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Methodological Aspects of Valuation of Credit Institutions under External Uncertainty

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ABSTRACT

The article is devoted to the research of the issues of commercial bank business valuation under the conditions of uncertainty. The study **aims** to develop a model for forecasting the value of total assets and loan portfolio of a commercial bank within the framework of value estimation under external uncertainty. The **relevance** of the paper is that in the context of the COVID-19 pandemic, military actions and sanctions pressure it is difficult to justify the market value of credit institutions due to the difficulties in implementing the methodology of assessment of banks whose business is associated with increased risks. The scientific **novelty** of the study lies in the development of a regression model that allows forecasting the value of total assets and the loan portfolio of a commercial bank as key value factors under external uncertainty. The authors used the following **methods** of scientific research: deduction, induction, correlation and regression analysis, and logical method. The key factors of business valuation of Russian banks are systematized. The authors propose to build a model within the framework of the income approach, based on the forecast of external cost factors: total assets and loan portfolio of the banking sector. A leading indicator that affects total assets and loan portfolio is justified. A model has been developed which makes it possible to forecast the total assets and loan portfolios of the banking sector and find the required value of the assets of the bank being evaluated through the market share. The model is tested on the example of the valuation of Sber. The authors **conclude** that the model developed by the authors makes it possible to build scenarios for future cash flows and quantify the valuation interval of a commercial bank. The prospect of further research is related to evaluating the influence of internal financial and non-financial factors in the context of the valuation management system. The article will be useful to practicing appraisers in business valuation and investors.

Keywords: valuation methods; external uncertainty; value factors; banking; forecasting model; banking sector assets

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INTRODUCTION

The situation of external uncertainty in an emerging economy has recently arisen more often. In the context of the COVID-19 pandemic and sanctions pressure, it is not easy to justify the market value of a commercial bank, as the appraiser has difficulty implementing the valuation methodology. They are caused by as follows:

1. High degree of information obsolescence. Events can move quickly, leading to significant volatility in many indicators.
2. Lack of reliable information and accurate forecasts for making informed decisions about the prospects for the business model of the property being evaluated.
3. Reflexive processes in the market that do not allow a sober assessment of the prospects of its individual segments.
4. The complexity of assessing business risks, taking into account the imposed sanctions, which obliges the appraiser to understand in detail their classification and the degree of impact on the business model.

"The high uncertainty of external factors in the recommendations of the expert council means a situation where, for objective reasons beyond the control of the appraiser, the value cannot be determined 'with a reasonable degree of certainty' (Article 393 of the Civil Code of the Russian Federation[1]). At the same time, the reasons are external in relation to the object of valuation and its market (political, military, macroeconomic, epidemiological/pandemic, etc.). The appraiser, within the framework of modern achievements in science and technology (methodology), and the rules of economic activity, cannot reliably take into account the nature and intensity of the influence of these causes on the cost of the valuation."[2]

Particularly relevant and debatable in the evaluation is the type of value being determined. Stock market indicators in extreme conditions and during panic moods are subject to high volatility and can reach extremely low values. For example, the MOEX index fell by 33% from February 22 to February 24, 2022, to the level of 2058 points (*Fig. 1*). As a result, trading on the stock exchange was stopped. Another example is the price of depository receipts for Sberbank shares on the London Stock Exchange, which fell to $ 0.05.[3]

At the same time, the applicability of exchange value (market value also belongs to this category) under external uncertainty is significantly limited. From the point of view of Art. 3 of the Federal Law "On Appraisal Activities",[4] the market value is understood as the most probable price at which the object of the valuation can be alienated on the open market in a competitive environment, when the parties to the transaction act reasonably, having all the necessary information, and the value of the transaction price is not affected by any or emergency circumstances.

Thus, the presence of extraordinary circumstances in certain territories at certain periods of time casts doubt on the very existence of market value. However, it is possible to determine other types of value outside the market that are not directly specified in the Federal Valuation Standard No. 2,[5] which requires a separate study.

The banking business is an important element of the market economy and plays a key role in capital redistribution, risk transformation, and economic growth. However, due to the specifics of the business

[1] Civil Code of the Russian Federation. Part 1. Dated 30.11.1994 51-FZ. Ed. as of 25.02.2022.

[2] Methodological explanations for determining the value under high uncertainty of external factors MP-1/22 dated 01.03.2022. URL: https://srosovet.ru/activities/Metod/MR 1–22/? (accessed on 21.03.2022).

[3] Information resource. URL: https://ru.tradingview.com/symbols/LSIN-SBER/ (accessed on 21.03.2022).

[4] Federal Law No. 135-FZ dated July 29, 1998 "On Valuation Activities in the Russian Federation" (as amended, entered into force on March 18, 2020).

[5] Order of the Ministry of Economic Development of Russia dated July 20, 2007 No. 255 "On Approval of the Federal Valuation Standard. Valuation Purpose and Cost Types (FSO No. 2)".

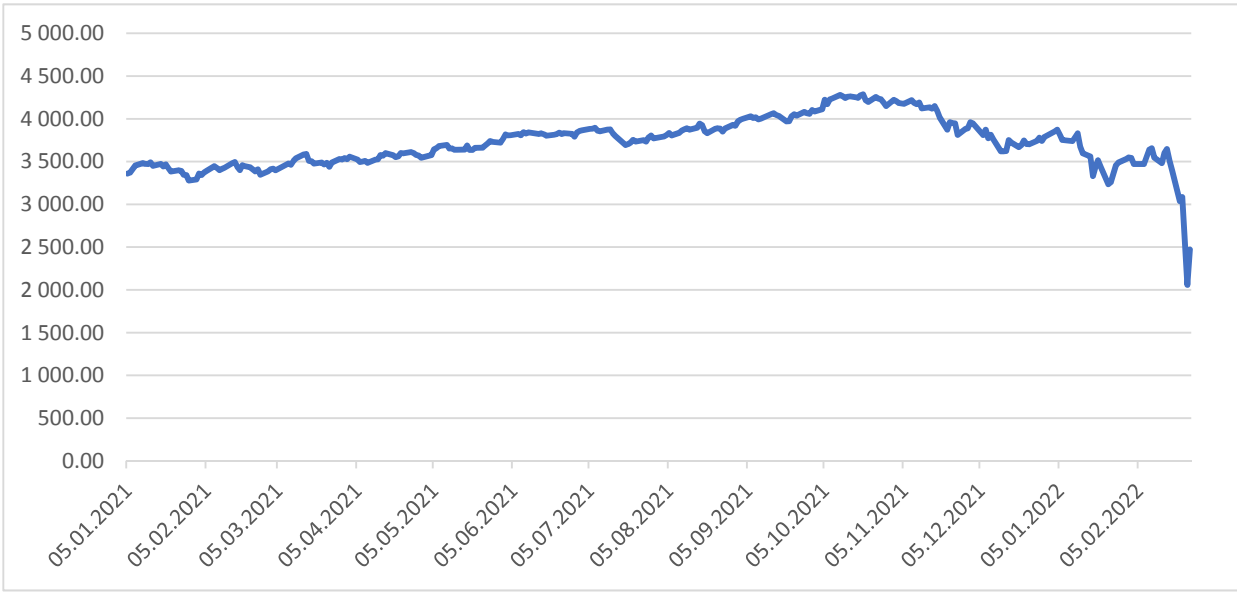

Fig. 1. **Dynamics of the Moscow Exchange Index (MOEX)**

Source: compiled by the authors according to cbonds.ru.

model, it is subject to significant risks, which, in conditions of high volatility, is reflected in financial results. Reflexive processes in the stock market directly affect their financial results. Thus, when evaluating this type of business, a detailed study and quantitative assessment of the main cost factors are required.

