by national supervisors to reflect specific jurisdictions. In these cases, particular attention should be paid to the transparency of the parameters and the clarity of their definition in each jurisdiction. This will bring clarity both at the jurisdictional level and at the international level.

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<sup>42</sup> Gunduz V., Gonenc H. (2019), Credit Portfolio Diversification and Bank Performances During the Recent Crisis Period, 4th International Conference on Banking and Finance Perspectives

In addition, supervisors may require individual banks to comply with more stringent standards or parameters to better reflect their liquidity risk profile and to better assess banks' compliance with the Basel Committee's Good Principles.

### **1.4.3. Legal and Reputational Risk Management**

Managing legal risks and legal issues is becoming a priority for key stakeholders, including stakeholders such as the board of directors and regulators. In many companies, the lack of a clear legal risk analysis can lead to difficulties that force the legal department to engage in ad hoc response. However, such problems can be avoided by creating a system and developing a proactive risk management strategy.

Since generally accepted approaches and industry standards in the field of proactive risk management do not develop as quickly, organizations do not have appropriate strategies. Thus, many managers cannot be completely sure that they are adequately managing risk in the following areas:<sup>43</sup>

- litigation;
- changing legislation;
- contract management;
- data privacy.

It was talked about reputational risks in 2008, during the global financial crisis associated with the bankruptcy of one of the oldest and largest financial institutions, Lehman Brothers Bank. Current international problems caused by the introduction of trade restrictions and sanctions, changes in political and economic regimes, changes in the regulatory environment are the cause of many risks, among which reputational risk can be highlighted, as it is affected by a number of objective and subjective factors.

Reputational risk can be managed; there is a whole system of measures and procedures for this. It requires a special approach to the choice of ways to manage reputation, and there are very few specialists in this area. For example, if we are talking about a public company, for which business reputation can be defined as the difference between capitalization and assets, then it is possible to predict the impact of reputational factors on the markets using information disclosure and capitalization management tools. Other organizations may be treated differently. For accounting purposes, goodwill is defined as the totality of a company's intangible assets, including the brand, stable position in the market, quality of management and skill level of personnel. Business reputation,

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<sup>43</sup> Kanchu T., Kumar M.M., Risk Management In Banking Sector -An Empirical Study (2013) International Journal of Marketing, Financial Services & Management Research ISSN 2277- 3622 Vol.2, No. 2

or goodwill; (in the case of a negative meaning, the word badwill is used), can be considered, firstly, as the value of all intangible assets, and secondly, as the amount by which the value of the enterprise's business (capitalization) exceeds the market value of its tangible assets and that part of intangible assets that reflected in the balance sheet (net assets)<sup>44</sup>. When evaluating the business reputation of firms, they proceed from the second value. Goodwill occurs when a business generates stable, high profits, its return on assets (or equity) is above the industry average, resulting in the value of the business exceeding its net asset value. Goodwill as an economic value is taken on the balance sheet only at the time of the change of the owner of the enterprise<sup>45</sup>. An example is public companies whose shares are bought and sold on the exchange and over-the-counter markets. The capitalization and liquidity of such companies increase in the presence of excessive demand, while not physical assets grow, but business reputation and brand value.

The fact of reputational risk arises in result of the implementation of the reputational risk factor: the emergence of certain information, the actions of employees or third parties, as well as other events that can negatively affect the business reputation of the company.

To manage reputation, an organization should:

- formulate goals and objectives of reputational risk management;
- establish the procedure for identifying, monitoring, assessing this risk;
- identify measures to maintain an acceptable level of risk and minimize it;
- distribute the powers of the participants in the reputational risk management process.

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<sup>44</sup> Regan L. (2008). «A framework for integrating reputation risk into the enterprise risk management process». Journal of Financial Transformation, No. 22, pp. 187–194.

<sup>45</sup> Оценка деловой репутации. — <http://pro-appraisal.ru/drugie-vidyi-otsenki/otsenka-delovoy-reputatsii-goodwill>

## 2. CHAPTER II. RISK MANAGEMENT IN BANKING

### 2.1. The Process of Risk Management in banking sector

Despite the fact that risk management is one of the most relevant areas of management in commercial banks, there are no unambiguous approaches to the concept and content of risks in credit institutions in the theoretical literature. One of the debatable issues is the classification of banking risks.

The existing approaches to the classification of banking risks, formulated by scientists, regulators and commercial structures, give reason to believe that by now the banking community is not on a unified and scientifically sound position on this issue.

The fundamental point is that credit institutions<sup>46</sup> are exposed to various kinds of risks:

- general risks to which absolutely any objects operating in a given social stratum, locality, geographical area, etc. are exposed - for example, robberies or natural disasters;
- market (entrepreneurial) risks to which any entrepreneurial structure is exposed, for example, the failure of a strategy, lack of demand for a product, changes in legislation;
- banking concentration risks, to which, in particular, credit risk, credit institutions are exposed due to the specifics of their activities;
- bank initialization risks, in which the bank is a risk factor.

Risk management requires different methods and procedures: for general and market risks, typical methods for any business structure are required, for specific banking risks, special methods of risk management of credit institutions are required.

The concept of risk management tools, determining the possibility of using similar methods and risk management tools in certain cases requires, as a theoretical justification, more detailed types and varieties of risks. This task is solved in the course of risk classification: the selection of classification features and the completion of one or more risk groups that correspond to these features (Table 2.1).

**Table 2.1. Multi-criteria classification of banking risks**

<b>Classification sign</b>	<b>Types of banking risks</b>
By type of activity of credit institutions	credit risks; deposit risks; risks of settlements and payments; emission risks; investment risks; risks of currency exchange

<sup>46</sup> Банковский менеджмент: учебник / под ред. Ю.Ю. Ровенского, Ю.Ю. Русанова. – Москва: Оригинал-макет, 2016, p. 171



	operations; guarantee risks; documentary risks; savings risks; trust risks; consulting risks
By instruments and objects of banking activity	currency risks and risk-opportunities; risks and risks-opportunities for operations with securities; non-monetary banking risks (for example, risks of leasing, deposits and mortgages); risks of inadequacy of settlement and payment instruments; risks of operations with precious metals; risks of image assets; risks to the safety and functionality of premises and equipment
By the impact on the basic parameters of the activities of commercial banks	liquidity risks (liquidity loss risks, unbalanced liquidity risks); capital risks (inadequate size, structure, sufficiency, timeliness of formation and replenishment); asset quality risks; risks of income, profit, interest margin and spread (risks of an unjustified increase in interest and non-interest operating expenses; risks of a decrease in income from passive operations; risks of a decrease in income from active operations; risks of loss and impairment of assets; risks of lost profits, etc.)
In relation to the external and internal environment	risks of environmental factors, risks of internal environmental factors, risks of a complex of external and internal factors
According to the factors of the internal environment	price risks; personnel risks; banking policy risks (adequacy, feasibility, functionality); management quality risks; types of operational risk, etc.
By susceptibility to managerial influences	managed risks, limited manageability risks, unmanaged risks
By type of managerial influence	transferable risks, neutralized risks, compensated risks, minimized risks, diversifiable and other risks
According to the relationship (correlation) factor-risk	parametric (in high probability and stability, following activated risk factors); non-parametric (weakly or not at all reacting to manifestations of environmental instability and aggressive factors forming in it)

Source: Rusanova, 2016, p. 172-173

The classification feature of the risks of the “sphere of formation” is specified in the following areas:

- basic areas, areas of concentration of risk conditions. They highlight natural, man-made, technological, social, market and other types of risks identified by this sub-variant of the classification feature;

- the main areas and factors that predetermine the formation of risks (within the framework of the basic areas considered above). Here, among natural risks, such as cosmic risks (meteorite attacks, radiation, etc.), risks of the atmosphere (hurricanes, tornadoes, showers, etc.), water elements (storms, tsunamis, etc.), soil (earthquake), landscape (avalanches, landslides, etc.), fauna and flora;

- the areas of risk detection, their identification and assessment (information, information channels, indications) are considered as forming the risks themselves and as predetermining risk parameters of the grouping of factors. Of the information risks, the most significant are the risks of insufficient information, the risks of low-quality information, the risks of excessive information, the risks of inadequate (volumes, content, timing) information;

- types of activities, business areas, industries are considered as areas of formation (formation) of risks, since active risk management in a market economy, often itself specialized in a similar way, focuses primarily on these groups of risk factors. With regard to credit areas of risk management, the most important is their diversification based on the specifics of cash flows and financial concentrations formed and realized in them.<sup>47</sup>

The classification sign of risks - "their spheres of realization, manifestation, concentration" has several directions of concretization. The spheres of formation and spheres of realization of risks can practically coincide, be included in one or related groups, or form distant indirect relationships. Such relationships and their nature practically do not correlate with the strength and intensity of the manifestation of risks. The classification approach (attribute) - the areas of manifestation of risks, identifies the following groups and types of risks in risk management methods:

- risks of changes (problems) of natural conditions in specification: risks of a space threat (disturbance of the ozone layer, fall of “space debris”); atmospheric risks (“warming”, atmospheric emissions, smog, smoke, etc.); risks of water resources (depletion, pollution, etc.); risks of soil, land resources (depletion, waterlogging, salinization, sinkholes, destruction of underground utilities, etc.);

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<sup>47</sup> Zupanovic I. (2014) Sustainable Risk Management in the Banking Sector, Journal of Central Banking Theory and Practice, Vol.3 No.1, pp. 81-100

– risks of technological problems (technologies that do not meet production goals, overly complex and “demanding” technologies, technologies that are not provided with resources, technologies that are dangerous to implement, prohibited technologies, etc.);

- the risks of social problems (changes) manifest themselves in the form of excessive population growth or population decline, an increase in the number and importance of incapacitated groups (pensioners, the disabled), an increase in the importance of parasitic groups (“professional” unemployed, unemployed illegal elements, refugees, etc.), the spread criminal and semi-criminal social groups;

- the risks of inadequate markets and market losses are specified in the form of a shortage of goods both in general and for certain groups, the lack of trade organizations and their inadequate location, inconvenient work schedules, in the form of suppressed price competition, and others.

A separate area of risk classification based on areas of manifestation are regions and administrative entities - regional risks. The regional aspect is characterized, first of all, by concentrating positions, since the parameters of the region include the already considered natural conditions, and techno genic stresses, and technological problems of local industry, and social upheavals and the adequacy of the market and information infrastructure. The factors of resource provision, the nature of the environment, historical evolution, phases of ethno genesis, and others can also be of great importance for the risks of regions. When analysing regions, it is necessary to distinguish between the manifestations of risks of a general nature, risks specific to a number of regions, and risks of exclusive, sometimes very narrowly concentrated. Thus, the risks of a wide regional manifestation, when only certain exceptional regions do not experience their impact, include in various modifications the risks of resource provision, crime, technology; social risks, information infrastructures are widespread and cover a number of regions; and, finally, regional spheres of manifestation of landscape risks, techno genic risks, some natural and socio-cultural risks can be very narrowly concentrated, up to "point" ones.<sup>48</sup>

For banking risk management, it is important to classify risks according to the principle of spheres of manifestation in concretization by “stages of controlled and observable processes”. These are the risks of the preparatory stages (entry into the risk zone), the risks of the initial stages of analysis and evaluation, the risks of structuring, the risks of documentation, the risks of starting the process, the risks of implementing the process, the risks of completing the process, the risks of the result. This

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<sup>48</sup> Kanchu T., Kumar M.M., Risk Management In Banking Sector -An Empirical Study (2013) International Journal of Marketing, Financial Services & Management Research ISSN 2277- 3622 Vol.2, No. 2

classification feature is closely related to the structuring of risk, with the allocation in risk management of the factor and resultant areas of risk and the corresponding "defence in depth" schemes, which include sequentially interconnected methods and techniques of risk management, formed by the stages of controlled or observable processes.

