# New Approach to the Prediction of the Structure of Liabilities in Commercial Organizations

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## Abstract

The crises occurring in the global economy, and the systemic transformations caused by them, require effective solutions in the process of financial management of commercial organizations. At the current stage, the price policy of attracting capital from the financial market has brought new problems to economic entities. It is obvious that in conditions of falling profitability, the financial resources attracted at a relatively high cost have a negative impact on the debt management of financial stability of organizations.

In professional literature and practical approaches to financial management, in the study of theoretical and practical materials, there are few approaches to effective control of the capital structure, in particular, the threshold limits for determining the preferred capital structure by branch need to be clarified.

In line with the development of the IT sector, in the context of the digitalization of the economy,there is a strong need and demand for such prediction approaches that provide an opportunity to obtain the desired information online. In the framework of this article, the development of a new approach to predicting the capital structure has become of primary importance, the scientific result of which is the determination of threshold limits for the main items of liabilities for a randomly selected commercial organization. The teaching model of prepredictionspital components as an effective way to improve financial management was considered the main goal of this article.

**Keywords:** Approach, Factors, Threshold Limits, Preferred Structure, Financial Management, Financial Resources, Commercial, Value, Prediction

## Introduction

The current economic reforms are regularly accompanied by crisis phases, so there is a need to predict the expected crises and take measures to prevent them. It is obvious that the ongoing crises are characterized by a change in the ratio of centers of influence in the world.

The characterization of crisis manifestations has been reflected in several studies. From that point of view, we emphasize the theory of investment portfolio management developed by (Markowitz,1952) according to which the prices of stocks included in the portfolio should depend on various economic and political factors.

The theory of asset valuation in capital markets (Capital Asset Pricing Market, CAPM), which was developed by (Sharpe,2014) and the liquidity factor was not emphasized.:

In the context of the continuity of the development of theoretical approaches, the theories of the formation of the preferred capital structure were put forward, which later served as the theoretical-methodological bases of debt burden management in commercial organizations. In this regard, the concept of agency costs is of key importance, according to which agency costs negatively affect the welfare of shareholders and reduce the value of the organization (Jensenet al. 1986) models are the most popular within this framework. In particular, the optimal capital structure in Schulz's model provides a balance between the tax burden and the debt burden costs. The theory of agency costs not only explains the nature and causes of disputes but also provides ways of resolving them.

(Kraus; Litzenberger1973) in their views noted that the increase in debt burden can lead to bankruptcy. They proposed an approach to determine the value of borrowed funds (leveraged) and only equity capital (non-leveraged) organizations.

In his research, (Warner,1977) came to the view that bankruptcy costs are still considered a determining factor of capital structure.

(Altman,1984) contributed to the determination of the indirect costs of bankruptcy and proposed approaches to assessing the probable risk of bankruptcy.

The researchers (Booth et al.2001) have tried to find out, if capital structure theory is portable across countries with different institutional structures. Analyzing the capital structure of companies in 10 developing countries, they found that decisions are influenced by the same variables as in developed countries.

(Frielinghaus et al. 2005) proposed their solution to the problem of correlation between the capital structure and the life stage of the organization, particularly proving that the debt burden in organizations differs significantly at the beginning and end of the life cycle.

Questions related to the role of the capital market in predicting the capital structure were addressed by (Berk, 2007)who researched the behavior of state and private corporations.

The impact of capital structure on the profitability of Islamic and conventional banks was investigated by (U Noureen, 2019): To assess the impact of capital structure, a regression analysis was performed using a fixed effects model. The results of the research show that the capital structure of both types of banks is the same, except for the size of the bank, which is significantly different. Furthermore, ROA is negatively correlated with the capital structure of both conventional and Islamic banks.

(Phung; Nguyen2022) addressed the issue of the impact of capital structure on the financial condition of pharmaceutical organizations. With the constructed regression model, they proved that financial leverage ratio (LR), long-term asset ratio (LAR), and debt-asset ratio (DR) have a positive relationship with the financial position of pharmaceutical companies, while self-financing (E/C)hurts equity. on return on investment (ROE).