The **aim** of this study is to develop a model for forecasting the value of total assets and the loan portfolio of a commercial bank as part of a valuation under conditions of external uncertainty. To achieve this aim, the following tasks were set:

1. Determine the type of value and approach to valuation that is applicable in the face of external uncertainty.
2. To study and classify the external and internal factors of the value of a credit institution.
3. Identify leading indicators that will allow forecasting the total assets and loan portfolio of the banking sector.
4. Develop a forecasting model for the total assets and loan portfolio of the banking sector.
5. To test the developed model on the example of the valuation of PJSC "Sberbank".

METHODS

A. Damadaran [1], T. Copeland, T. Koller and others [2], J. Dermine [3], N. Antill [4], and Sh. Pratt [5] study the specifics of credit institutions and the applicability of the valuation methodology. Features of credit institutions as objects of assessment and their legal regulation are considered in the studies of V.M. Rutgaizer [6], A.E. Buditskii [7], I.V. Kosorukova, and M.A. Fedotova [8].

I.A. Nikonova and R.N. Shamgunov [9] consider approaches to developing a strategy for creating and increasing the market value of commercial banks and establishes the impact of investment projects and intangible assets on the value of a bank.

S. Yu. Bogatyrev and S.S. Dobrynin [10] develop the topic of assessing and managing the value of a bank under international economic sanctions using the residual income method according to the Edwards-Bell-Ohlson model. However, the successful application of the model requires up-to-date forecasts of the macroeconomic, financial, and banking sectors.

A.L. Rozhkovsky [11] substantiates the advantages of the commercial bank valuation model based on economic profit and gives

recommendations for adjusting profit and capital. The author systematizes financial and non-financial factors but does not pay due attention to external factors.

A. V. Tukhvatulina [12] considers the main factors that affect the competitiveness and cost of a commercial bank, without considering external factors.

Based on the sources on the research topic, it can be concluded that there is an insufficient study of the issues of the influence of external factors on the value of the bank, and the specifics of valuation under external uncertainty.

Among the features of credit institutions as objects of assessment, the following should be noted:

- complexity of a real assessment of the quality of assets and liabilities;
- high concentration of risks;
- availability of intangible assets;
- regulatory restrictions (requirements to comply with standards set by the regulator);
- the complexity of calculating **reinvestment** (a significant part of investments is made using borrowed funds, which makes it necessary to evaluate assets taking into account the amount of liabilities and vice versa);
- the main source of self-financing is profit, the role of depreciation is small;
- for credit and financial institutions, capital should be considered only in terms of **own funds**.

Among the approaches and methods of evaluation are cost, comparative and profitable methids. The applicability of these methods for estimating the value of a commercial bank under external uncertainty is discussed in *Table 1*.

The current version of the Federal Valuation Standards provides for four main types of value: market, investment, liquidation and cadastral.[6] As have been noted, the market value is not applicable by the appraiser under extraordinary circumstances and increased uncertainty. The liquidation value is a derivative of the market value, taking into account the factor of the forced sale of the asset. The investment value is more suitable for the purposes of valuation in emergency circumstances, as it is determined for a specific person for investment purposes and does not involve the alienation of the object on the open market. If there are no investment goals and the task is to assess the growth potential of the business value as part of the implementation of the business value management concept, then it is more logical to use this type of value as a fundamental one.

The fundamental value of a business is based on the present value of future earnings, "includes an assessment of the company's performance and development prospects, and is an aggregate indicator that can adequately reflect the company's potential ability to satisfy the interests of key stakeholders" [13].

Fundamental value is more suitable for management decisions within cost management, there is no obligation to conduct an assessment and there is no need to contact an independent appraiser. If an independent appraisal is required under the Valuation Law, it is recommended to use the investment value.

Taking into account the features of approaches and methods, the discounted cash flow method is most suitable for evaluating a commercial bank in order to determine the fundamental and investment value. The method is based on forecasting the bank's cash flows, risk assessment and subsequent discounting of the flows in order to determine the current value. It is also worth noting that this method is the only one acceptable for assessing growing banks or under conditions of uncertainty [7], as it allows assessing business prospects, taking into account sanctions restrictions and risks affecting the business model.

[6] Order of the Ministry of Economic Development of the Russian Federation of 20.07.2007 No. 255 "On Approval of the Federal Valuation Standard Purpose of Valuation and Types of Value (FVO No. 2)".

Table 1

Applicability of methods for estimating the value of a commercial bank in conditions of external uncertainty

Methods	Possibility of applying methods in bank valuation	Applicability under external uncertainty
1. Net assets method	Applicable for valuation of unprofitable banking business, does not take into account the profitability of the business	Applicable, allows you to estimate the cost of equity, taking into account the market value of assets and liabilities
2. Liquidation value method	Implemented to evaluate the bank in the liquidation of the banking business, does not take into account the profitability of the business	Applicable when it is impossible to fulfill one's obligations to counterparties
3. Deal method 4. Capital market method	Used when there is an active market and a sufficient number of comparables	Not applicable due to high volatility in the markets: in the event of a panic, the value of shares in open trading may decrease by up to 50%
5. Discounted cash flow method	Applicable for banks with unstable growth rate	Applicable for assessing business prospects under external uncertainty
6. Dividend discount method	Applicable for banks with unstable growth rates	Not applicable, as the payment of dividends during a crisis period can be significantly reduced or completely canceled
7. Direct capitalization method	Applicable for large, stable banks from the TOP 20 or for a credit institution with stable growth rates	Not applicable as there is no confidence in stable future growth rates
8. Gordon growth model	For the Gordon growth model, the condition of constant growth rate (g) is necessary, the discount rate (r) must be greater than g	Applicable to calculate the cost in the post-forecast period of time within the framework of the discounted cash flow method
9. EBO model (E.O. Edwards, P.W. Bell, J.A. Ohlson)	Applicable to the valuation of a bank with adjustments. The model combines income and cost approaches to valuation. The advantage of the method is the possibility of forecasting not an absolute indicator of profit, but a relative indicator of the profitability of the company's advanced capital. Disadvantage — discrepancies in the valuation of the bank's net assets	Partially applicable, as up-to-date forecasts of macroeconomic indicators of the banking sector are needed

Source: developed by the authors.

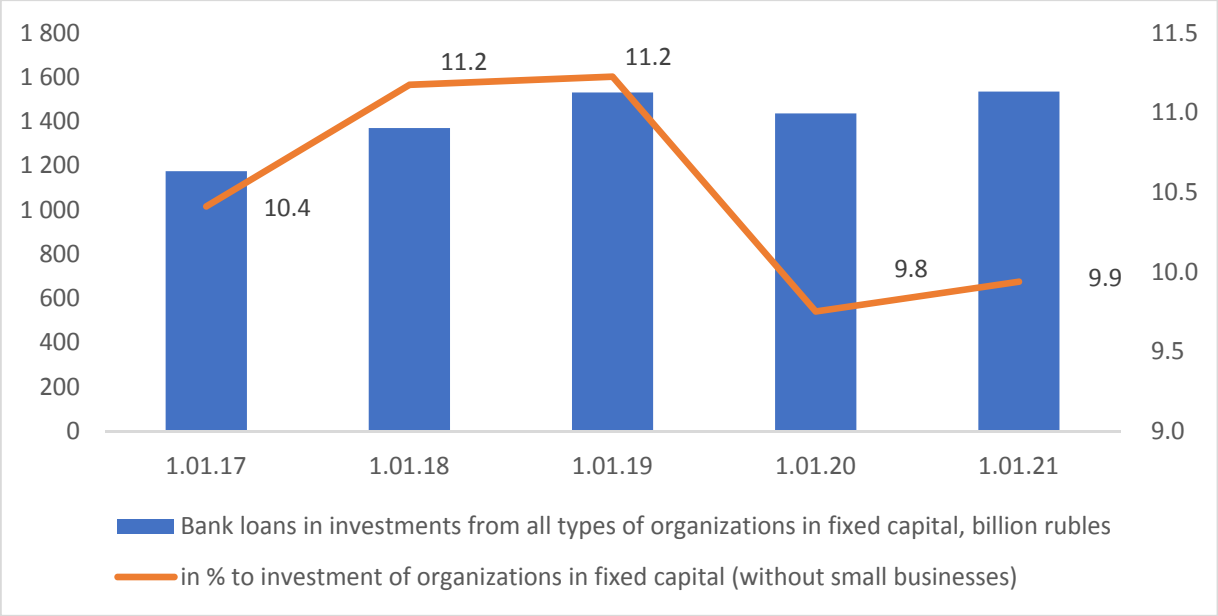

Fig. 2. **Bank loans in investments of organizations of all forms of ownership in fixed assets (excluding SMEs), billion rubles**

Source:compiled by the author according to the Central Bank*.