A significant classification feature that forms groups and ratings of risks and predetermines the activity, purposefulness and intensity of risk management actions is the gradation of risks according to their "value, level". The concretization of this classification feature in risk management is carried out in several directions:

- magnitudes (cost, quantitative and other) of risks, the results of their manifestations both for risk carriers and for persons associated with them. The magnitude of risks can be expressed in the amounts of various monetary instruments, in periods of disruptions and delays in recovery processes and others, in quantitative numbers (pieces), volumetric (litres, cubic meters) and other indicators of losses, losses. This estimate also includes the amount of lost income, unfulfilled targets;

- changes under the influence of risks of individual parameters of risk carriers and related objects and subjects of risk management. For credit institutions, this may be expressed in deviations from supervisory, standard or internal (banking policy) norms and standards of such parameters as capital, assets, liabilities, reserves, trust funds, payment amounts, number of customers, branch network, personnel and others.

- the volume of "financing" of risks, that is, the amount of costs for their discovery, identification, assessment, ranking, development and implementation of strategic concepts, methodological schemes, methods and tools of risk management.

The classification of risks according to their magnitude, volume is expressed both in direct and in comparative, relative terms. Thus, a catastrophic (shock), large, medium, small, insignificant risk in the areas of banking risk management is determined by comparing the types and amounts of losses in the manifestation of risks with the costs of financing risks or with the parameters (including their dynamics) of risk carriers, and the comparison risk financing costs with the parameters of their carriers.<sup>49</sup>

In risk management, the classification of risks is also carried out based on "controllability". The ability to perceive managerial impacts graduates risks according to the degree of controllability and is specified in a number of areas, such as controllability:

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<sup>49</sup> Никонец О. Е., Родный М. П. Кредитный риск коммерческого банка: возможности управления // Научно-методический электронный журнал «Концепт». – 2016. – Т. 15. – С. 2733

- conditions and factors that form risks;
- observed and controlled processes, their characteristics;
- structure and parameters of risk carriers;
- individual elements of risks and risk management.

Classification and ranking of risks based on controllability determines the effectiveness, speed, cost-effectiveness of effective risk management. To mark the manageability of risks, various systems of their designation are used - from non-specified (easy, standard, difficult to manage and unmanageable risks) to percentages and indices.

In the course of the implementation of the classification feature “risk consequences”, the following types of risks are identified and marked:

- resource risks as problems of quantity, assortment, structure in providing management objects with financial, labour, raw materials, technical, technological and other resources;
- income risks as their quantitative shortcomings or low quality;
- for credit institutions, the risks of financial spheres are additionally allocated in the form of problems with assets, capital, liabilities, liquidity or with attraction, placement, reservation of funds;
- risks of social spheres, including internal ones as problems in personnel management, customer relations and external ones as aggressive manifestations of socio-cultural factors;
- risks of national values as harm caused by the risk carrier to national interests, which, according to "return" schemes through legislative restrictions and repression by the authorities, leads to serious internal problems in terms of resources, income, and financial results;
- image risks as a decline in reputation, attractiveness and trust in risk bearers associated with their professional incompetence, social inadequacy of the directorate, violation of partnerships and other problems.
- risks of national values as harm caused by the risk carrier to national interests, which, according to "return" schemes through legislative restrictions and repression by the authorities, leads to serious internal problems in terms of resources, income, and financial results;
- image risks as a decline in reputation, attractiveness and trust in risk bearers associated with their professional incompetence, social inadequacy of the directorate, violation of partnerships and other problems.<sup>50</sup>

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<sup>50</sup> Подходы к оценке системы управления рисками в банках (международный опыт) Т.Ю.Морозова, к.э.н., доцент кафедры «Экономика и антикризисное управление»(2007). Вестник финансовой академии при Правительстве Российской Федерации №5, (стр. 20).

The intensity of risk management efforts, the choice of one or another target strategy or a set of them, the adequacy of specifying the latter in methodological schemes, methods and tools are determined on the basis of risk classification according to the feature - “risk life cycle period”. In this classification, risks are labelled as:

- prospective risks;
- formed risks;
- current risks;
- ending risks;
- accomplished risks.

From the standpoint of the state, functionality, and sometimes up to the viability of risk management objects, risks are classified according to the “mechanism and degree of possible coverage”, that is, compensation for losses when risks occur. On this basis, risks are formed into the following groups and types:

- by areas of concentration of sources of security (coverage of losses) of risks: internal sources (reserves, penalties from the guilty, corporate liability, etc.); internal environment - partners, contractors (deposits, mortgages, fines, penalties, etc.); external sources in contractual schemes (guarantees, insurance, etc.); external sources outside contractual schemes (securitization, derivatives, budget subsidies and other transfers, financial assistance from specialized public organizations, and others);

– according to the mechanism of coverage, risks are identified that cannot be covered; risks of accidental loss coverage (compensation); risks, compensation for losses of which is difficult to form (securitization); risks of standard security (pledges, guarantees, guarantees); compulsory security risks (compulsory insurance);

- according to the time adequacy of coverage, risks are marked as risks of preliminary coverage (mortgages); risks of timely coverage (factoring, guarantees, warranties); risks of deferred coverage within a manageable timeframe (collaterals, insurances, etc.); risks of long-term deferred coverage (returns of lost loans, accidental confiscations);

- according to the degree of coverage, risks are defined as uncovered (unsecured); partially covered; fully covered without taking into account the time value of money; over-covered risks (collateralized credit risks with low loan margins).<sup>51</sup>

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<sup>51</sup> “ВСК снова лидер банкострахования”. (2012). Корпоративный журнал “Формула успеха”, No 02 (36). с. 10-13.

In risk management, such a classification feature of risks as “the nature of an interconnected manifestation with other risks” is considered. On this basis, risks are classified as:

- individual (separate, independent, independent);
- risks of accidental contacts;
- risks of standard contacts;
- risks of partial configurations;
- risks of wide configurations;
- risks of complete sets.

## **2.2. Credit Risk Management in Banking**

Credit risk management consists of several phases. First, the cost of borrowing money is determined, the principles for working with the loan portfolio are formulated, and the main provisions of the credit policy are determined. The next step is to monitor your creditworthiness and to do a thorough analysis and work with problem debtors. In the final phase, the effectiveness of the work performed is analysed.

### **2.2.1. Principles for the Assessment of Banks' Management of Credit Risk**

A credit risk rating is the maximum amount a bank can tolerate over a period of time with a pre-calculated probability. One of the most common causes of losses is a decrease in the value of a loan portfolio that occurs in result of a total or partial loss of the creditworthiness of many borrowers.

The concept of quality appraisal involves gathering the most accurate information about the borrowers. Also, based on the data obtained, the financial stability of the potential client, collateral liquidity, business activity and other similar indicators are analysed.

A credit institution's credit risk is recorded for individual loans as well as for the entire credit portfolio. In the latter case, the term total credit risk is used. The creditor organizations draw up a credit policy to limit possible losses. The document contains improved regulations for the organization of activities, as well as a number of control measures for the loan process.<sup>52</sup>

A balanced credit portfolio is considered the least risky. It includes stable, high-yield loans that cover loans with a high probability of default.

The essence of credit risk methods is their consistent use as steps in the lending process. At each stage, a specific group of employees of a credit institution is assigned tasks aimed at minimizing

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<sup>52</sup> Потапова, Е.В., Житникова, Е.А., Александрова, Е.Ю. (2011). Оптимизация валютных рисков на предприятиях внешнеэкономической торговли. Научные записки ОрелГИЭТ, 1, с. 318

potential credit risks. In this context, a set of sequential methods is considered as a risk management algorithm related to a specific loan:

- Analysis of the level of creditworthiness of potential borrowers.
- Credit assessment and analysis.
- Loan structuring.
- Loan processing.
- Control over the issued loan and collateral.

### **2.3. Credit Risk Management Policy and Procedures Tips for Banks**

Every transaction that issues a loan carries the risk of a credit bank. For this reason, multi-level credit risk management systems are primarily aimed at reducing the default of borrowed funds completely or partially. The process is done in several steps:

- Determination of the borrower's credit rating and the level of its solvency.
- Diversification of bank clients by groups, income level, etc.
- Loan insurance.
- Formation of reserve funds to cover losses.
- Organization of the work of the creditor company, aimed at minimizing credit risks.

Interest-bearing credit risk of the borrower occurs more often than others. This is explained by the fact that the income of each individual bank client is not tied to the size of the established interest rate on the loan. If the interest rate rises, the amount of monthly payments often reaches critical levels and makes up the bulk of the borrower's income. Currency risks associated with a sharp devaluation of national currencies are similar. Due to the high volatility of currency rates, borrowers usually miss the opportunity to pay off their loans early. A similar situation often occurs with mortgages.<sup>53</sup>

Commercial credit risk for an entrepreneur is the potential loss during economic activity that leads to non-repayment of the loan amount in whole or in part. A similar risk to the lender is the reduction in the level of income on which the bank or other organizations rely. Commercial credit risk of financial institutions is also considered an unexpected increase in the cost of repaying or amortizing loans. For both parties, commercial credit risk undermines the expected return.

One of the main sources of credit risk is the uncertainty of the lender about the creditworthiness and commitment of the borrower. Non-compliance with the terms and exceeding the terms of the loan agreement is possible in the following cases:

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<sup>53</sup> Soltanizadeh, Sara, Siti Zaleha Abdul Rasid, Nargess Mottaghi Golshan, and Wan Khairuzzaman Wan Ismail. 2016. Business strategy, enterprise risk management and organizational performance. *Management Research Review* 39: 1016–33.



- The debtor is unable to generate the required amount of cash flow. This happens due to an unfortunate set of circumstances, as well as for economic and political reasons.
- The lender is not sure about the objectivity of the valuation and liquidity of the collateral.
- The borrower's business suffers losses due to common business risks.

The most common types of credit risks:

- Geographic risks - associated with the issuance of loans in a particular region or country.
- Political risks - provoked by the unstable political situation in the state, a high level of corruption in the government, reduce the solvency of borrowers.
- Macroeconomic risks are associated with a slowdown in the development of the state economy, a fall in GDP, and a slowdown in the growth of certain sectors of the national economy.

There are also inflationary, sectorial, legislative and risks of changes in the discount rate.

### **2.3.1. Partner with Outsourced Risk Management Team**

Outsourcing is primarily a management tool. Wrong goal setting always leads to deceived expectations and customer dissatisfaction. The goals and objectives of using an external provider can be different. The main thing is to avoid substitution of concepts and fix them correctly. To do this, a working group can be created within the customer's company. When the cost of the contract is more than significant and the client is thinking about transferring the entire IT infrastructure to an outsourcer, it makes sense to involve external consultants.<sup>54</sup>

After the main goals are identified, it is necessary to calculate possible additional costs and risks. Risks for the customer can be of varying complexity, we will consider only the most significant ones.

The most serious risk is the collapse of the supplier company. To avoid unpleasant consequences, you must first thoroughly study your future service provider. It should be a fairly large company with a positive experience of previous or existing contracts. Processes within the outsourcing company must be transparent. You should also make sure that the company has sufficient funds and staff to provide full service to all customers, and also that the outsourcer has strong security policies in place, and that this security system has been verified by a third party. It would not be superfluous

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<sup>54</sup> Ojeka, Stephen A., Alex Adegboye, Kofo Adegboye, Oluwaseyi Alabi, Mosinmileoluwa Afolabi, and Francis Iyoha. 2019. Chief financial officer roles and enterprise risk management: An empirical based study. *Heliyon* 5: 1–10.

to make inquiries about the supplier through his regular customers and customers who, for some reason, stopped cooperating.

Other problems may be associated with the risk of disruptions in service; this may occur, for example, due to the introduction of new technologies or management practices by the outsourcer. In order to prevent such problems, ways to eliminate possible risks should be discussed even before the signing of the contract.

Another important point is providing access to information for those managers who remain in your company. It is necessary to discuss with the outsourcer how the company's employees will receive complete information about the processes. This is also necessary so that the company's employees do not lose their knowledge and skills. Loss of knowledge most often occurs during system upgrades, when the process is controlled exclusively by the outsourcing company.