The methods of regression and panel analysis gained primary importance in the presented approaches. However, we believe that in the current conditions, taking into account the development of information technologies, and innovations in the IT sector, new models of prediction training will be very important for forming a preferred capital structure in commercial organizations and for planning systemic financial management decisions. Within the framework of this article, taking into account the solutions provided within the financial management of the capital structure, we have proposed new solutions to form an efficient capital structure.

## Research Methodology

**1. The Main Variables Used in the Neural Network Being Buil**t:

In the proposed training model, the main value was the percentage of equity (Y1), the equity share in total liabilities (P1'), and the equity share of long-term loans and loans in total liabilities. (P2') short-term loans and the equity share of loans in total liabilities (P3), the equity share of trade and other accounts payable in total liabilities (P4), and the equity share of other stable liabilities in total liabilities (P5).In the proposed training model, the ratio of equity turnover as a percentage (Y1) was of paramount importance, as the determining factors were the equity/total liabilities*100 (H1) from long-term liabilities: (credits + loans). total liabilities*100 (H2)), of short-term liabilities: (loans + borrowings)/total liabilities*100 (H3), trade and other accounts payable/all liabilities*100 (H4), other stable liabilities/total liabilities*100 (H5).A neural network with structures 5 - 5 - 10 - 20 - 10 - 1 was created using the output variable Y1 and factors P1-P5 using the tensorflow package. The model has five layers between five input neurons and one output neuron. The activation function of each layer is sigmoid: the value of the output signal of k-th neuron located in the middle layers is determined by the ratio $\phi_k(x) = \frac{1}{1+e^{-x}}$, **(1),**,where $x = \sum_{i=1}^{m} w_{kj} x_j$, (2)

m - is the number of neurons in the previous "input" layer, Xj is the output signal of the j-th neuron of that layer, and $w_{kj}$s the weight corresponding to the link j -> k.

The problem of optimizing factor weights in the built-in training model is solved in the process of learning itself with the help of the gradient descent algorithm.In the constructive learning model, the optimization of factor weights during the training itself is decided by the gradient descent algorithm.Based on the input training data, the built and optimized model calculates the loss function during the program run. The mean square error is chosen as the loss function in the model. It should be noted that the data of the tested configuration does not participate in the process of optimization of the model, and education of the loss function. However, after each iteration, the test data is fed into the improved model, and the output of the model is compared with the corresponding magnitude of the already tested data; The model can constantly check for new training data.

### Stage 2: Input Data of the Model Being Built.

Table 1:Statistical database of the training model

| N | $H_1$ | $H_2$ | $H_3$ | $H_4$ | $H_5$ | $Y_1$ | $Y_1$ according to the model | RelAbsErrY1 in %s |
|---|---|---|---|---|---|---|---|---|
| **1** | 23.100 | 60.300 | 12.200 | 4.100 | 0.400 | **67.200** | **67.200** | **0.005** |
| **2** | 75.599 | 10.548 | 4.345 | 8.788 | 0.720 | **74.182** | **74.180** | **0.003** |
| **3** | 47.200 | 38.700 | 1.000 | 6.900 | 6.200 | **76.500** | **76.500** | **0.001** |
| **4** | 19.190 | 29.080 | 14.660 | 29.815 | 3.690 | **28.057** | **28.057** | **0.001** |
| **5** | 19.200 | 29.100 | 14.700 | 29.800 | 3.700 | **28.100** | **28.100** | **0.000** |
| **6** | 75.600 | 10.500 | 4.300 | 8.800 | 0.700 | **74.200** | **74.200** | **0.003** |
| **7** | 16.800 | 64.600 | 0.400 | 17.600 | 0.200 | **73.500** | **73.500** | **0.004** |
| **8** | 47.160 | 38.691 | 1.042 | 6.909 | 6.197 | **76.525** | **76.524** | **0.001** |
| **9** | 75.600 | 10.500 | 4.300 | 8.800 | 0.700 | **74.200** | **74.200** | **0.003** |
| **10** | 26.800 | 9.300 | 24.900 | 14.300 | 24.400 | **22.600** | **22.600** | **0.020** |
| **11** | 26.841 | 9.335 | 24.889 | 14.260 | 24.429 | **22.595** | **22.591** | **0.020** |
| **12** | 19.200 | 29.100 | 14.700 | 29.800 | 3.700 | **28.100** | **28.100** | **0,001** |
| **13** | 16.827 | 64.649 | 0.355 | 17.609 | 0.207 | **73.464** | **73.461** | **0.004** |
| **14** | 16.800 | 64.600 | 0.400 | 17.600 | 0.200 | **73.500** | **73.500** | **0.004** |
| **15** | 73.100 | 4.800 | 0.600 | 21.200 | 0,001 | **39.700** | **39.700** | **0.012** |