* Statistical indicators of the banking sector No. 233. March 2022. URL: https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcbr.ru%2FCollection%2FCollection%2FFile%2F39835%2Fobs_233.xlsx&wdOrigin=BROWSELINK (accessed on 21.03.2022).

In a study by Ken-Yien Leong [14], devoted to the valuation of bank shares in developed countries, it is noted that the best result in valuation is given by a comparative approach (capital market method, P/E multiplier). However, the capital market method is not applicable in an environment of high stock price volatility. The excellent predictive power of the discounted cash flow method (FCFE) was also noted).

In order to justify the business prospects of a commercial bank, it is necessary to identify financial and non-financial factors that have a significant impact on cash flows. This is especially true of external factors, since they are the most difficult to forecast for the formation of forecasts of future activity.

Correlation-regression analysis tools are used to assess and model the influence of external factors, which makes it possible to statistically substantiate this influence.

RESULTS AND DISCUSSION

The country's financial sector retained the significant potential for further growth in the medium term, as the level of financial intermediation remains relatively low. Many companies continue to invest primarily through retained earnings rather than bank lending (*Fig. 2*).

Banks dominate the financial system, while non-bank financial institutions remain underdeveloped but are gradually gaining importance. It is also worth noting that the country's banking sector is significantly consolidated, with 9 banks accounting for 75.37% of total assets (*Table 2*).

The lack of institutional investors is holding back the development of private sector investment and equity markets. According to the Central Bank of the Russian Federation, in 2020 the market share of banks in terms of assets amounted to 82%, the rest was almost equally distributed between insurance, pension funds, mutual funds, and individual investments through brokerage companies.[7]

Russian banks have been hit by the 2020 pandemic, but not as badly as in many other

[7] Industry report Financial services Russia 1 quarter 2022, Economist Intelligence Unit. URL: https://www.emis.com/ (accessed on 24.03.2022).

Table 2

Total assets and shares of credit institutions

No.	Bank	Type of business model	Volume of assets as of 01.02.2022, thousand rubles	Share of total banking sector assets, %
1	Sber	Universal	38,368,756,022	31.48
2	VTB	Universal	19,500,995,348	16.00
3	Gazprombank	Universal	8,705,774,216	7.14
4	National Clearing Center	Non-bank credit institution	6,354,963,312	5.21
5	Alfa Bank	Universal	6,003,928,854	4.93
6	Russian Agricultural Bank	Industrial	4,099,242,428	3.36
7	Credit Bank of Moscow	Universal	3,604,988,677	2.96
8	Bank Otkritie	Universal	3,293,166,258	2.70
9	Sovcombank	Universal	1,936,403,488	1.59

Source: calculated by the authors according to kuap.ru*.

* Information resource of banking analytics. URL: https://kuap.ru/banks/ranks/ (accessed on 23.03.2022).

countries. According to the IMF, industry profits fell by 5.8% to 1.6 trillion rubles ($ 21.7 billion). Net interest income increased by 8.4% to 3.2 trillion rubles, while non-interest income increased by 11.2% to 2.9 trillion rubles. Operating expenses grew moderately, by 4.4%, to 2.4 trillion rubles. The main reason for the decrease in profits was provisioned for possible losses on loans, which increased by 39.7% to 1.8 trillion rubles.[8]

The aggravation of the geopolitical situation and the imposition of US and European sanctions threaten the planned positive growth rates. According to Frank's media[9] estimates, the country's GDP in 2022 may fall to 10%, unemployment to rise to 12%, and the banking sector will need additional capitalization by 5–6 trillion rubles. According to the Central Bank's,[10] consistent forecast, GDP will fall to 8%, inflation may accelerate to 20%. Discrepancies in expert forecasts are common, especially when the uncertainty is very high.

The deterioration of macroeconomic indicators against the background of the aggravation of the geopolitical situation will lead to a significant decline in the banking industry. However, in order to understand the order of numbers based on the results of the correction, it is necessary to classify external and internal factors that affect cash flows and, thus, form the fundamental value of a commercial bank.

[8] Industry report Financial services Russia 1 quarter 2022, Economist Intelligence Unit. URL: https://www.emis.com/ (accessed on 24.03.2022).

[9] Announcement. URL: https://www.kommersant.ru/doc/5240055 (accessed on 24.03.2022).

[10] Central Bank of the Russian Federation. URL: https://cbr.ru/statistics/ddkp/mo_br/ (accessed on 24.03.2022).

Table 3

Fundamental value factors of a commercial bank

External	Internal	
	Financial	**Non-financial**
Regulatory requirements for minimum capital adequacy, liquidity ratios, etc.	Total assets (including loan portfolio)	Client capital [20]
Level of competition	Effective interest rates on interest bearing assets and liabilities	Human Capital [20]
Changing customer preferences	Operating expenses	Intellectual property
Pandemic restrictions	Cost of risk by loan products / lending segments	Management concepts
Sanction restrictions	Write-off rates for the loan portfolio by loan products / lending segments	Level of digital maturity (information systems)
Key rate	Integral risk level	Systemic significance
MOSPRIME 3M, 6M	Loan portfolio quality	Corporate culture
GDP growth rate	Business model type	Management processes
Ruble inflation, wage growth index		Network Relations
Rate of exchange		Financial connections
Yield of bonds of Russian issuers		
US Treasury yield		
US dollar inflation		
The volume of total assets, loans and deposits in the banking sector		

Source: developed by the authors.

The study of O. N. Salmanova [15] explores the relationship of multipliers (P/E, P/BV) with the fundamental indicators of commercial banks (the growth rate of profit and risk in the form of a coefficient). However, this is not enough to understand the growth drivers. In separate works, cost factors of intracorporate management are considered — remuneration of the board of directors[11] [16], brand [17], diversification

[11] In this case, the share price is used as a regressor. It is important to note that the share price is not the market value, but the basis for determining the market capitalization of the company.

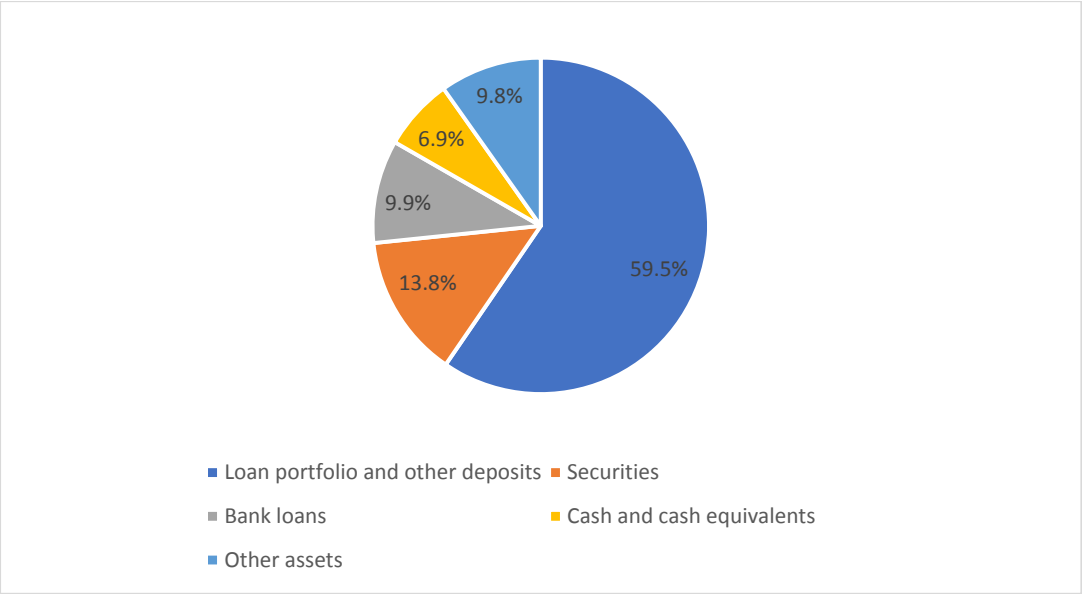

Fig. 3. **Structure of assets of credit institutions grouped by areas of investment, % (as of February 1, 2022)**

Source: calculated by the authors according to the Central Bank*.