There is a good preventive measure to deal with risks - the client should certainly include a clause in the outsourcing contract that would provide for the customer's actions upon termination of the contract. This solution will allow the company to easily return to normal operation after the termination of the agreement with the outsourcer, in addition, there will be no disputes regarding the return of employees and equipment to their original owner.<sup>55</sup>

In order to transfer the management of the IT infrastructure to an external provider, the customer company must carry out serious work to identify its true state. To prevent problems as much as possible in the future, the company should assess its current state as adequately as possible and fix it, describe the IT infrastructure, and also allow the outsourcer to conduct a full IT audit.

In Western practice, a certain term is used for the preliminary verification process - due diligence (Due Diligence - ensuring due diligence). It implies the conclusion of a short-term agreement with the outsourcer, according to which he undertakes to conduct a full check of the state of the client's IT environment, for which he will then have to be responsible. In addition, this practice makes it possible to understand whether both parties use the same comparative methods, which is a vital part of cooperation and obtaining the planned results.

### **2.3.2. Origination/Acquisition Standards for Loans and Investments**

A long-term mortgage loan is a loan or a loan granted for a period of 3 years or more, respectively, by a bank (credit institution) or a legal entity (non-credit institution) to an individual

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<sup>55</sup> Liu, Xin. 2019. The Role of Enterprise Risk Management in Sustainable Decision-Making: A Cross-Cultural Comparison. Sustainability 11: 2939.

(citizen) for the purchase of housing secured by the housing being purchased in as security for the obligation.

The main participants in the long-term mortgage lending market are:

1) borrowers - individuals, citizens of Azerbaijan Republic who have entered into loan agreements with banks (credit organizations) or loan agreements with legal entities (non-credit organizations), under the terms of which the funds received in the form of a loan are used to purchase housing. The pledge of the acquired housing (mortgage) serves as security for the fulfilment of obligations under the agreements;

2) home sellers - individuals and legal entities selling residential premises owned by them or belonging to other individuals and legal entities, on their behalf;

3) creditors - banks (credit organizations) and other legal entities that provide mortgage credits (loans) to borrowers in the manner prescribed by law.

The main functions of the lender are:

- granting a mortgage loan based on an assessment of the solvency and creditworthiness of the borrower in accordance with the requirements and conditions of lending;
- drawing up a loan agreement (loan agreement) and a mortgage agreement;
- maintenance of issued mortgage loans.

Under a housing mortgage agreement, the creditor becomes a pledgee, which gives him the opportunity, in case of default by the borrower of obligations under the loan agreement, to receive satisfaction of his monetary claims against the debtor from the value of the mortgaged residential premises preferentially over other creditors of the pledger;<sup>56</sup>

4) operators of the secondary market of mortgage loans (agencies for housing mortgage lending) - specialized organizations that refinance creditors that issue long-term mortgage loans to the population.

The main functions of secondary market operators include:

- refinancing of creditors on the basis of established standards and requirements for mortgage lending procedures;
- issuance of emissive mortgage-backed securities;
- attracting funds from investors in the field of housing lending;

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<sup>56</sup> Huang, Min, Fu-Qiang Lu, Wai-Ki Ching, and Tak Kuen Siu. 2011. A distributed decision making model for risk management of virtual enterprise. *Expert Systems with Applications* 38: 13208–15

- assisting lenders in implementing sound mortgage lending practices and developing types of mortgage loans that are more accessible to borrowers and less risky for lenders;

5) bodies for state registration of rights to real estate and transactions with it - state bodies that ensure state registration of rights to real estate and transactions with it.

The main functions of these bodies are:

- registration of transactions of purchase and sale of residential premises, registration of the transfer of ownership rights to a new owner;
  - registration of mortgage agreements and mortgage rights;
  - storage and provision of information on ownership rights and encumbrance of housing mortgage to all participants of the mortgage market;
- 6) insurance companies - insurance companies licensed to carry out property insurance (insurance of mortgaged housing), personal insurance of borrowers and civil liability insurance of mortgage market participants;
- 7) appraisers - legal entities and individuals who have the right to carry out a professional assessment of residential premises that are the subject of collateral for mortgage lending;
- 8) real estate firms - legal entities that are professional intermediaries in the market for the purchase and sale of housing. The functions of realtors include selecting options for the purchase and sale of housing for borrowers and sellers of housing, assistance in concluding purchase and sale transactions, organizing the sale of housing on behalf of other participants in the housing market, participating in organizing auctions for the sale of housing foreclosed;
- 9) investors - legal entities and individuals who purchase securities secured by mortgage loans, issued by creditors or secondary market operators. These include pension funds, insurance companies, investment banks, mutual funds, etc;
- 10) infrastructure links of the mortgage lending system - notaries, passport services, guardianship and guardianship authorities, legal advice, etc., providing the necessary legal support for transactions with residential premises, registration of citizens at the place of residence (including mortgaged apartments and houses) , protection of the rights of minors when concluding real estate transactions.<sup>57</sup>

The state is called upon to play a special role, especially at the initial stage of creating a system of long-term mortgage lending to the population.

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<sup>57</sup> Farrell, Mark, and Ronan Gallagher. 2019. Moderating influences on the ERM maturity-performance relationship. *Research in International Business and Finance* 47: 616–28.

The state determines the development concept of the mortgage lending system and forms the legal framework for the reliable and efficient functioning of the mortgage lending system, creates a mechanism for social protection of borrowers, pursues a tax policy that stimulates mortgage lending market participants, creates the necessary institutions for organizing the market and participates in managing them.

Currently, long-term housing loans to the population are provided by universal commercial banks. The expansion of these operations, the growth of the market will inevitably lead to the creation of specialized credit organizations, limited to the activity of mortgage lending to the population. Creation of credit organizations such as "mortgage banks", "savings and loan associations", "construction savings banks" will improve the professionalism and quality of services offered to the population by banks and credit organizations. Their creation and work in the field of lending to the population will largely be determined by the adequate development of banking legislation and the creation of the necessary regulatory framework that regulates their activities.<sup>58</sup>

In addition to commercial banks, other organizations that are currently being created in accordance with civil law, including as creditors (funds for the support and development of housing construction, credit unions, etc.) can play a certain role in the formation of additional effective demand for housing. These organizations, at the expense of their own and borrowed funds, provide loans to the population for the construction and purchase of finished housing within the framework of the created share capitals or funds. They are not credit institutions and do not require a license from the Central Bank to carry out mortgage lending activities. The activities of non-credit organizations providing mortgage loans are currently not subject to the control of state bodies. The issuance of equity mortgage-backed securities by them can be carried out only if strict state control over their activities is established at the legislative level and a special mechanism is developed to protect the rights and interests of investors (citizens).

All participants in the market of mortgage housing loans, to one degree or another are already operating in the market today. The challenge is to ensure that they are interested in effective interaction in order to expand the opportunities provided to the population to improve their living conditions.

#### **2.4. Portfolio Theory and Traditional method to Credit risk management**

The main directions of risk management of the credit portfolio is the development and implementation of measures to prevent or minimize the losses associated with it. This involves the

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<sup>58</sup> Cohen, Jeffrey, Ganesh Krishnamoorthy, and Arnold Wright. 2017. Enterprise risk management and the financial reporting process: The experiences of audit committee members, CFOs, and external auditors. *Contemporary Accounting Research* 34: 1178–209.

creation by each bank of its own credit risk management strategy, that is, the basis of decision-making policy in such a way as to timely and consistently use all the opportunities for the development of the bank and at the same time keep risks at an acceptable and manageable level.<sup>59</sup>

Banking practice has developed certain methods for managing the risk of the bank's credit portfolio. These methods include diversification, limiting, and reservation.

Diversification is the process of allocating capital between different investment objects that are not directly related to each other. It is the most reasonable and relatively less expensive way to reduce the degree of credit risk. It is used to neutralize the negative consequences of non-systematic (specific) types of risks, and also allows minimizing to a certain extent certain types of systematic risks - currency, interest and some others. The operating principle of diversification is based on the division of risks in order to prevent their concentration.<sup>60</sup> The diversification method consists in dispersing the credit portfolio among a wide range of borrowers that are not related to each other, which may differ from each other in various characteristics such as the amount of capital, form of ownership, operating conditions, industry, etc., and is aimed at reducing his credit risk. Usually diversification of the loan portfolio is carried out in conjunction with limiting based on the establishment of a credit limit differentiated by groups of buyers.

Credit diversification can be carried out as part of the overall diversification of banking assets. In this case, the size of loans (the total size of the supply of loans) can not only increase, but, on the contrary, decrease. The bank is often forced to do this by the economic situation itself, which leads to an aggravation of contradictions in economic relations and, as a result, to an increase in the risk of credit transactions. This is especially noticeable in a crisis, when banks, due to increased credit risk, reduce the volume of lending operations and expand the volume of those assets that allow keeping the profitability of banking activities at an acceptable level. The diversification method should be applied carefully, relying on statistical analysis and forecasting, taking into account the capabilities of the bank itself and, above all, the level of staff training. Diversification requires professional management and deep market knowledge. That is why excessive diversification leads not to a decrease, but to an increase in credit risk.<sup>61</sup>

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<sup>59</sup> Sinki J.F.–Jr. Financial management in commercial banks, 2010, p.832

<sup>60</sup> Голубев А.П. Аспекты управления отраслевой диверсификацией кредитного портфеля и показателями концентрации // Управление финансовыми рисками. 2010. №3

<sup>61</sup> Ачкасов А.И. Активные операции коммерческих банков. М.: Консал-банкир, 2016. 173 с.

When forming a credit portfolio, bank experts should avoid excessive diversification and concentration. The task of determining the optimal ratio between these methods can be solved by setting credit and reservation limits.

Limitation can be divided into two directions. The first direction involves compliance with the standards set by the Central Bank, i.e. external limits; the second is based on the creation of a system of intra-bank restrictions (internal limits) and the fulfilment of their requirements. These directions differ not only in the subjects of rationing, but also in the functions of the subjects and the stages of their implementation.<sup>62</sup> When setting internal limits, banks are guided by the selected rationing criteria. The Bank sets limits on the types of credit risk allocated to it. Of the variety of internal limits, the most significant are<sup>63</sup>:

- credit portfolio limit,
- sectorial limits,
- regional restrictions,
- limits on loan quality categories.

It is recommended to set limits on a top-down basis, from general (aggregate) to private (individual). Loan portfolio limit - the maximum possible loss on the assessed risk, as a percentage of equity and in absolute terms. It can be calculated as the sum of the assets in the portfolio, weighted by the level of risk<sup>64</sup>. Important integral indicators of the quality and riskiness of the loan portfolio are the share of non-performing loans and the share of reserves for possible losses on loans (hereinafter referred to as RPLL) in the loan portfolio. For example, in accordance with the international practice of banking supervision, a high credit risk is indicated by the share of non-performing (problem and bad) loans exceeding 10% of the total loan portfolio<sup>65</sup>.

For sectorial segments of the loan portfolio, it is advisable to set limits on growth rates as a percentage. The size of the growth limit should be determined taking into account the share of non-performing loans in the industry segment<sup>66</sup>. The limit by category of loan quality allows you to control the degree of risk taken by the bank and the amount of RPLL. Limitation of individual credit risk is determined by the credit limit. Portfolio theory, after making a number of changes to it, is quite

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<sup>62</sup> Жуков Е.Ф. Банки и банковские операции. М.: ЮНИТИ, 2010. 247 с

<sup>63</sup> Балабанова И.Т. Банки и банковское дело: учеб. пособие. СПб.: Питер, 2012. 304 с.

<sup>64</sup> Дубенецкий Я. Н. Проблемы финансовой устойчивости банков в современных условиях: учебник. М.: ЮНИТИ, 2008. 303 с

<sup>65</sup> Лаврушин О.И. Банковские риски, М., КноРус, 2012. 232 с

<sup>66</sup> Балакина Р.Т. Кредитная политика коммерческого банка: учебно-практическое пособие. Омск: Изд-во Ом.гос. ун-та. 2009. 120 с.

acceptable for working with bank portfolios. In addition, it should be emphasized that the implementation of the portfolio concept in banking practice will minimize inevitable losses in the face of negative economic dynamics.