| N | $H_1$ | $H_2$ | $H_3$ | $H_4$ | $H_5$ | $Y_1$ | $Y_{1\ according\ to\ the\ model}$ | RelAbsErrY1 in %s |
|---|---|---|---|---|---|---|---|---|
| **16** | 75.599 | 10.548 | 4.345 | 8.788 | 0.720 | **74.182** | **74.180** | **0.003** |
| **17** | 28.600 | 57.900 | 0.400 | 12.600 | 0.200 | **82.700** | **82.700** | **0.003** |
| **18** | 19.190 | 29.080 | 14.660 | 29.815 | 3.690 | **28.057** | **28.057** | **0.000** |
| **19** | 30.400 | 55.300 | 6.600 | 7.700 | 0,001 | **74.400** | **74.400** | **0.011** |
| **20** | 73.100 | 4.800 | 0.600 | 21.200 | 0,001 | **39.700** | **39.700** | **0.012** |
| **21** | 16.827 | 64.649 | 0.355 | 17.609 | 0.207 | **73.464** | **73.461** | **0.004** |

The presented table 1 includes the main components of the liabilities of the organizations taught by us in terms of factors H1-H5. They are the input variables of the first layer of the neural network. The actual value of the output indicator, Y1, is entered in column 7, and the results already predicted as a result of model training are entered in column 8. Column 9 of the table presents the absolute values of the relative error in percentage terms.

Stage 3.Obtained test results for the outcome variable (Y1).

**Table 2:Outcome variable values by training model testing**

| N | $H_1$ | $H_2$ | $H_3$ | $H_4$ | $H_5$ | $Y_1$ | $Y_{1\ according\ to\ the\ model}$ | RelAbsErrY1 in %s |
|---|---|---|---|---|---|---|---|---|
| **1** | 27 | 9 | 25 | 14 | 24.4 | ***23*** | ***23*** | ***0.02*** |
| **2** | 23 | 60 | 12 | 4 | 0.4 | ***67*** | ***67*** | ***0.01*** |
| **3** | 47 | 39 | 1 | 7 | 6.2 | *77* | *77* | ***0.001*** |
| **4** | 30 | 55 | 7 | 8 | 0.002 | ***74*** | ***74*** | ***0.01*** |

In Table No. 2, we have presented the results of testing obtained with the training model. According to the factors H1-H5, it was possible to distinguish the lower and upper thresholds, which were respectively:

Lower threshold:

H1=23.07, H2=9.33, H3=1.042, H4=4.11, H5=0.002, Y1=22.6, Y1 according to the model=22,59 :

Upper threshold:

H1=47,15, H2=60.31, H3=24.89, H4=14.26, H5=24,42, Y1=76,52, Y1 according to the model=76.52:

According to the results of testing the trained model, the maximum relative error was 0.02%.

**Stage 4: In the fourth stage, we carried out a random selection testing** of organizations PJSC Rosneft Oil Company, PJSC Transneft Oil Company, PJSC BELUGA GROUP, RUSNANO JSC, PJSC "Magnit", PJSC LUKOIL,andPJSC TransContainer, the results of which we have presented in the table below.