* Statistical indicators of the banking sector No. 233. March 2022. URL: https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcbr.ru%2FCollection%2FCollection%2FFile%2F39835%2Fobs_233.xlsx&wdOrigin=BROWSELINK (accessed on 21.03.2022).

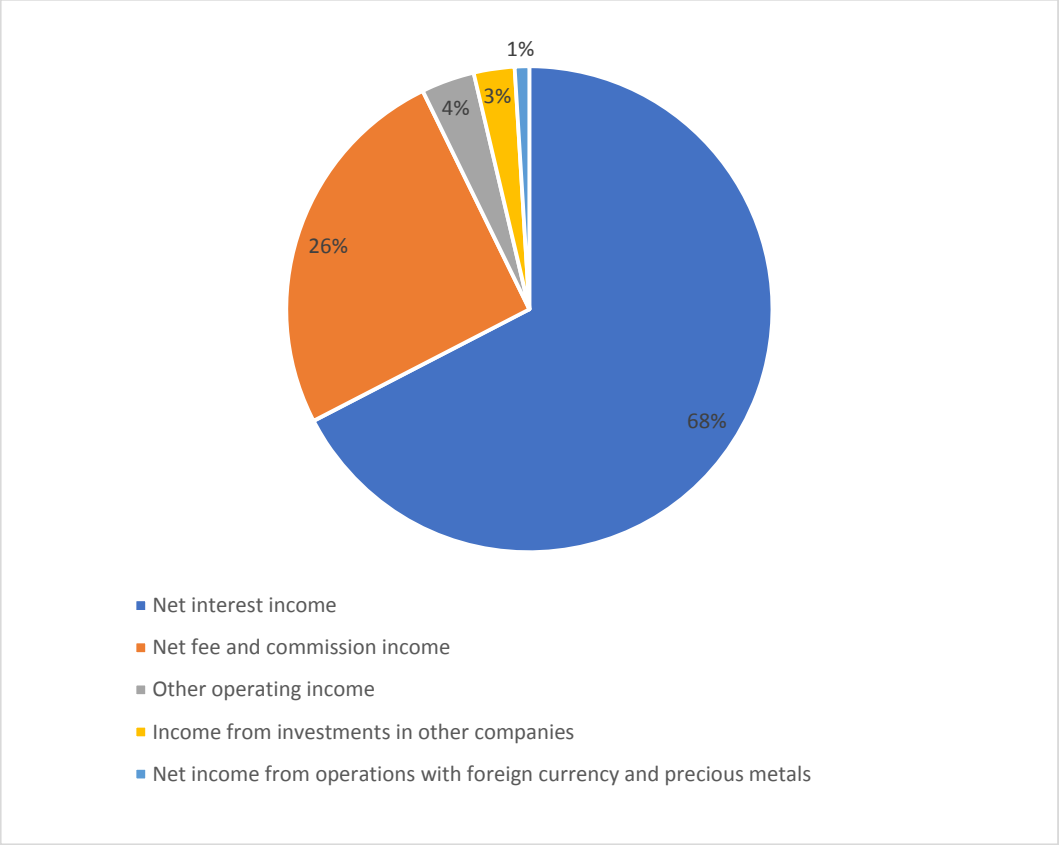

Fig. 4. **Income structure of operating credit institutions (% of total income for 2021)**

Source: calculated by the authors according to the Central Bank.

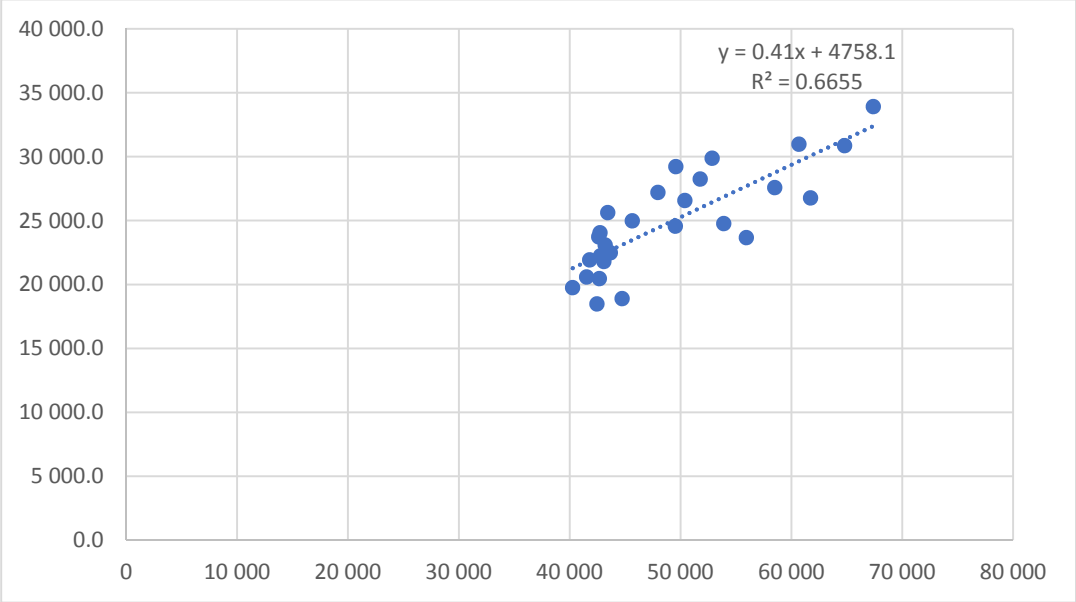

Fig. 5. **Graph of the dependence of the loan portfolio (billion rubles, abscissa axis) and GDP, (billion rubles, ordinate axis)**

Source: calculated by the authors.

of the loan portfolio [18], and quality of the loan portfolio [19].

All key factors of the bank's value can be classified as follows (*Table 3*).

The main source of income for a commercial bank is interest income from performing assets, which are represented by a loan portfolio (69.4%), debt investment securities available-for-sale and held-to-maturity (13.8%), and other assets, if they generate interest income (*Fig. 3*). Another source is non-interest income, which is represented by commissions, transactions with securities, foreign exchange, and precious metals.

Accordingly, the structure of income of credit institutions is dominated by interest income at 68% (share of net interest income in 2021), fee and commission income received from credit and other services is 26%, and other income accounts for only 7% (other operating income, investment income to other companies, net income from operations with foreign currency and precious metals) (*Fig. 4*).

Thus, the operating cash flow (income and expenses) of the bank depends on the *balance sheet.*

In this regard, in order to calculate the free cash flow of a bank, it is first necessary to predict its balance sheet.