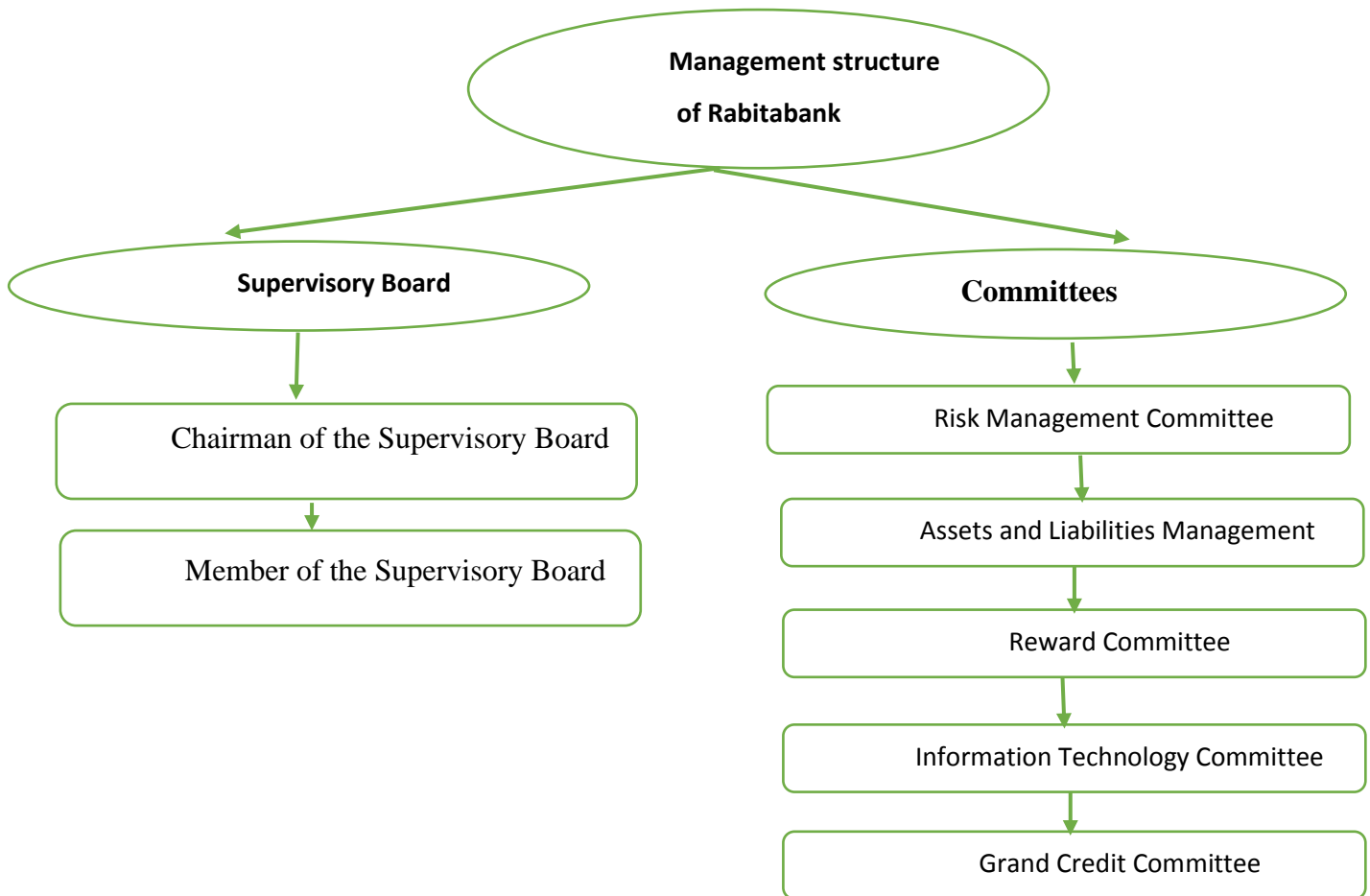
### 3. CHAPTER III. MEASURING RISK MANAGEMENT IN BANKING SECTOR IN AZERBAIJAN: CASE STUDY

#### 3.1. Efficiency of risk management in banking in Azerbaijan (on the examples of Rabitabank)

Rabitabank was established in 1993 as an open joint stock company in accordance with the laws of the Republic of Azerbaijan. The supreme governing body of the bank is the general meeting of shareholders convened for annual or extraordinary meetings. The general meeting of shareholders makes strategic decisions on the Bank's operations.

Management structure is presented in the diagram 3.1 below.

**Diagram 3.1. Management structure of Rabitabank**



Source: own study based on the information obtained from Rabitabank's official webpage

#### **Risk Management Committee:**

Forecasting the risks that may be encountered during the Bank's activity, determining their probable extent and consequences, developing and implementing appropriate measures to prevent and minimize the risks (losses) that may arise in connection with the risks.

**Assets and Liabilities Management Committee:**

Develop and implement appropriate measures (plans) to prevent and minimize interest rate risk, market risk, as well as possible costs (losses) associated with the management of liquidity gap (GAP) and open currency position limits during the Bank's operation.

**Reward Committee:**

The main purpose of the reward committee is to formulate the bank's reward policy, monitor the reward process, evaluate the effectiveness of the reward system in accordance with the law and, if necessary, make proposals to the Supervisory Board to improve it.

**Information Technology Committee:**

To improve the bank's management systems and organizational relations, and to organize control over computer systems and processes in information technology.

**Grand Credit Committee:**

Defining credit policy, discussing loan portfolio diversification, credit limits, lending decision-making powers, making decisions on bank guarantees and project financing, as well as making decisions on changing or restructuring loan terms.

The general meeting of shareholders elects the Supervisory Board. The Supervisory Board has general management powers over the Bank's operations. The legislation of Azerbaijan and the Charter of the Company, exclusively, determine the list of decisions approved by the General Meeting of Shareholders and the Supervisory Board.

The general activities of the Bank are managed by the collective executive body of the Bank. The general meeting of shareholders elects the Management Board. The executive body of the Bank is responsible for the implementation of the decisions made by the General Meeting of Shareholders and the Supervisory Board of the Bank. The Bank's executive body reports to the Bank's Supervisory Board and the General Meeting of Shareholders.

Risk management is the basis of banking and is a key element of banking operations. The main risks faced by the bank are related to market risk, credit risk and liquidity risk.

The Supervisory Board and the Management Board are responsible for the development, implementation and maintenance of internal control systems in the Bank in accordance with the scope and nature of operations.

The purpose of internal control systems is to ensure:

- Accurate and comprehensive risk assessment and management;
- Proper business, accounting and financial reporting functions, including proper approval, processing and recording of transactions;
- Completeness, accuracy and timeliness of accounting records, management information, normative reports;
- Reliability of IT systems, integrity and protection of data and systems;
- Elimination of fraudulent or illegal actions, including misappropriation of assets;
- Compliance with the requirements of laws and regulations.

Management is responsible for identifying and assessing risks, establishing control systems and verifying their effectiveness. Management monitors the effectiveness of the Bank's internal control systems and regularly applies additional control systems or, if necessary, makes adjustments to existing control systems.

Risk management is the basis of banking and is a key element of banking operations. The main risks faced by the Bank are related to market risk, credit risk, liquidity risk and operational, legal and reputation risks. Risk management policies aim to identify, analyse and manage the risks faced by the Bank, establish appropriate risk limits and controls, continuously monitor the level of risk and comply with the restrictions. Risk management policies and procedures are reviewed regularly to reflect changes in market conditions, the products and services offered, and emerging best practices. The Supervisory Board is responsible for oversight of risk management, oversight of key risk management, risk management policies, as well as substantial approval of major expenditures.

The Management Board is responsible for monitoring and implementing risk mitigation measures and ensuring the Bank's operations within the established risk parameters. The Chairman of the Risk Management Department is generally responsible for ensuring that the general principles and methods for risk management and compliance, identification, measurement, management and reporting of financial and non-financial risks are implemented. He reports directly to the Deputy Chairman of the Board. The Bank's Management Board is responsible for overseeing the Bank's compliance with the risk limits and capital adequacy ratios set by the ARMB. In order to monitor the effectiveness of the Bank's risk management procedures and their consistent application, the Bank's Management Board periodically receives reports prepared by the Internal Audit Function and the Risk Department, discusses the content of these reports and reviews the proposed remedial measures. Both portfolio and operational-level credit, market and liquidity risks are managed and controlled through

the Credit Committee and the Assets and Liabilities Management Committee (APIC). Both external and internal risk factors are identified, managed and regulated at all levels and areas of the organization. Particular attention is paid to determining the full range of risk factors and the level of provision of current risk management procedures. In addition to standard analysis of credit and market risks, the Risk Management Department monitors financial and non-financial risks by conducting periodic meetings with operational departments and obtaining expert opinions on their areas of expertise.

### **Market risk at Rabitabank**

Market risk is the risk that the fair value of a financial instrument or future cash flows will fluctuate due to changes in market prices. Market risk includes currency risk, interest rate risk and other price risks. Market risk arises from open positions in interest rates and equity financial instruments that are affected by general and specific changes in market prices and foreign exchange rates and changes in the level of variability in market prices. Market risk management serves the purpose of managing and regulating market risks within certain parameters and at the same time optimizing the ratio of profitability to risks. The general authority for market risks belongs to APIC, chaired by the Chairman of the Management Board. Market risk limits are approved by APIC in accordance with the recommendations of the Risk Management Department. The Bank regulates market risk by setting open position limits in relation to financial instruments, interest rate maturities, currency positions and loss limits. The Supervisory Board conducts regular monitoring and inspections of these indicators.

### **Interest rate risk at Rabitabank**

Interest rate risk is the risk that changes in the fair value of a financial instrument or future cash flows will result from changes in market interest rates. The Bank is affected by changes in market interest rates and its financial condition and cash flows. Interest margins can increase as a result of such changes, but at the same time, they can decrease or lead to losses in the event of unexpected changes.

#### ***Analysis of interest rate differences.***

Interest rate risk is mainly regulated by controlling the differences between interest rates. The following table 3.1 presents the differences between interest rates on major financial instruments:

**Table 3.1. Differences on interest rates on major financial instruments at Rabitabank, 2020-2021**

<b>December 31, 2021</b>	<b>Less than a month</b>	<b>1 – 3 months</b>	<b>3 – 12 months</b>	<b>1 – 5 years</b>	<b>More than 5 years</b>	<b>Interest free</b>	<b>The residual value</b>
<b>FINANCIAL ASSETS</b>							
Cash and cash equivalents	28,492	-	-	-	-	390,727	419,219
Funds to be received from banks and other financial institutions	5,938	-	10,780	3,150	-	-	19,868
Investment securities	-	6,176	35,805	35,626	1,856	402	79,865
Loans to customers	27,330	31,577	123,415	169,652	93,265	-	445,239
Other financial assets	-	-	-	-	-	25,389	25,389
<b>Total financial assets</b>	<b>61,760</b>	<b>37,753</b>	<b>170,000</b>	<b>208,428</b>	<b>95,121</b>	<b>416,518</b>	<b>989,580</b>
<b>FINANCIAL LIABILITIES</b>							
Bank deposits and balances	-	1	3,128	7,412	-	1,651	12,192
Current accounts and customer deposits	7,485	14,552	108,830	58,572	4,662	530,078	724,179
Subordinated debts	112	-	-	5,950	-	-	6,062
Other borrowed funds	430	8	575	51,884	93,919	-	146,816
Lease obligation	92	184	823	1,412	202	-	2,713
Other financial liabilities	-	-	-	-	-	7,764	7,764
<b>Total financial liabilities</b>	<b>8,119</b>	<b>14,745</b>	<b>113,356</b>	<b>125,230</b>	<b>98,783</b>	<b>539,493</b>	<b>899,726</b>
<b>Liquidity gap</b>	<b>53,641</b>	<b>23,008</b>	<b>56,644</b>	<b>83,198</b>	<b>(3,662)</b>	<b>(122,975)</b>	<b>89,854</b>
<b>December 31, 2020</b>	<b>Less than a month</b>	<b>1 – 3 months</b>	<b>3 – 12 months</b>	<b>1 – 5 years</b>	<b>More than 5 years</b>	<b>Interest free</b>	<b>The residual value</b>
<b>FINANCIAL ASSETS</b>							
Cash and cash equivalents	55,604	-	-	-	-	237,359	292,963
Funds to be received from banks and other financial institutions	31,446	10,874	199	1,252	-	-	43,771
Investment securities	-	11,198	26,844	10,994	-	402	49,438
Loans to customers	32,298	41,267	125,357	142,450	50,959	-	392,331
Other financial assets	-	-	-	-	-	11,527	11,527
<b>Total financial assets</b>	<b>119,348</b>	<b>63,339</b>	<b>152,400</b>	<b>154,696</b>	<b>50,959</b>	<b>249,288</b>	<b>790,030</b>
<b>FINANCIAL LIABILITIES</b>							