**Table 3:Predictions of maincomponents of liabilities**

| | $H_1$ | $H_2$ | $H_3$ | $H_4$ | $H_5$ | $Y_1$ Factual | $Y_1$ Predicted |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| PJSC Rosneft Oil Company(2019) | 24.5 | 7.3 | 9.4 | 0.1 | 72.8 | 26.9 | 24.5 |
| PJSC Rosneft Oil Company(2018) | 23.2 | 6.1 | 9.0 | 0.1 | 73.9 | 27.1 | 23.2 |
| PJSC Transneft Oil Company (2019) | 50.0 | 7.2 | 19.1 | 2.6 | -23.1 | 31.0 | 50.0 |
| PJSC Transneft Oil Company(2018) | 53.6 | 8.6 | 19.2 | 0.4 | -27.3 | 30.2 | 53.6 |
| PJSC BELUGA GROUP(2019) | 40.7 | 10.5 | 3.9 | 0.2 | 38.7 | 26.2 | 40.7 |
| PJSC BELUGA GROUP(2018) | 24.5 | 6.7 | 8.6 | 0.4 | 45.5 | 22.7 | 24.5 |
| RUSNANO JSC (2019) | 51.6 | 1.0 | 0.8 | 4.9 | -189.2 | 30.7 | 51.6 |

| | $H_1$ | $H_2$ | $H_3$ | $H_4$ | $H_5$ | $Y_1$ Factual | $Y_1$ Predicted |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| RUSNANO JSC (2018) | 15.1 | 11.4 | 1.8 | 4.3 | -121.4 | 23.6 | 15.1 |
| PJSC “Magnit” (2019) | 12.6 | 6.8 | 17.0 | 7.8 | -19.5 | 29.4 | 12.6 |
| PJSC “Magnit” (2018) | 10.6 | 8.0 | 14.8 | 7.9 | -20.2 | 28.4 | 10.6 |
| PJSC “LUKOIL” (2019) | 8.4 | 2.8 | 8.4 | 0.5 | 39.2 | 21.5 | 8.4 |
| PJSC “LUKOIL” (2018) | 7.1 | 2.2 | 10.2 | 2.8 | 22.3 | 21.9 | 7.1 |
| PJSC TransContainer (2019) | 23.8 | 4.9 | 10.3 | 0.002 | 26.3 | 23.0 | 23.8 |
| PJSC TransContainer (2018) | 23.7 | 3.8 | 12.3 | 0.026 | 24.5 | 23.2 | 23.7 |
| "IN-VI" LLC (2018) | 41.52 | 47.47 | 0.001 | 10.55 | 0.46 | 83.14 | 29.67 |
| "IN-VI" LLC (2017) | 18.79 | 64.69 | 0.001 | 16.49 | 0.001 | 76.94 | 34.36 |
| "TIGRAN" Co.Ltd (2018) | 10.12 | 88.99 | 0.56 | 0.34 | 0.001 | 97.39 | 93.17 |
| "TIGRAN" Co.Ltd (2017) | 39.43 | 59.26 | 0.001 | 1.31 | 0.001 | 91.99 | 33.12 |
| "YEREVAN JEWELLERY PLANT” OJSC (2018) | 94.69 | 0.001 | 0.87 | 1.32 | 0.03 | 96.39 | 19.88 |
| "YEREVAN JEWELLERY PLANT” OJSC (2017) | 77.46 | 0.001 | 0.01 | 0.17 | 0.02 | 99.09 | 22.30 |
| "Haykakan atomayin electrakayan" (CJSC) (2018) | 30.89 | 46.96 | 0.51 | 0.001 | 0.001 | 71.99 | 34.86 |
| "Haykakanatomayinelectrakayan" (CJSC) (2017) | 44.48 | 27.97 | 0.33 | 3.00 | 0.001 | 79.38 | 30.10 |
| "EGA" Co.Ltd (2018) | -1.41 | 79.85 | 6.90 | 14.66 | 0.001 | 64.61 | 54.54 |
| "EGA" Co.Ltd (2017) | -52.40 | 121.77 | 0.001 | 30.63 | 0.001 | -185.79 | 99.00 |

In some of the Russian randomly tested organizations in 2018-2019, the analysis of the data of the financial reports revealed problems subject to regulation in the process of managing own current assets. In particular, there was a negative balance of own current assets in organizations PJSC Transneft Oil Company, RUSNANO JSC,andPJSC “Magnit”. The mentioned circumstance undermines the need to implement capital structural changes in terms of increasing the efficiency of financial stability and working capital management in these organizations.