In assets, balance sheet items are divided into two categories: items that are forecast as **a percentage of total assets,** и статьи, *and items that are* ***forecast based on other indicators.***

First, items that are not based on total assets are calculated:

a) cash and cash equivalents (projected as a share of customers' current accounts):

cash and cash equivalents = current accounts of the bank's customers × share of cash and cash equivalents in current accounts of customers;

b) required reserves in the Central Bank — are forecasted as a share of total liabilities, except for funds of the Central Bank, subordinated loans, and other liabilities. Typically, this proportion is projected to be constant at the historical level:

required reserves in the Central Bank =
= [total liabilities — (funds of the Central Bank +
+ subordinated loan + other liabilities)] ×
× share of required reserves in the corresponding liabilities;

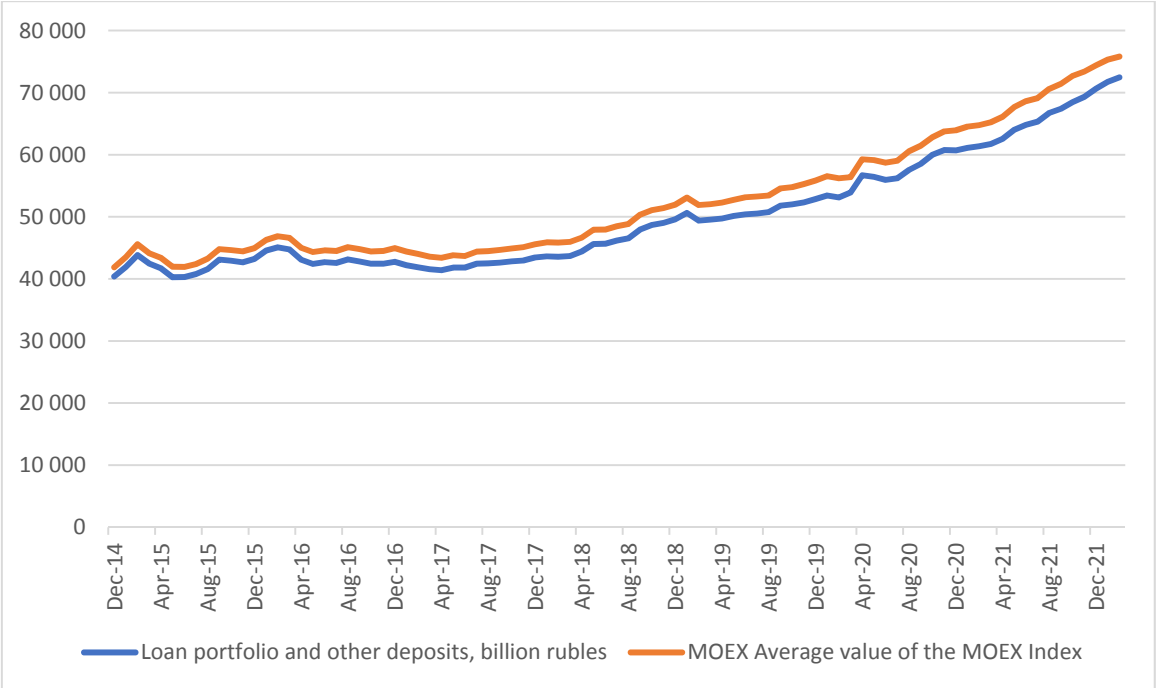

Fig. 6. **Dynamics of the loan portfolio of the banking sector (billion rubles) and the average value of the Moscow Exchange Index (basis points) for the comparable period**

Source: calculated by the authors.

c) loan portfolio:

loan portfolio = loan portfolio before impairment – allowance for loan impairment.

The value of the loan portfolio before impairment allowance can be predicted as a share of the volume of loans in the banking sector (market share), then the formula will look as follows:

loan portfolio before allowance for impairment of the loan portfolio = volume of the loan market × market share of the bank.

Corresponding shares are calculated separately for loans to legal entities and individuals or for smaller lending segments if management reporting and the bank's budget/strategy require such a breakdown. As a rule, the bank's market share is predicted based on its strategy or taken equal to the budget value / historical share.

In the absence of a loan market forecast, the loan portfolio before provisions is determined taking into account the growth rate of nominal GDP. Functionally, the volumes of the loan portfolio of the banking sector and GDP moderately correlate with each other, which is confirmed by the multiple correlation coefficient of 66% (*Fig. 5*). However, GDP is a consequence of investment activity and the result of active participation in this process of the banking sector.

The loan portfolio of the banking sector depends on the level of investment activity and the state of the economy as a whole. With a significant slowdown in economic growth and a decrease in investment activity, the assets of the banking sector are subject to correction.

Technically, it is difficult to use the expected GDP growth rates for the purposes of forecasting the loan portfolio, since, under external uncertainty, forecasts are often late and differ significantly from each other.

As indicators that may indicate a decrease in investment activity and problems in the economy, it is possible to use the Moscow

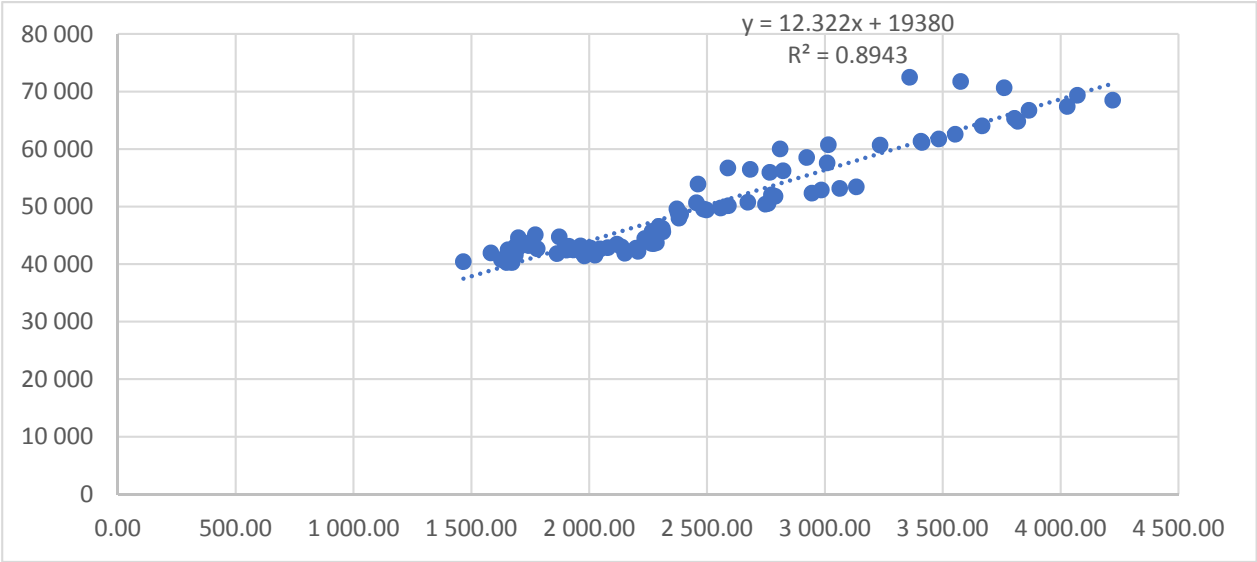

Fig. 7. **Relationship between the loan portfolio of the banking sector (ordinate axis) and the Moscow Exchange Index (abscissa axis)**

Source: calculated by the authors.