Bank deposits and balances	-	6,800	-	10,540	-	1,179	18,519
Current accounts and customer deposits	16,377	26,150	124,257	16,710	4,397	358,063	545,954
Subordinated debts	4,758	-	-	15,618	-	-	20,376
Other borrowed funds	399	20	2,639	62,932	62,532	-	128,522
Lease obligation	86	172	771	1,405	370	-	2,804
Other financial liabilities	-	-	-	-	-	7,117	7,117
<b>Total financial liabilities</b>	<b>21,620</b>	<b>33,142</b>	<b>127,667</b>	<b>107,205</b>	<b>67,299</b>	<b>366,359</b>	<b>723,292</b>
<b>Liquidity gap</b>	<b>97,728</b>	<b>30,197</b>	<b>24,733</b>	<b>47,491</b>	<b>(16,340)</b>	<b>(117,071)</b>	<b>66,738</b>

Source: [www.rabitabank.com](http://www.rabitabank.com)

Differences between interest rates are mainly eliminated by refinancing interest-bearing liabilities with maturities of the same or lower interest rates that expire on the relevant maturity date.

#### *Average effective interest rates*

Table 3.2 below presents the average effective interest rates on interest-bearing assets and liabilities for December 31, 2021 and 2020. These interest rates are an estimate of the ratio of profitability levels to the maturity of those assets and liabilities.

**Table 3.2. Average effective interest rates on interest-bearing assets and liabilities for 2020-2021 (Rabitabak)**

Interest-bearing assets	2020			2021		
	Average effective interest rate, %			Average effective interest rate, %		
	AZN	USD	EURO	AZN	USD	EURO
Cash and cash equivalents	5.15%	-	-	5.85%	3.61%	-
Funds to be received from banks and other financial institutions	4.92%	0.88%	-	10.79%	2.01%	-
Investment securities	6.54%	5.01%	1.75%	9.33%	5.19%	3.15%
Loans to customers	12.86%	4.09%	4.93%	12.80%	4.38%	5.41%
Interest-bearing liabilities	AZN	USD	EURO	AZN	USD	EURO
Bank deposits and balances	9.67%	7.46%	-	-	3.00%	-
Current accounts and customer deposits	9.37%	0.99%	0.45%	8.76%	0.94%	0.38%
Other borrowed funds	2.47%	-	-	2.25%	-	-
Lease obligation	10.00%	-	-	10.00%	-	-
Subordinated debts	-	7.50%	-	-	3.26%	-

Source: [www.rabitabank.com](http://www.rabitabank.com)

## **Credit risk**

Credit risk is the risk that the Bank will incur a financial loss if the customer or the counterparty of the financial instrument fails to meet its obligations under the contract. The Bank has policies and procedures for managing credit risk (both for registered financial assets and for unregistered contractual obligations); including rules for limiting portfolio accumulation and rules for establishing a Credit Committee that actively monitors credit risk. Credit policy is reviewed and approved by the Management Board.

Rabitabank's credit policy defines the following:

- procedures for reviewing and approving loan applications;
- methodology for assessing the creditworthiness of borrowers (corporate and individual);
- methodology for assessing the creditworthiness of contractors, issuers and insurance companies;
- Collateral assessment methodology;
- loan documentation requirements;
- Procedures for regular monitoring of loans and other credit risks.

Corporate loan applications are written by the relevant customer management and then forwarded to the Credit Department responsible for the corporate loan portfolio. The analysis of reports is based on a structured analysis that takes into account the client's business and financial performance. The loan application and report are reviewed independently by the Risk Department and a second opinion is issued to confirm compliance with the credit policy requirements. Considers loan applications submitted by the Credit Committee, the Credit Department and the Risk Department. Individual transactions are also reviewed by the Legal, Accounting and Tax Departments, depending on the final approval of the probable Credit Committee and the specific risks.

Rabitabank constantly monitors the performance of individual credit risks and regularly redefines customers' solvency. The review is based on the client's latest financial statements and other information provided by the borrower or obtained by the Bank. Individual loan applications are reviewed by the Individual Credit Department. In addition to individual customer analysis, the loan portfolio is determined by the Risk Department according to credit concentration and market risks. In addition to the analysis of an individual customer, the loan portfolio is assessed by the Risk Department in terms of credit concentration and market risks. The maximum level of credit risk is usually reflected in the statement of financial position in the residual value of financial assets and the amount of unaccounted contractual liabilities. The effect of a possible mutual offset of assets and

liabilities to reduce potential credit risk is not significant. Table 3.3 below presents the maximum credit risk associated with financial assets at the reporting date.

**Table 3.3. Maximum credit risk at Rabitabank associated with financial assets for the reporting period of 2020-2021**

ASSETS	31 December 2021	31 December 2020
Cash and cash equivalents	368,432	254,087
Funds to be received from banks and other financial institutions	19,868	43,771
Investment securities (excluding capital securities)	79,463	49,036
Loans to customers	445,239	392,331
Other financial assets	25,389	11,527
<b>Total maximum credit risk</b>	<b>938,391</b>	<b>750,752</b>

Source: [www.rabitabank.com](http://www.rabitabank.com)

In determining whether the risk of default on a financial instrument increases significantly after initial recognition, Rabitabank considers reasonable and supportive information that does not require additional costs or effort. This includes quantitative and qualitative information, Rabitabank's past experience, credit-based analysis and forward-looking information.

The purpose of the assessment is to determine whether there has been a significant increase in credit risk by comparing the following:

- probability of default for the period remaining on the reporting date; and
- the probability of default determined at the time of initial recognition of the amount exposed to credit risk and calculated for the period remaining to the present date (adjusted for changes in expectations for early repayment).

Rabitabank uses three criteria to determine whether there is a significant increase in credit risk:

- quantitative test based on changes in the probability of default;
- quality indicators; and
- 30 days delay after payment date.

Rabitabank assigns each amount of risk to the level of credit risk based on various information and past credit experience that is an indicator of default risk. Credit risk levels are determined using quantitative and qualitative factors that are indicators of default risk. These factors vary depending on the nature of the amount at risk and the type of borrower.



Credit risk levels are a key factor in determining the time structure of the probability of default of the amounts exposed to risk. Rabitabank collects payment and default information on credit risk based on jurisdiction, region, type of service and borrower, as well as credit risk level. Some portfolios also use information purchased from a credit bureau. Rabitabank uses statistical models to analyse the information collected and calculates the probability of default for the remaining period of exposure to credit risk and how they are expected to change over time.

### **Operational risk**

Operational risk is the risk of direct and indirect losses arising from a number of factors related to the Bank's processes, staff, technology and infrastructure, as well as factors other than credit, market and liquidity risks, such as legal and regulatory requirements and generally accepted corporate standards of conduct. Operational risks arise from all operations of the Bank.

Rabitabank's goal is to prevent any financial loss or damage to the Bank's reputation through operational risk management, economic efficiency and innovation. In all cases, Rabitabank's policy requires compliance with applicable legal and regulatory requirements. Rabitabank manages operational risk by establishing internal control systems that management deems necessary in all areas of its operations.

### **3.2. Risk management in e-banking in Azerbaijan: Survey**

Banks should be insured against criminal risks. It was founded by Lloyds of London. This insurance institution is still the world leader in this type of insurance. They developed the Bankers Blanket Bond (BBB) insurance policy and launched it on the world market. 95% of banks and other financial institutions around the world have a BBB policy. The BBB (comprehensive criminal risk insurance of banks) police, being an integral and mandatory attribute of banking security and reliability, significantly enhances the bank's reputation in the eyes of customers and partners. Every bank currently operating in the United States with individual deposits must have a BBB policy at the request of the Deposit Insurance Corporation.<sup>67</sup>

The lack of loyalty of the bank's staff is the basis of the BBB police guarantee. The police cover up the bank for illegal, fraudulent actions committed by bank employees in groups or alone in order to damage the bank or gain financial benefits. Another component of the BBB policy is to cover the damage caused to banks by transactions with counterfeit checks, currencies, promissory notes and securities. Falsification of documents can cause great damage to the bank. BBB police also cover this

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<sup>67</sup> Blanco-Mesa, Fabio, Julieth Rivera-Rubiano, Xiomara Patino-Hernandez, and Maribel Martinez-Montana. 2019. The importance of enterprise risk management in large companies. *Technological and Economic Development of Economy* 25: 600–33

damage. Police theft, vandalism, etc. also insures against damage or destruction of office supplies in result of bad deeds.

The main directions of crimes against banks in modern times are electronic and computer systems of banks. As we know, in the context of global information, electronic systems, despite the long distances between banks and customers, allow customers to directly manage their bank accounts, transfer funds, debit, electronic clearing, etc. allows operations to be performed. Damage to banks in crimes in this area is several times greater than in traditional crimes. It should be noted that the volume of bank payments using electronic money transfer systems is billions of dollars per day.

The need for insurance coverage for such losses dates back to the 1980s. In response, an insurance case called Electronic @ Computer Crime Policy (ECC) was prepared and launched. This insurance policy is listed as a supplement to the BBB policy and is not issued separately. ECC police compensate banks for damage caused by hacking of information and computer systems, alteration or corruption of information stored in them. At the same time, it covers the damage caused to customers by breaking the customer's computer with the participation of the bank's computer system, the damage caused by intentional damage, theft and destruction of electronic data and their carriers, as well as the damage caused by computer viruses.<sup>68</sup>

At the same time, losses caused by transactions based on false information received through electronic communication systems, transactions with undocumented securities, falsified instructions or assignments accepted for execution are also covered by insurance. One of the advantages of the BBB insurance policy is the pre-insurance examination of the bank's security systems, the quality of its management and internal control in accordance with world standards. This is called a survey. This is done by specialized professionals. The report of these persons serves as a basis for insurers to make a decision on insuring the bank. The survey also provides suggestions for the development and improvement of the bank's security systems. These proposals must be implemented by the bank wishing to insure, as it serves to increase the level of security of the bank.

Access to information systems is very important to avoid risks in the bank. This process is based on the division of powers in the bank. In order to access information systems, the bank must create an account of users and system administrators in the system, as well as procedures for determining the access of these persons to information systems. The creation of users in these systems should be carried out by the system administrator, the process of changing powers, and the process of

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<sup>68</sup> Bailey, Cristina, Denton Collins, and Lawrence Abbott. 2018. The Impact of Enterprise Risk Management on the Audit Process: Evidence from Audit Fees and Audit Delay. *Auditing—A Journal of Practice & Theory* 37: 25–46.

suspending users should be carried out by the security administrator. To reduce the risk of errors, unauthorized interference, fraud, deletion or alteration of data by unauthorized persons, the logs of access to the systems should be regularly compared with the access rights to the systems. In order to prevent unauthorized access to information systems, physical safety and control rules must be distinguished on the information technology equipment in the bank.

In order to avoid risk, all banks must ensure uninterrupted operation in all cases where information technology and information systems are destroyed, damaged or endangered. The bank must take at least a number of measures to ensure business continuity:

1) A Reserve Centre should be established outside the bank to maintain backups and restore operations of information systems;

2) In all emergencies, the bank's sustainability plan should be developed and approved, which should define communication measures in case of emergencies, restore the bank's operations, and establish procedures for the transition to the Reserve Centre and subsequent recovery.