Optimal solutions were predicted by the trainingpredicting model, especially for those organizations, “Transneft"PJSC, “RUSNANO” JSC, and “Magnit”PJSC, in which there were cases of unsecureability by own current assets.With the learning predicting model, effective options were obtained for “Transneft"PJSC, “RUSNANO” JSC, and “Magnit”PJSC, which are not supported by their own current assets.

For PJSC Transneft Oil Company on the Y1 line was predicted 30.22% in 2018 and 30.98% in 2019, 23.56% was predicted for RUSNANO JSC in 2018 and 30.66% in 2019, for PJSC “Magnit” organizationwas predicted 28.38% in 2018, , and in 2019 - 29.44%. For Tigran LLC in 2017 was predicted 33.12%, and for 2018 - 93.17%, for IN-VI LLC in 2017 was predicted 34.36%, and for 2018 - 29.67%, for Yerevan Jewelry Factory OJSC in 2017 was predicted. 22.30%, and in 2018 - 19.88%, for the organization Armenian Atomic Power Plant CJSC in 2017 was predicted 30.10%, and in 2018 - 34.86%, for the organization EGA LLC in 2017 was predicted 99.0%, and in 2018 - 54.54%. The obtained results will be considered effective strategic and tactical financial management decisions.

With the predicted values of the variable Y1(own current assets/current assets)*100, it is necessary to optimize and improve the structure of current assets and current liabilities as much as possible in PJSC Rosneft Oil Company, PJSC BELUGA GROUP, PJSC LUKOILandPJSC TransContainer. It is worth noting that organizations face such a problem in the conditions of attracting expensive credit funds, which makes it impossible to use a strategy of sustainable liabilities, emphasizing the role of accounts payable for purchases, advances received and loans provided by key partners.

It is obvious that in any commercial organization randomly selected by the built model, the target is the provision of the required positive amount of own current assets, which has its essential importance in the framework of the financial management strategy of the general state of the financial situation and, in particular, of the latter's components: financial stability, liquidity, and solvency, in the process of implementing mutually agreed and effective internal control, optimizing the structures of current assets and current liabilities.

## Stage 5. Input data

At this stage, the variable Y2, own current assets/equity)*100, was taught along with the liability coefficients H1-H5. We have presented the obtained estimates regarding the training of Y2, the indicator expressing the specific weight of own current assets in the equity capital, in table No. 4.

**Table 4:Ratio of own working capital to equity (Y2) training model testing results**

| N | $H_1$ | $H_2$ | $H_3$ | $H_4$ | $H_5$ | $Y_2$ | $Y_2$ according to the model | RelAbsErrY1 in %s |
|---|---|---|---|---|---|---|---|---|
| 1 | 29 | 58 | 0.4 | 13 | 0.2 | 221 | 220 | 0.4 |
| 2 | 19 | 29 | 14.7 | 30 | 3.7 | 98 | 98 | 0.1 |
| 3 | 17 | 65 | 0.4 | 18 | 0.2 | 299 | 298 | 0.4 |
| 4 | 30 | 55 | 6.6 | 8 | 0.0 | 136 | 136 | 0.3 |

In Table No. 4, we have presented the results of testing obtained by the training model. According to the factors H1-H5, it was possible to distinguish the lower and upper thresholds, which were respectively:

**Lower threshold**

H1=16,83, H2=29.08, H3=0.35, H4=7,69, H5=0.002, Y2=97,88, Y2 according to the model=97,81 :

**Upper threshold**

H1=30.39, H2=64.65, H3=14,66, H4=29,81, H5=3,69, Y2=298,95, Y2 according to the model=297,71:

According to the results of testing the trained model, the maximum relative error was also 0.02%.