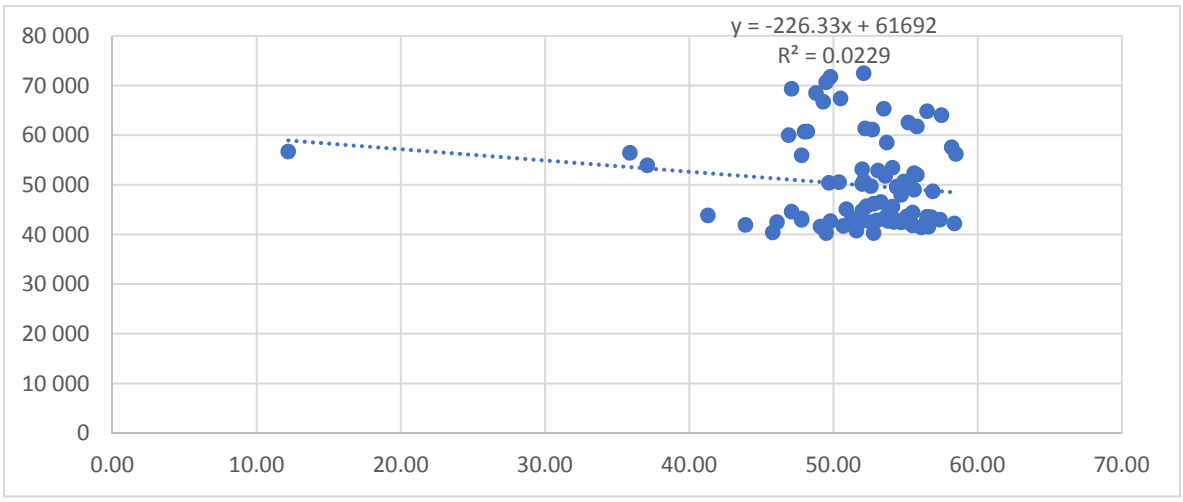

Fig. 8. **Relationship between the loan portfolio of the banking sector (ordinate axis) and the PMI index (abscissa axis)**

Source: calculated by the authors.

Exchange index and PMI[12] in the services sector. PMI is formed based on the results of a survey of purchasing managers and reflects the idea of the further movement of key macroeconomic indicators. The index can take a value from 0 to 100. Values above 50 mean an increase in business activity compared to the previous month, and less means a recession.

The relationship between total assets and the bank loan portfolio with the Moscow Exchange index is logical since the loan portfolios and shares of the largest banks are also concentrated in the largest public companies that are part of the index.

To confirm the hypothesis about the relationship between the indicators, we collected

[12] Announcement. Purchasing Managers Index. URL: https://quote.rbc.ru/news/training/5b155fc59a79473b856de349 (accessed on 21.03.2022).

Table 4

Conclusion of the results of the regression analysis of the influence of the Moscow Exchange Index on the loan portfolio of the banking sector

Indicator	Coefficients	Standard error	t-statistics	P-value
Y-intersection	19380.18	1183.209042	16.37933446	5.00333E-28
*X*1 (MOEX Index)	12.32195	0.459510104	26.81540982	3.05513E-43
Regression statistics				
Multiple *R*	0.945668			
R-square	0.894287			
Normalized *R*-square	0.893044			
Standard error	2939.064			
Observations	87			

Source: calculated by the authors.

data on the loan portfolio of the banking sector,[13] monthly averages of the Moscow Exchange index[14] and PMI in the service sector for the period from 2014. *Fig. 6* shows the dynamics of the Moscow Exchange index and the volume of the loan portfolio of the country's banking sector.

The coefficient of determination between the Moscow Exchange Index and the volume of the loan portfolio is 89%, which indicates a close relationship between these indicators (*Fig. 7*).

The loan portfolio has no connection with the PMI indicator (determination coefficient 2.29%) (*Fig. 8*).

To describe the statistical significance of the Moscow Exchange Index, we will use the "Data Analysis" — "Regression" toolkit in the MS Office package (*Table 4*).

Schematically, the banking sector loan portfolio forecasting model can be represented as formula (1):

$$Y = 19380.18 + 12.32195 \times X, \quad (1)$$

where Y — the projected value of the banking sector's loan portfolio, billion rubles; X — the average value of the Moscow Exchange Index for the period, basis points.

The reliability of the model is confirmed by the high *R*-squared value (determination coefficient) — 0.89. The *P*-value of the factor is not higher than 0.15, the *t*-statistic is higher than 2.

Similarly, the total assets of the banking sector are significantly interconnected with the Moscow Exchange Index (*Fig. 9*).

To describe the statistical significance of the Moscow Exchange Index with total assets, we will use the "Data Analysis" — "Regression" toolkit in the MS Office package (*Table 5*).

Schematically, the forecasting model for the total assets of the banking sector can be represented as formula (2):

$$Y = 36128.15657 + 19.85289058 \times X, \quad (2)$$

where Y — the forecast value of the total assets of the banking sector, billion rubles; X — the

[13] Overview of the banking sector of the Russian Federation. Statistical indicators. Central Bank of the Russian Federation. 2022. No. 233. URL: https://cbr.ru/statistics/bank_sector/review/ (accessed on 21.03.2022).

[14] Information and analytical system Cbonds. URL: www.cbonds.ru (accessed on 21.03.2022).

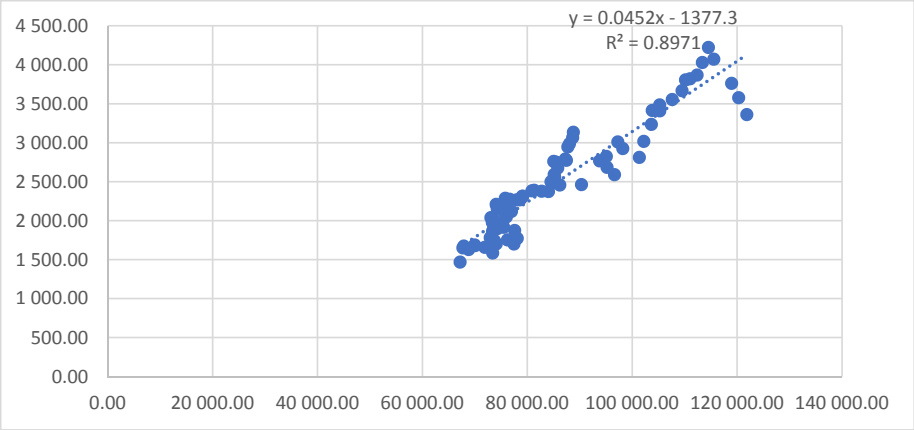

Fig. 9. **Relationship between the total assets of the banking sector (ordinate axis) and the Moscow Exchange Index (abscissa axis)**

Source: calculated by the authors.

Table 5

Conclusion of the results of the regression analysis of the influence of the Moscow Exchange Index on the total assets of the banking sector

Indicator	Coefficients	Standard error	t-statistics	P-value
Y-intersection	36128.15657	1877.614077	19.24152413	1.01142E-32
*X*1 (MOEX Index)	19.85289058	0.72918868	27.22599944	9.59202E-44
Regression statistics				
Multiple *R*	0.947167459			
R-square	0.897126195			
Normalized *R*-square	0.895915915			
Standard error	4663.950346			
Observations	87			

Source: calculated by the authors.

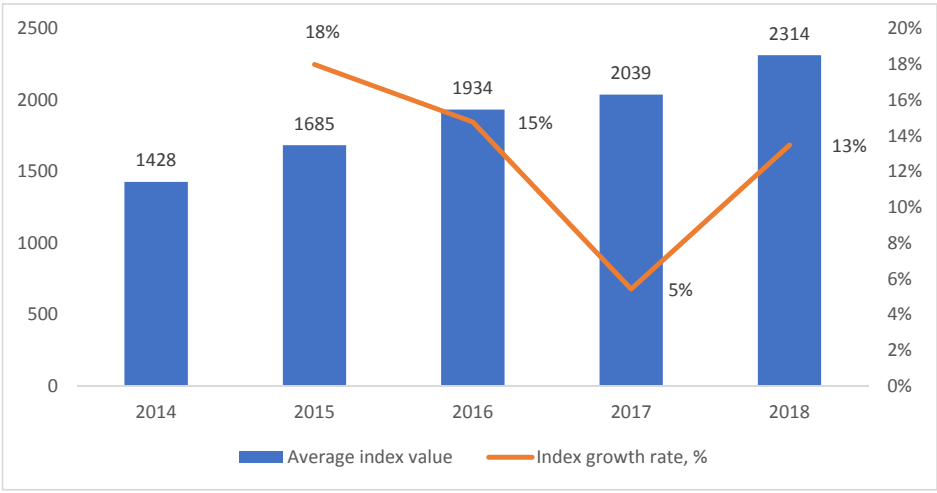

Fig. 10. **Ретроспективные средние значения индекса Московской биржи / Retrospective average values of the Moscow Exchange Index**

Source: calculated by the authors.