3) In case of emergency, the ability of information systems to support the bank's continued operation should be assessed at least every 6 months and the results should be formalized.

4) In order to ensure the continuity of operations during emergencies, the bank should conduct training for its employees at least once a year on the procedures to be followed in the event of an accident in information technology equipment and information systems, and the results should be formalized.

In order to avoid risk in the bank, the servers processing the data must meet the following requirements:

1) Licensed software distributed under free or open license terms should be used in consultation with the structural unit responsible for the application of information technology and the security administrator;

2) The software used on the server must be agreed with the security administrator.

3) All information systems should be protected with antivirus software and this database should be updated daily.

Passwords of system users and system administrators must be available, the maximum duration of passwords is 30 days, the number should not be less than 8. For system administrators, the password must be no less than 10 characters. The password must be changed by the user during the first connection to the system. The user is restricted from accessing the system after 3 attempts to enter the password incorrectly and can only log in after the security administrator has blocked access

to the system. Reuse of the last 12 passwords used in the system should be prevented automatically. At the same time, system administrators should not be able to access other users' passwords.

Passwords must consist of both letters and numbers, must not be displayed on the screen, and must have a screen protector with password protection. The entire system must also be stored in an envelope sealed with the administrator's password. At the same time, when applying cryptographic security systems, the requirements for storing and transmitting passwords in encrypted form must be observed. In this case, the information must be encrypted when transmitted through external communication channels, as well as when written to disks.<sup>69</sup>

Information Technology (IT) risks in the Bank must be managed in accordance with the “Rules on Risk Management in Banks” approved by the Resolution No. 24/3 of the Board of the Central Bank of the Republic of Azerbaijan dated December 9, 2013. In order to reduce the risks of information technology, the following measures should be implemented on the Automated Banking Information System (ABIS).

- 1) Daily, weekly, monthly, annual backup copies of ABIS, ie the database should be kept.
- 2) Records of changes in the database should be kept and backups should be created.
- 3) Daily copies should be stored in the database for at least one week, weekly for one month, monthly systems for one year, and annuals for five years. Before submitting the annual copies to the bank's archive, it is necessary to check the recovery of data on the server.
- 4) Authorization mechanisms for documents in ABIS should be established and provided.
- 5) Creation of an interface between ABIS and banks' payment and information systems, which excludes the possibility of intentional alteration of the transmitted data.
- 6) An on-line interface should be established between the Bank and its branches and affiliates.
- 7) Backup copies of information systems must be removed and stored in the Bank's Reserve Centre.

As we know, the structure of computer system IT application should determine the risk management requirements for the bank. The requirements of the implementation structure cover various types of risk management functions, including the following:

- 1) Market and credit risk management
- 2) Capital distribution
- 3) Asset and liability management

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<sup>69</sup> Altuntas, Muhammed, Thomas R. Berry-Stolzle, and David J. Cummins. 2019. Enterprise risk management and economies of scale and scope: Evidence from the German insurance industry. *Annals of Operations Research*

4) Evaluation of results of activities

5) Reporting to the supervisory authority

In addition to clarifying all of the listed functions, the implementation structure should also define the methodologies applied within them. The application structure should take into account the system constraints that may arise from a technologically complex methodology. It should also determine the application structure, level and type of centralization. As mentioned above, the risk structure for information technology should provide knowledge of the risk structure and the hiring of experienced, specialized staff. System staff should have a broad understanding of risk management activities. In this case, there will be no technological and business technical problems<sup>70</sup>. In order to develop risk systems, specialized staff should be supported on a daily basis to develop and improve the system in a timely manner, taking into account modern services and methodology, and experience in this field should be consistently developed.<sup>71</sup>

As a logical sequence of ongoing systemic reforms, the Central Bank has created a National Pay System (NPS) with an architecture based on advanced technology and software. In 2020, the total volume of payment transactions with the NPS amounted to 223.4 billion manat, and the number was 59.8 million units, compared to the last 3 years, the volume of transactions decreased by 19%, and the number increased by 50%. The total volume of transactions with the Government Payment Portal, created by the Central Bank for the centralized collection of payments for budget payments and public services, in 2020 amounted to 3.3 billion manat, and the number was 51.9 million units, which is 34% and 39% higher than in the last 3 years, respectively. During 2020, 53.2 million card transactions were carried out with the Interbank Card Centre, the volume of transactions in national currency was 2752 million manat, and in foreign currency - 14.6 million US dollars and 3.1 million euros. Compared to 2018, the total number of transactions processed in the system increased by 1.9 times, the volume by 2.8 times in manat, 2.6 times in US dollars and 1.6 times in euros.<sup>72</sup>

Significant progress has been made in the card infrastructure over the last 3 years. As of January 1, 2021, the total number of payment cards issued by banks and the national postal operator operating in the country amounted to 9.6 million. and 39% of these cards were contactless cards. The total number of payment cards increased by 44% compared to last year, and the number of contactless cards increased by 5.5 times. As of January 1, 2021, a total of 2779 ATMs, 57344 POS-terminals

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<sup>70</sup> Mərkəzi Bank - Banklarda risklərin idarə olunması haqqında qaydalar (2010). Azərbaycan Respublikası Mərkəzi Bankı, Pr. No24

<sup>71</sup> [www.trend.az](http://www.trend.az)

<sup>72</sup> [www.cbar.az](http://www.cbar.az)

(60% or 34181 contactless cards), 1928 payment terminals operated in the territory of the republic, including the service network of "Azerpocht" LLC. Compared to 2018, the number of ATMs increased by 8%, the number of contactless POS-terminals by 57%, and the number of payment terminals by 24%.<sup>73</sup>

Most banks in Azerbaijan has e-banking services. The banks has special security and risk management procedures (hereinafter - security procedures) for e-banking services. Security procedures for the bank's e-banking service are approved by the bank's authorized management body and the status of implementation is regularly checked. E-banking security procedures take into account at least the following:

- methods of protecting the confidentiality of information in order to ensure information security;
- methods of ensuring the accuracy, reliability and integrity of information sent, processed and stored between the bank and the user;
- methods of applying electronic authentication;
- measures for logical and physical access to restrict the user's access to unauthorized information;
- measures to be taken in case of involvement of a third party (software and network provider) in the provision of e-banking services in case of sudden termination of the third party or failure to fulfil its obligations under the contract with it;
- carrying out of division of powers on employees working in the field of information technologies, as well as organization of regular trainings in order to increase their professionalism.

The bank monitors the risks of e-banking services, taking into account technological solutions, third-party services and the technical environment of users. The bank analyses risk scenarios for major incidents that may affect the e-banking service, as well as assesses the adequacy and effectiveness of existing security measures. When the risk assessment requires changes in existing security measures, applied technologies and procedures, as well as services for e-banking, the bank takes measures to minimize the likelihood and impact of possible incidents and fraud during the transition period required for these changes. The overall risk assessment analysis is conducted at least once a year and the results are approved by the relevant management body of the bank.<sup>74</sup>

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<sup>73</sup> [www.marja.az](http://www.marja.az)

<sup>74</sup> [www.banks.az](http://www.banks.az)

The bank registers and monitors real-time security incidents, including security user complaints. The bank submits incident reports to the relevant management body of the bank and, if necessary, information about the incident to law enforcement agencies. The bank maintains a register of incidents on e-banking services. At least the following information shall be registered in the register:

- type of e-banking service (PC banking, internet banking, mobile banking);
- transaction reference number
- the cause of the incident;
- the content of the incident;
- date and time of the incident;
- measures taken to eliminate the incident.

The bank has appropriate security solutions to protect the network, website, servers and communication connections against abuse and attack. In order to restrict the use of fake websites, the website of the bank, which provides an operational e-banking service, is identified through extended verification certificates. The bank has appropriate functionality to control, monitor and restrict access to logically and physically significant resources such as networks, systems, databases and security modules. The bank creates, maintains and analyses relevant logs and audit files. The Bank audits security measures for e-banking services at least once a year. Reliable and independent (internal or external) experts are involved in the audit.<sup>75</sup>

The bank shall ensure that the recommendations contained in this Methodological Guide regarding the security of the service are taken into account in the contract concluded with the third party for the e-banking service. In case of sudden termination of the activity of the third party or inability to fulfil its obligations, the reserve options, appropriate methods and means of providing e-banking services to the bank's customers are determined in advance.

There are different types of remote attacks when using e-banking services, measures to detect and prevent them (Table 3.4.)

**Table 3.4. Types of remote attacks when using e-banking services, measures to detect and prevent them**

Types of remote attacks	A brief description of the attacks	Measures to detect and prevent attacks
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<sup>75</sup> Methodological Guide for the provision of electronic banking services in the Republic of Azerbaijan and ensuring security for these services, 2015

Back doors	<p>Back door is a program code written for programmers to access applications or operating systems without going through security controls. The back door can be used both through the data entry sequence and through the user ID granted special access rights. Programmers use backdoors to gain quick access to checking and controlling errors in software. If the "back door" is not removed after checking for errors in the program, a security problem arises. In addition, a user who attacks the program can create a "back door" for his future activities after gaining access to the system.</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Obtain certificates confirming the absence of any undocumented "back door" in third-party products and accept systems only from reliable sources;</li> <li><input type="checkbox"/> to apply procedures to verify the absence of back doors before real-time operation of systems;</li> <li><input type="checkbox"/> Carry out "integrity" tests of systems in order to check the completeness (not changed) of systems operating in real mode.</li> </ul>
Brute force	<p>The Brute force attack is used to obtain encrypted data. The encrypted information obtained during this attack is decrypted using special software and access to the passwords, usernames and data stored in the data is obtained. The attacking user can create a "back door" for his future activities after gaining access to the data.</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> use sophisticated encryption technology and certificate management methods to protect the confidentiality of data, usernames and passwords;</li> <li><input type="checkbox"/> to apply a complex password policy (minimum length of passwords and change period, reuse requirements, etc.);</li> <li><input type="checkbox"/> Carry out unauthorized intrusion tests to identify security vulnerabilities in systems and the complexity of the encryption method;</li> <li><input type="checkbox"/> Educate users on security measures (especially in the field of password identification).</li> </ul>
Denial of service - DOS	<p>Service Denial (DOS) is not intended to gain access to a network or system. DOS is an attack aimed at shutting down both the system and the network by sending excessive data or requests to the system or network. A DOS attack can be performed from one or more sources. In a Distributed DOS attack, the attacker can intentionally direct an online DOS attack on several or hundreds of systems at once.</p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> to apply appropriate network security in order to block network traffic that is not necessary for the operation of systems;</li> <li><input type="checkbox"/> Negotiate with Internet providers to receive traffic only from authorized sources;</li> <li><input type="checkbox"/> Establish appropriate backup and recovery mechanisms;</li> <li><input type="checkbox"/> Use scanning tools or unauthorized intrusion tests to test the resilience of systems and networks against DOS and / or distributed DOS attacks.</li> </ul>