Stage 6.At this stage, we have presented the results of the testing of commercial organizations tested by random selection obtained by the training model from the point of view of the Y2 result indicator. We presented the data in table No. 5.

**Table 5:Predictions made by the training model**

| | H1 | H2 | H3 | H4 | H5 | $Y_2$ Factual | $Y_2$ Predicted |
|---|---|---|---|---|---|---|---|
| PJSC Rosneft Oil Company (2019) | 38.6 | 24.5 | 7.3 | 9.4 | 0.1 | 155.1 | 297.2 |
| PJSC Rosneft Oil Company (2018) | 39.8 | 23.2 | 6.1 | 9.0 | 0.1 | 151.3 | 299.5 |
| PJSC Transneft Oil Company (2019) | 16.8 | 50.0 | 7.2 | 19.1 | 2.6 | -32.3 | 305.8 |
| PJSC Transneft Oil Company (2018) | 18.0 | 53.6 | 8.6 | 19.2 | 0.4 | -33.5 | 307.2 |
| PJSC BELUGA GROUP (2019) | 44.7 | 40.7 | 10.5 | 3.9 | 0.2 | 20.7 | 309.0 |
| PJSC BELUGA GROUP (2018) | 59.8 | 24.5 | 6.7 | 8.6 | 0.4 | 21.9 | 311.0 |
| RUSNANO JSC (2019) | 47.2 | 51.6 | 1.0 | 0.8 | 4.9 | -73.0 | 314.2 |
| RUSNANO JSC (2018) | 53.6 | 15.1 | 11.4 | 1.8 | 4.3 | -47.4 | 287.8 |
| PJSC “Magnit” (2019) | 19.9 | 12.6 | 6.8 | 17.0 | 7.8 | -26.0 | 197.0 |
| PJSC “Magnit” (2018) | 24.1 | 10.6 | 8.0 | 14.8 | 7.9 | -21.2 | 191.2 |
| PJSC LUKOIL (2019) | 71.3 | 8.4 | 2.8 | 8.4 | 0.5 | 13.0 | 311.3 |
| PJSC LUKOIL (2018) | 66.8 | 7.1 | 2.2 | 10.2 | 2.8 | 8.7 | 310.2 |
| PJSC TransContainer (2019) | 58.5 | 23.8 | 4.9 | 10.3 | 0.0 | 10.1 | 311.5 |
| PJSC TransContainer (2018) | 57.3 | 23.7 | 3.8 | 12.3 | 0.0 | 10.1 | 311.8 |

| | H1 | H2 | H3 | H4 | H5 | $Y_2$ Factual | $Y_2$ Predicted |
|---|---|---|---|---|---|---|---|
| "IN-VI" LLC (2018) | 41.52 | 47.47 | 0.001 | 10.55 | 0.46 | 130.82 | 313.8 |
| "IN-VI" LLC (2017) | 18.79 | 64.69 | 0.001 | 16.49 | 0.001 | 292.83 | 313.7 |
| "TIGRAN" Co.Ltd (2018) | 10.12 | 88.99 | 0.56 | 0.34 | 0.001 | 329.32 | 314.3 |
| "TIGRAN" Co.Ltd (2017) | 39.43 | 59.26 | 0.001 | 1.31 | 0.001 | 38.05 | 314.2 |
| "YEREVAN JEWELLERY PLANT" OJSC (2018) | 94.69 | 0.001 | 0.87 | 1.32 | 0.03 | 67.45 | 313.5 |
| "YEREVAN JEWELLERY PLANT " OJSC (2017) | 77.46 | 0.001 | 0.01 | 0.17 | 0.02 | 66.97 | 311.3 |
| "Haykakan atomayin electrakayan" (CJSC) (2018) | 30.89 | 46.96 | 0.51 | 0.001 | 0.001 | 48.88 | 312.2 |
| "Haykakan atomayin electrakayan" (CJSC) (2017) | 44.48 | 27.97 | 0.33 | 3.00 | 0.001 | 56.79 | 310.9 |
| "EGA" Co.Ltd (2017) | -52.40 | 121.77 | 0.001 | 30.63 | 0.001 | 38.00 | 313.4 |