Table 6

Forecast values of total assets and loan portfolio of the banking sector

Forecast of banking sector assets	2022	2023	2024	2025	2026
Model prediction					
Total assets of the banking sector, billion rubles	64,478	69,580	74,524	76,608	82,068
Banking sector loans, billion rubles	36,976	40,143	43,211	44,505	47,893
Probable scenario for the value of the MOEX Index	1428	1685	1934	2039	2314
Forecast by share of expected GDP					
Total assets of the banking sector, billion rubles	83,040	83,853	84,622	85,214	86,113
Banking sector loans, billion rubles	51,944	52,710	53,669	54,679	56,083
GDP, growth rate forecast, according to the Central Bank, %	–8.00	1.00	1.50	1.00	1.00
GDP forecast in absolute terms, billion rubles	98,012	98,992	100,477	101,482	102,497
Share of total assets of the banking sector in GDP,%	84.72	84.71	84.22	83.97	84.01
Share of banking sector loans in GDP, %	53.00	53.25	53.41	53.88	54.72

Source: calculated by the authors.

average value of the Moscow Exchange Index for the period, basis points.

Based on the results of the regression analysis, two models were obtained that make it possible to build an operational forecast of the total assets of the banking sector and lending volumes in the country based on the average value of the Moscow Exchange Index for the analyzed period.

The forecast is probabilistic in nature and many other factors are not taken into account. In a situation where the exchange has been closed for a long time, even such a leading indicator will not work at one point in time. However, when trading resumes, the level of asset prices and the prospects for further action will be determined.

In the situation of suspension of trading, as a basic assumption, the authors hypothesized

Table 7

Valuation of Sber using the DCF method (scenario based on the developed model)

Indicator	Calculation algorithm and data source	Forecast of indicators by years					
		2021 (fact)	2022	2023	2024	2025	2026
Balance figures							
Total assets of the banking sector, billion rubles	Model prediction		64,478	69,580	74,524	76,608	82,068
Banking sector loans, billion rubles	Model prediction		36,976	40,143	43,211	44,505	47,893
Share of PJSC Sberbank in total assets of the banking sector,%	Mean value since 2014	36	35	36	36	35	36
Share of PJSC Sberbank in credit assets, %	Mean value since 2014	40	43	43	43	43	42
Gross Loans, million rubles	Forecast of banking sector loans * share in loan assets	28,517,500	16,037,439	17,273,843	18,427,492	18,922,852	20,168,165
Share of loan portfolio provisions, % of loans, as of the date	Mean value since 2014	4.99	6.20	6.40	6.46	6.41	6.32
Allowance for possible losses on loans, million rubles	Gross Loans * Share of loan portfolio provisions, % of loans	–1,422,000	–994,478	–1,105,106	–1,190,634	–1,212,038	–1,275,611
Net loans, million rubles	Gross Loans – Allowance for Possible Loan Losses	27,095,500	15,042,960	16,168,737	17,236,858	17,710,814	18,892,553
Total assets, million rubles	**Total assets of the country's banking sector, million rubles × Share of Sberbank in total assets, %**	**41,165,500**	**22,808,259**	**24,749,694**	**26,552,687**	**27,105,825**	**29,223,952**
Deposits, million rubles	Bank loan portfolio / L/D ratio	28,312,400	15,730,499	17,319,773	18,538,616	19,060,438	20,349,706
LDR (Loans to Deposits Ratio, ratio of loans and deposits), %	Mean value since 2014	101	102	100	99	99	99
Total liabilities, million rubles	**Deposits + additional liabilities**	**35,521,000**	**18,867,608**	**20,979,459**	**22,960,046**	**23,714,830**	**25,972,430**
Equity capital, million rubles	**Fixed capital + retained earnings**	**5,645,000**	**3,940,651**	**3,770,236**	**3,592,640**	**3,390,994**	**3,251,521**
Liabilities and equity, million rubles	**Total Liabilities + Equity**	**41,166,000**	**22,808,259**	**24,749,694**	**26,552,686**	**27,105,824**	**29,223,951**
Performance results							
Net margin, (net interest income / loan assets), million rubles	Mean value since 2014	6.32%	6.36%	6.47%	6.66%	6.58%	6.49%
Net interest income, million rubles	Interest income margin, % × Average value of the loan portfolio for the two previous periods		1,417,498	1,078,281	1,189,455	1,229,499	1,269,290
Allowance for possible losses on loans, % loans for the period, million rubles	Allowance for possible losses on loans from P&L statement / Mean value of gross loans	125,271	397,250	319,085	214,929	218,316	226,897
Net interest income after the accrual of provisions, million rubles		1,676,729	1,020,249	759,196	974,526	1,011,183	1,042,393
Non-interest income, million rubles	Commissions and other income (% of the average loan portfolio in the retrospective period)	725,310	609,629	630,145	644,444	625,269	651,271
Revenue, million rubles		**2,527,310**	**2,027,127**	**1,708,426**	**1,833,899**	**1,854,768**	**1,920,561**
Non-interest expenses, million rubles	Retrospective average of the ratio of non-interest expenses to revenue before provisions for possible losses × Net interest income t + 1 + non-interest income t + 1		914,275	770,534	827,125	836,537	866,211
Write-off of assets, million rubles	% mean value in hindsight		–10,863	–8,457	–8,183	–7,597	–8,863
EBT (earnings before taxes), million rubles			**1,101,990**	**929,435**	**998,591**	**1,010,634**	**1,045,487**
Accrued tax, million rubles		288,590	230,831	194,687	209,173	211,695	218,996
Net income, million rubles		**1,089,141**	**871,158**	**734,748**	**789,419**	**798,939**	**826,491**
Calculation of cash flow equity							
Depreciation, million rubles	Fixed assets t – 1 × Depreciation rate	–	107,808	113,333	126,363	138,631	148,393
Capital expenditures, million rubles	% of revenue	–	–16, 693	–139,646	–146,660	–146,436	–152,742

Table 7 (continued)

Indicator	Calculation algorithm and data source	Forecast of indicators by years					
		2021 (fact)	2022	2023	2024	2025	2026
Sources (+), million rubles	[Total liabilities t] – [Total liabilities *t* – 1]	–	–1,130,164	2,111,851	1,980,587	754,784	2,257,600
Use (–), million rubles	[Net Loans t] – [Net Loans] *t* – 1	–	–12,052,540	1,125,777	1,068,120	473,957	1,181,739
Cash Flow Equity, million rubles		–	–3,259,351	1,694,510	1,681,589	1,071,961	1,898,003
Discount rate (*r*), %	W. Sharpe model [21]: *CAPM* (*r*) = *Rf* + β × *MRP* + *SCRP*	22.46					
Market return (*Rm*), %	Median annual return of the MOEX Index since 2013	15.87					
Risk-free rate of return (*Rf*), %	Median value of the MOSPRIME 3M rate since 2013[1]	8.31					
Market premium (*MRP*), %	(*Rm* – *Rf*)	7.56					
Systematic risk (β), fractions of a unit	$\beta = \frac{Cov(r_i, r_m)}{Var(r_m)}$ where *Cov*(r_i, *rm*) – the covariance of the return of the i-th asset ri (Sberbank shares since 2010) and the average market return rm (MOEX Index since 2010) *Var*(*rm*) – variation of the average market return rm	1.21					
Premium for the risk of external sanctions restrictions, %	We propose to apply a risk premium in the range of 0 to 5%, since no peace agreements have been reached and the risks of restrictions on the financial sector are high	5					
Discount factor	1 / (1 + *r*) ^ *n*		0.80	0.65	0.52	0.42	0.34
Current value of cash flow equity, million rubles	549939		–2661589	1129962	915692	476671	689202
Terminal value calculation (Gordon Growth Model)							
Terminal value (TV), million rubles	[EBT × (1 + g)] / K	3936627					
Capitalization rate (K), %	*r* – *g*	21.46					
Long-term income growth rate (g), %	Forecast of the Central Bank of the Russian Federation[2]	1					
Current value of the terminal value, million rubles	TC × discount factor of the last forecast period	1429467					
Calculation of the cost of equity							
Cost of equity, million rubles	Present value of cash flow equity + current value of terminal value	1979405					
Number of outstanding ordinary shares, million psc		21.5					
Fundamental value of 1 share, rub.		**92**					
Current price of 1 share on the market, rub. (as of 24.02.2022)		**130**					

Source: calculated by the authors.