Exploiting known security vulnerabilities	Attacking users exploit known security vulnerabilities to gain unauthorized access to systems. There are many sources on the Internet about this type of vulnerability. Alternatively, attacking users use special automated tools to identify security vulnerabilities. Security vulnerabilities can be related to hardware, software on web servers, network firewalls, or tools used to create software on web servers. For example, certain security vulnerabilities allow an unauthorized modification of the content of a website.	<input type="checkbox"/> Delete or deactivate programs and computer processes that do not use servers and network firewalls; <input type="checkbox"/> Apply the latest security package tasks and updates to operating systems and system applications; <input type="checkbox"/> Select a third party that provides software and hardware with effective technological capabilities to prevent the latest attacks; <input type="checkbox"/> use scanning tools or unauthorized external intrusion tests to identify security vulnerabilities such as software errors and / or protocol flaws; <input type="checkbox"/> To penetrate external contact equipment and internal network at least once a year.
Password prediction	Encrypting passwords is a method of verifying all possible password combinations in order to access a system or network through software. Some password guessing attacks speed up this process by first checking the most commonly used password combinations.	<input type="checkbox"/> to apply a complex encryption policy (minimum length of passwords and replacement period, reuse requirements, etc.); <input type="checkbox"/> Introduce strict access control mechanisms (revocation of user identity after several unsuccessful login attempts); <input type="checkbox"/> Accurately change passwords available in critical network components; <input type="checkbox"/> Educate users on security measures (especially in the field of password creation)
Hijacking	Hijacking is an attack on a user to steal a connection after confirming themselves in the system. Generally, hijacking attacks occur remotely over a computer (the user's personal computer), but sometimes it is also possible to steal a connection from a computer on the route between the remote computer and the bank's internal systems.	<input type="checkbox"/> Implement appropriate network security by applying sophisticated authentication methods to gain remote access, such as periodically suspending access to critical sessions and requiring re-authentication to restrict access to the person hijacking confidential information; <input type="checkbox"/> install properly configured firewalls in appropriate locations; <input type="checkbox"/> Monitor network traffic or potential interference on a regular basis; <input type="checkbox"/> Use scanning tools or unauthorized outside intrusion tests to identify vulnerabilities associated with hijacking attacks;

		<input type="checkbox"/> Apply strong encryption to highly confidential information.
Spoofing	<p>Spoofing recognizes an unauthorized computer system as an authorized computer system to gain access to networks or confidential information in order to deceive the network. For example, an attacked user creates an authenticated session with the organization's website after entering a username and password from their personal device (for example, a personal computer). By intercepting this session, the attacker can gain access to the system by stealing the IP address of the user's device and imitating that device. In this case, the sanctioned user may not be aware of outside interference as it has no effect on the session</p>	<input type="checkbox"/> apply authentication methods based not only on the IP address, but also on the encrypted identification, which is unique for the session, in order to ensure the security of the data transmitted over the authenticated session; <input type="checkbox"/> install a properly configured network protector in appropriate locations; <input type="checkbox"/> Continuously monitor network traffic or potential outside interference.
Trojan horses	<p>Trojan horses are programs that do not affect the normal operation of the system, but include malicious processes such as data collection or system control. "Trojan horses" can be added to e-mails (like a computer game) and create a "back door" (see above) that allows unauthorized access to the system. "Trojan horses" may not contain logging and other information in order not to track the activities of the attacker. One of the earliest forms of this software is software that allows you to obtain a username and password entered by the user by displaying a fake login screen on the system.</p>	<input type="checkbox"/> to apply the necessary change management procedures in connection with the commissioning of the systems in real time and to carry out tests confirming the absence of "Trojan horses" in the system; <input type="checkbox"/> Regularly check the completeness of the programs used; <input type="checkbox"/> formulate an information security policy and provide appropriate training to internal staff on appropriate security measures to protect against Trojan horses (for example, a strict policy against email or Internet misuse); <input type="checkbox"/> To provide users with relevant rules on security measures related to opening files attached to e-mails and using the Internet.
Virus programs	<p>Computer viruses are computer programs that can be embedded in other code and can activate themselves. When active, it can perform malicious activities that could result in network or system crashes. Virus programs can spread to many platforms, databases,</p>	<input type="checkbox"/> to ensure the inclusion of the item "Verification of information protocols received by the bank against viruses" in the obligations of the third party when concluding a contract with a third party; <input type="checkbox"/> use updated virus scanning tools;

	<p>devices in the system, and many systems connected via a network. Virus programs can be embedded in e-mail attachments and can be activated when this file is opened</p>	<p><input type="checkbox"/> formulate an information security policy and provide internal staff with appropriate rules for appropriate security measures to protect against computer viruses (for example, a strict policy against the misuse of the Internet or e-mail address);</p> <p><input type="checkbox"/> To provide users with appropriate rules on security measures related to the opening of files at the e-mail address and the use of the Internet.</p>
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Source: own study based on internet resources analysing.

Before providing e-banking services, the bank discloses the following information to users in paper or electronic form:

- register, technical description of hardware, software and other necessary tools (antivirus programs, firewall, etc.), as well as individual security tools (PIN-code, E-token, etc.), the rules of their proper and safe use;
- stages of obtaining information in the system, including the entry and authorization of the payment transaction and / or the result of each transaction;
- measures to be taken in case of loss or theft of electronic authentication tools or equipment and software for payment operations;
- procedures applied in case of fraud and suspicion.

The bank uses enhanced user authentication methods depending on the amount of the transaction on the E-banking service, as well as the level of risk. The bank can use unified authentication methods for e-banking services for the convenience of the user. The Bank ensures the safe delivery and registration of authentication methods and software for the user to use the E-banking service.

A survey of 50 people was conducted through the Google Survey portal to analyse the effectiveness of the mobile banking system in Azerbaijan, to find out how much the population trusts mobile banking and to determine whether there are any risks associated with mobile banking.

The survey results are given below:

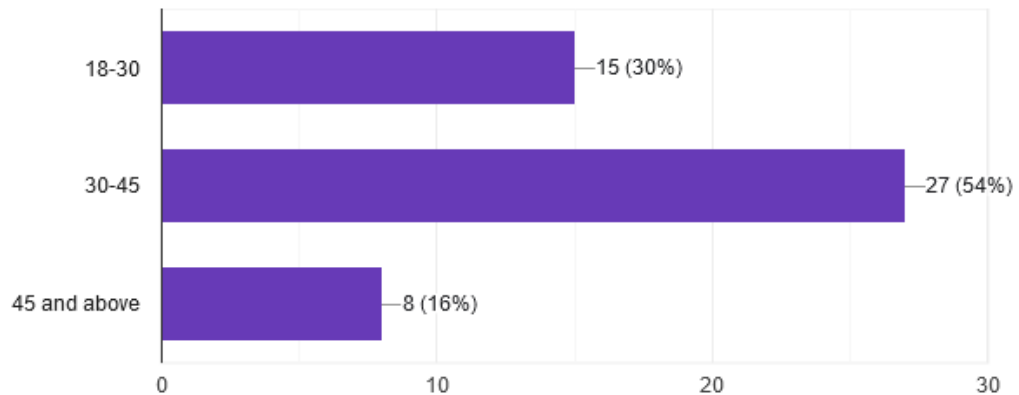
Survey questions are given in Figures 3.1 – 3.10:

**Figure 3.1. Age group of the respondents**

### 1. What age group do you belong to?



50 responses



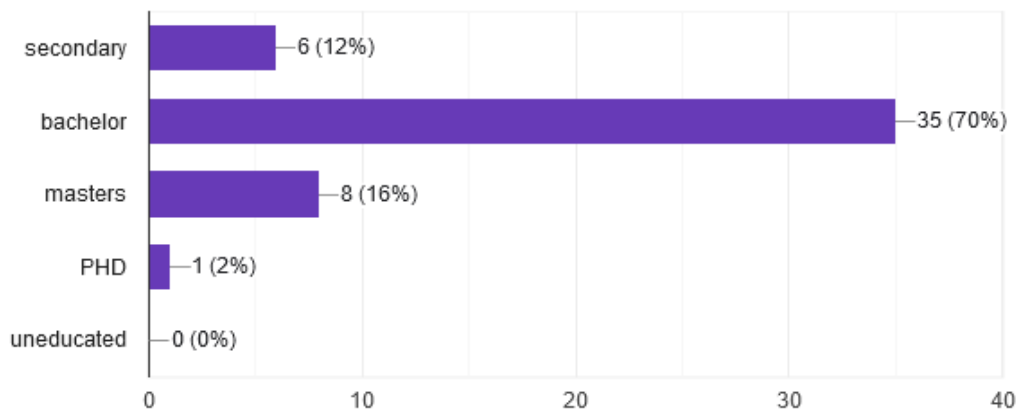
As it can be seen from the figure, 30% (15 people) of the respondents are under age 18-30, 54% (27 people) are under age 30-45 and 16% (8 people) are at age 45 and above.

**Figure 3.2. Education level of the respondents**

### 2. What category does your education correspond to?



50 responses



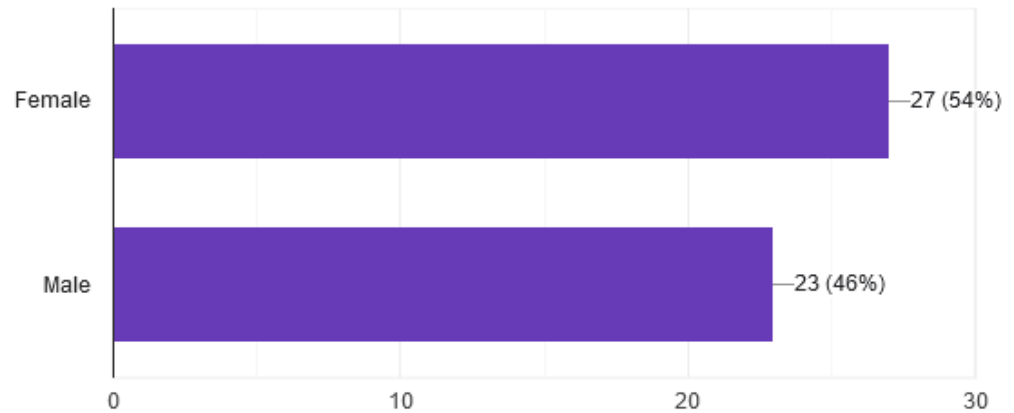
12% of respondents (6 people) has secondary school education, 70% of respondents (35 people) own bachelor degree, 16% have master's degree and 2% (1 person) has PHD, none of the respondents are uneducated.

**Figure 3.3. Gender of the respondents**

### 3. What category does your gender belong to?



50 responses



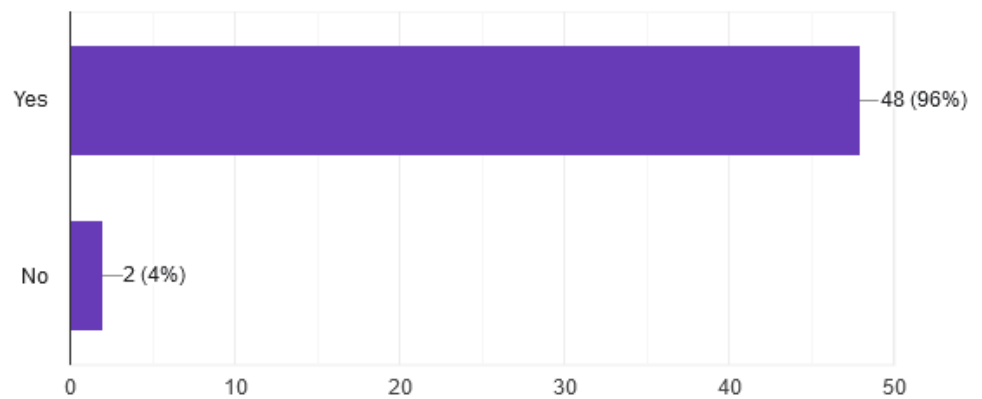
54% of respondents (27 people) are female and 46% (23 people) are male.

**Figure 3.4. Are the respondents bank account owner?**

### 4. Do you have a bank account?



50 responses



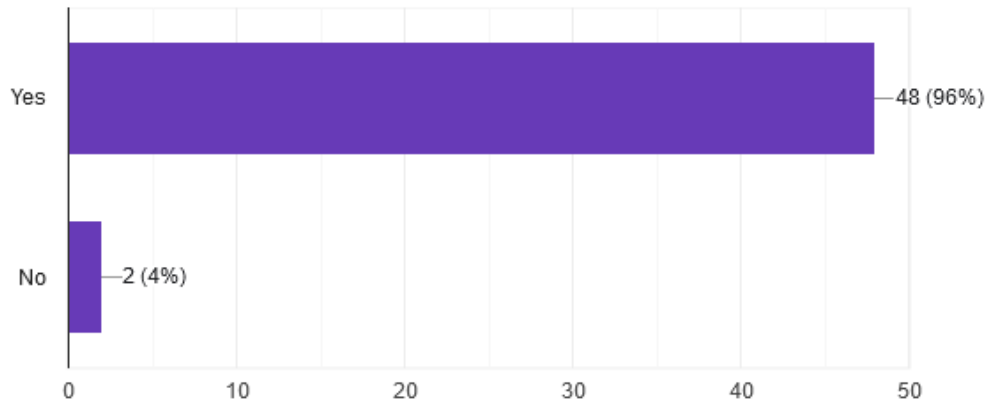
96% of the respondents (48 people) have bank account, 4% of the respondents (2 people) does not have bank account.