[1] Information and analytical system Cbonds. URL: www.cbonds.ru (accessed on 21.03.2022).

[2] Central Bank of the Russian Federation. URL: https://cbr.ru/statistics/ddkp/mo_br/ (accessed on 20.03.2022).

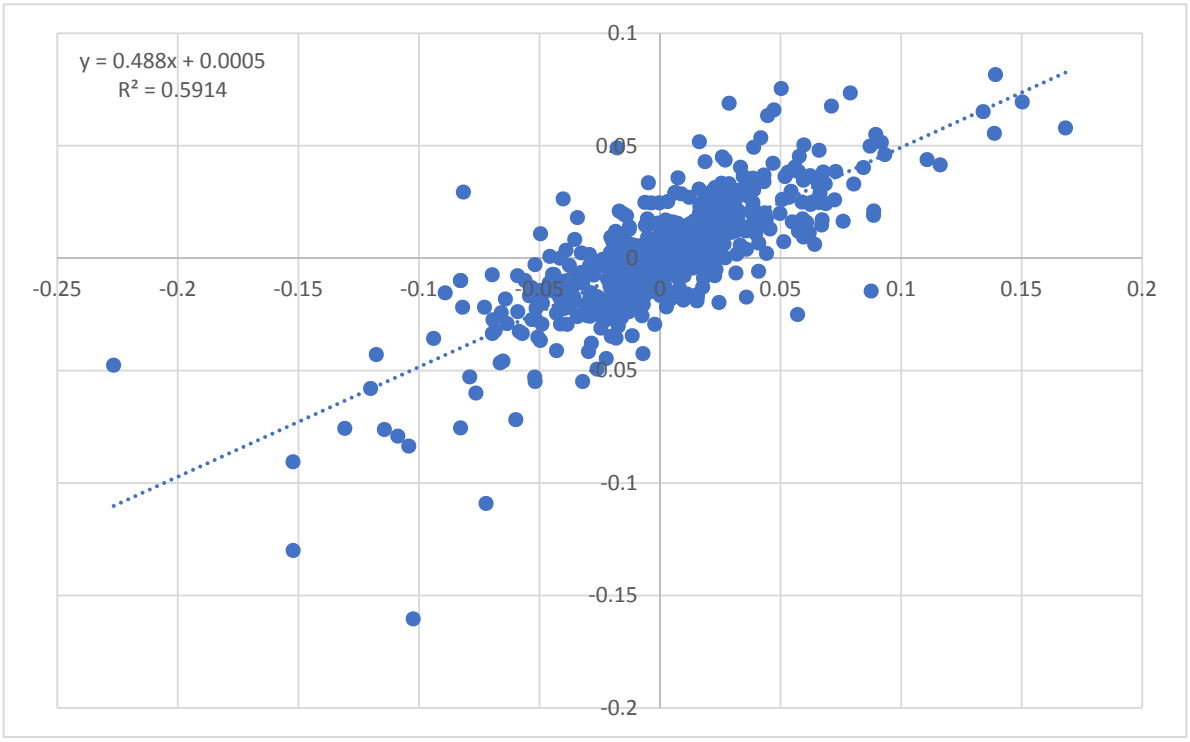

Fig. 11. **Scatter chart of the profitability of shares of Sberbank and the MOEX index (data from 2010 to 2020)**

Source: calculated by the authors.

that the Moscow Exchange Index could fall to the level of the 2014 crisis. Then the country faced sanctions for the first time. In 2014, the Moscow Exchange Index fell to 1428 points (*Fig. 10*). A slow recovery followed, with an average growth rate of 13% over six years.

If we project the current situation and the values of the index, then the forecast values of the total assets of the banking sector and the loan portfolio are expected to be as follows (*Table 6*).

Accordingly, if the Moscow Exchange Index for March falls to 1428, then the loan portfolio is expected to correct by 49%. Out of 72,460 billion rubles (February 2022) to 36,976 billion rubles with a confidence interval of +/– 5,761 billion rubles.

Under external uncertainty, the developed models give a more pessimistic forecast compared to the standard approach (shares of projected GDP), which will allow us to evaluate the total assets and loan portfolio of the banking sector and find the required value of the bank's assets are estimated through the bank's market share.

Let us test the developed model on the example of the assessment of Sberbank. The results of the calculation of the discounted cash flow (DCF) model are presented in *Table 7*.

The following assumptions were used in the calculations:

6) maintaining the position of the bank in the market of the banking system at a level not lower than the average values since 2014;

7) when calculating interest income, the average interest margin since 2014 was used, since the external assessment does not provide enough data to correctly justify interest rates for all segments of the portfolio;

8) the possible growth of problem debt in the portfolio is not taken into account, based on the fact that multiple increases in overdue debt can be avoided due to timely restructuring (according to the experience of the crisis years of 2014 and 2020);

9) cash flow equity;

10) the terminal value is calculated according to the Gordon growth model.

The measure of systematic risk (beta coefficient) was calculated based on the

statistics of the Sberbank share price and the Moscow Exchange Index since 2010 (*Fig. 11*).

Based on the results of calculating the value of Sberbank and the scenario of the developed model (*Table 6*), we can conclude that the fundamental value of Sberbank is 1,979,405 million rubles (92 rubles per share as of March 23, 2020, in the absence of trading, which does not allow tracking the current dynamics of the Moscow Exchange Index). In accordance with the scenario of expected GDP growth rates (agreed on the forecast of the Central Bank of the Russian Federation, the cost calculation is not given in the article), the fundamental value of Sberbank is 2,808,765 million rubles (131 rubles per share).

Practical approbation of the model for forecasting the total assets and loan portfolio of the banking sector based on the indicator — the Moscow Exchange Index allows us to conclude that this approach is suitable. However, in the conditions of the suspension of trading on the stock exchange, the model may give an error in forecasts, since it is based on the assumption about the dynamics of the index in past crisis periods. After the resumption of trading, the value of the stock index will be determined, which will make it possible to refine the forecast, adjust scenarios, and cost intervals and make the right investment decision. However, it is important to consider that the stock market will be regulated after the opening of trading and technically may even show growth in the short term. In this regard, it is important to use the average values of the index.

CONCLUSIONS

The valuation methodology is sufficiently developed and has a universal character. However, not all methods are applicable for evaluating credit institutions under external uncertainty, when there are difficulties in making forecasts. A significant problem for forecasting is external industry factors that affect the value of the bank.

The proposed method for forecasting the total assets of the banking sector and the loan portfolio will quickly justify a motivated judgment about the value range of the bank being evaluated. Models can reduce the labor costs of an external appraiser or investor when developing a financial model and generating scenarios when implementing the discounted cash flow method under external uncertainty.

The number of external factors is much larger and it is not always possible to assess their impact by linear regression. Customer behavior, new sanctions, and regulatory restrictions cannot be predicted. The modern Russian economy has never experienced such a shock before. Under such conditions, only a scenario approach will allow one to form a confidence interval and assess the margin of safety of the business model of a credit institution.

Separate attention deserves internal financial and non-financial factors, the impact of which must be studied separately since the considered approach to valuation does not allow building a system for managing the value of a commercial bank. These aspects will be considered in future studies.

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