**Figure 3.5. Respondents' awareness about mobile banking**

### 5. Are you aware of mobile banking?

 Copy

50 responses



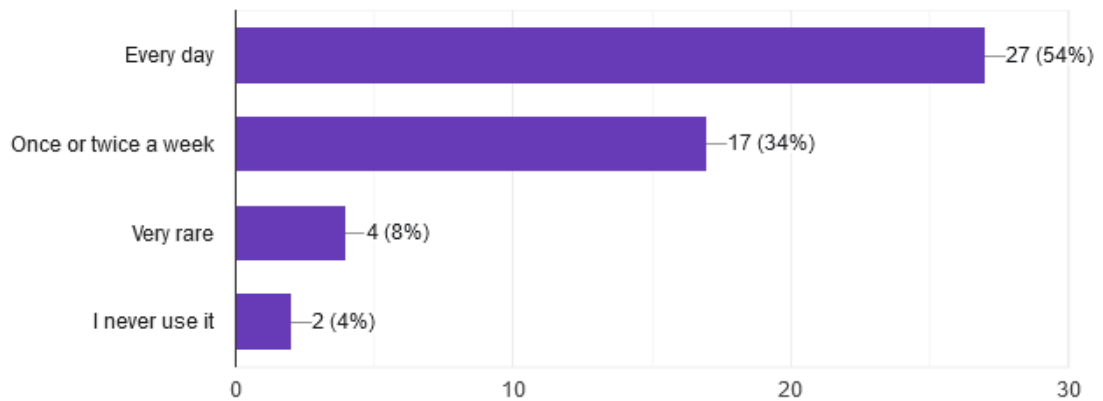
96% of the respondents (48 people) are aware of mobile banking, 4% of the respondents (2 people) does not know anything about mobile banking.

**Figure 3.6. How often is mobile banking used by the respondents?**

### 6. How often do you use your mobile banking?

 Copy

50 responses

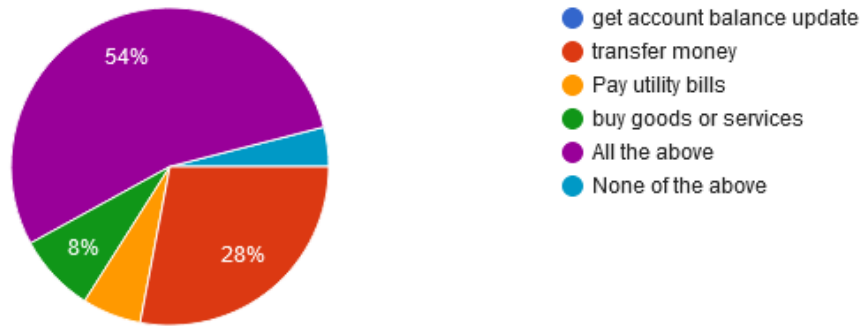


54% (27 people) of the respondents use mobile banking every day, 34% (17 people) use mobile banking once or twice a week, 8% (4 people) use rarely and 4% (2 people) never use mobile banking.

**Figure 3.7. Mobile banking purposes of use**

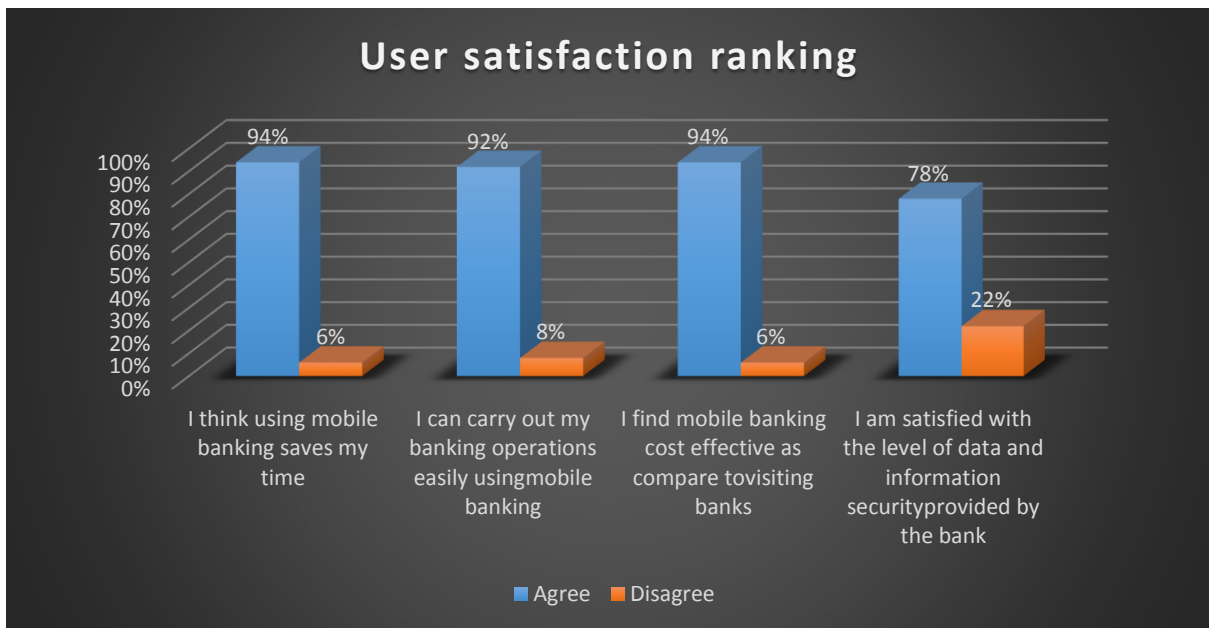
### 7. What purpose do you use mobile banking services for?

50 responses



54% of the respondents use mobile banking for getting account balance update, transferring money, paying utility bills and buying goods and services. 28% of respondents use mobile banking for transferring money, 8% of respondent use for buying goods and services, 6% use for paying utility bills and 4% does not use for any purposes.

**Figure 3.8. Mobile banking satisfaction rating by the users**

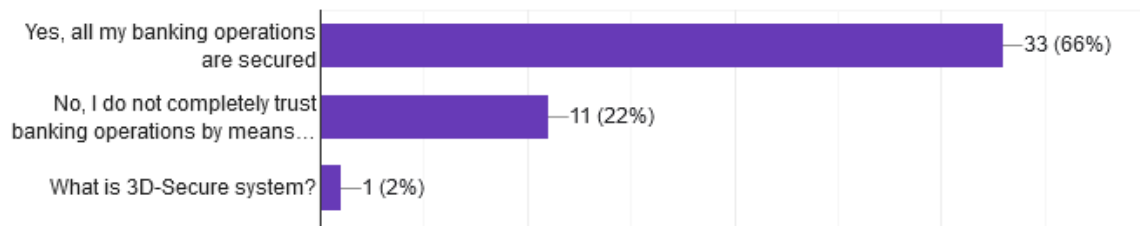


**Figure 3.9. How risky are mobile banking operations?**

9. Do you find using mobile banking risk-free? Does it have password protection and 3D-Secure system?



50 responses



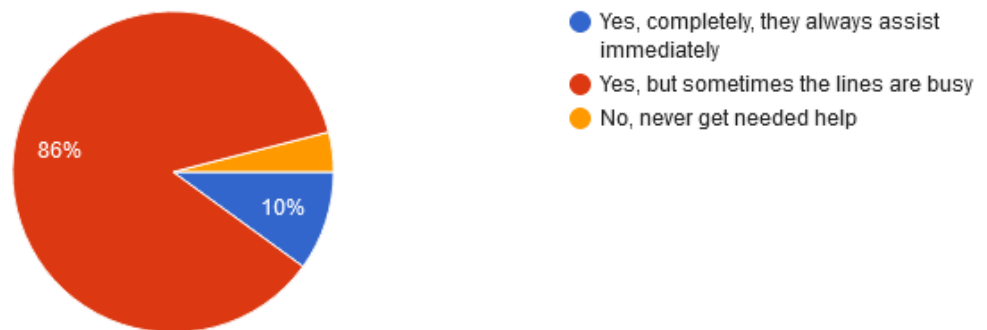
66% of the respondents think all mobile banking operations are secured, 22% of the respondents do not completely trust mobile banking operations, 2% of the respondents do not know what does 3D-Secure system mean (This system ensures safe money transfer operations by means of mobile banking).

### 3.10. User satisfaction about bank support services on use of mobile banking

10. Are you satisfied with the bank service of mobile banking when you need urgent assistance?



50 responses



86% of the respondents think the bank contact lines are always busy and it is difficult to get hold of the operator when the bank's assistance is needed. 10% of the respondents think the bank support system is completely useful and just 4% think they never get help from the bank when needed.

In result of the survey, it is concluded that mobile banking is very popular in Azerbaijan, it is mostly used every day for money transfer, utility payments, buying goods and services and checking balance. It is risk-free, because risks are eliminated by the banks by means of the password protection and 3-D Secure system, but it is difficult to keep in touch with bank operator when assistance is required, so it would be good for the banks to improve their user support services and make more operator lines available for the bank users.



## RESULTS AND SUGGESTIONS

The essence of risks in total and then especially banking risks was analysed in the dissertation work, risk management methods were identified and problems arising in risk management were considered. Risk refers to the probability of loss in result of an activity that may occur in one way or another. Acceptance of risks is the basis of banking. Banks succeed only if the risks they accept are manageable, and also within their ability to finance as well as compensate. Banks are trying to make more profit. But this attempt can also lead to losses. The risks of banking also include the possibility that the bank will receive less money than it probably planned. The higher the amount sought, the greater the risk.

Effective banking risk management covers many areas, from monitoring banking risks to their assessment. Every bank should think about minimization. This is very important for the bank to be able to continue its activities. Minimizing risks is, in a way, a struggle to reduce risks, or more precisely, to manage them. This process includes: seeing the risks; to determine their real rates and consequences; develop an action plan to prevent or minimize them.

The most common methods used to combat banking risks include: risk avoidance or avoidance; assuming risks; loss prevention; insurance; transfer of risks. Bank risk mitigation methods can also be classified as follows: 1) insurance; 2) creation of financial reserves (self-insurance); 3) diversification; 4) distribution of risks among the participants of entrepreneurial projects, etc. Thus, in the current situation, it is important to establish a risk management system for the management of credit institutions, and to create activities within this system that are adequate in nature and scale.

Banks that are mainly looking for a lucrative business sometimes forget about its risks. However, the development of market relations brings with it some instability, which in turn creates a number of banking risks. It is important to remember that no risk can be completely neutralized. In addition, banking activities are affected by 'risk-return', which consists of changes in bank rates, exchange rates, etc. However, the more risk a bank takes on, the more profit it can make.

The research in the dissertation suggests that the bank's risk tolerance, as well as further enhance its reputation in the banking services market. One of the main proposals is to successfully implement IT innovations in the banking sector. Another suggestion is for the bank to choose the right staff.

Most banks in Azerbaijan has e-banking services. The banks has special security and risk management procedures for e-banking services. The banks should set a limit on attempts to enter passwords and / or inactivity of the system when logging in to the e-banking service. When a one-

time password is used for authentication, the banks should set a limit on the validity period of such passwords in accordance with the minimum requirements set by the bank.

A survey was conducted to find out how popular is mobile banking in Azerbaijan and whether it is considered to be risky. The survey result showed that mobile banking users trust it and use it very often for their daily financial operations. It was concluded that e-banking is well protected by the banks by means of the modern protection systems like one-time authentication or 3-D secure system.

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