According to the prediction model, according to the data in table 5, in organizations PJSC Rosneft Oil Company, PJSC Transneft Oil Company, PJSC BELUGA GROUP, RUSNANO JSC, PJSC "Magnit", PJSC LUKOIL, PJSC TransContainer, Tigran LLC (2017), Yerevan jewelry factory OJSC, Armenian atomic power plant CJSC, EGA LLC, there was an improvement in the current assets/equity ratio (Y2). According to the results of the built-in training prediction model, it is possible to adjust Y2 based on the proposed liability thresholds in randomly tested commercial organizations. It is practically feasible if the owners of the studied organizations are inclined to use the strategy of sustainable liabilities in the conditions of attracting long-term financial resources. It should also be noted that in the process of financial policy development in a specific commercial organization, from the point of view of priority, the solution to the problem of securing with own current assets can be realized in the case of interrelated harmonization of the components of the financial situation. According to the received prediction results, the proposed solutions from the perspective of the indicator of the provision of own current assets in percentage terms (Y1) fully correspond to the financial management strategy, but the solutions predicted from the perspective of Y2 need to be theoretically and practically evaluated.

Stage 7: Tested at this stage, the threshold limits of the main components of the liabilities are predicted with the actual values of the performance indicators Y1 and Y2 of the tested commercial organizations.

The search for quintuples (H1 - H5) corresponding to the pair Y1 and Y2 given by the training model is performed by the problem-solving using method. We presented the results obtained at this stage in table No. 6.

**Table 6:Prediction results of liabilities components H1-H5**

| | $H_1$ | $H_2$ | $H_3$ | $H_4$ | $H_5$ | $Y_1$ | $Y_2$ |
|---|---|---|---|---|---|---|---|
| **1** | 16.83 | 28.76 | 12.62 | 6.68 | 17.1 | 31.35 | 200.88 |
| **2** | 22.70457 | 58.66763 | 17.52893 | 11.82289 | 9.772629 | 31.43298 | 200.0472 |
| **3** | 16.83 | 40.72 | 10.17 | 22.1 | 7.33 | 31.34 | 200.49 |
| **4** | 22.7 | 10.82 | 2.81 | 14.39 | 19.54 | 31.85 | 200.9 |
| **5** | 22.7 | 22.78 | 0.35 | 29.81 | 9.77 | 31.84 | 200.51 |
| **6** | 22.70457 | 64.64867 | 22.43583 | 4.112093 | 12.21527 | 31.1581 | 200.9983 |
| **7** | 22.7 | 58.67 | 17.53 | 11.82 | 9.77 | 31.43 | 200.05 |
| **8** | 22.7 | 64.65 | 22.44 | 4.11 | 12.22 | 31.16 | 201 |
| **9** | 28.58 | 28.76 | 10.17 | 4.11 | 21.99 | 31.94 | 200.47 |
| **10** | 28.58 | 40.72 | 7.72 | 19.53 | 12.22 | 31.93 | 200.07 |
| **11** | 28.5817 | 28.76241 | 10.16858 | 4.112093 | 21.98586 | 31.94391 | 200.4658 |
| **12** | 28.58 | 58.67 | 10.17 | 27.24 | 4.89 | 31.65 | 200.63 |
| **13** | 34.46 | 22.78 | 0.35 | 24.67 | 17.1 | 31.5 | 200.1 |
| **14** | 28.5817 | 40.7245 | 7.715127 | 19.5337 | 12.21527 | 31.93216 | 200.0746 |

| | $H_1$ | $H_2$ | $H_3$ | $H_4$ | $H_5$ | $Y_1$ | $Y_2$ |
|---|---|---|---|---|---|---|---|
| **15** | 40.34 | 46.71 | 12.62 | 6.68 | 21.99 | 31.32 | 200.61 |
| **16** | 28.5817 | 58.66763 | 10.16858 | 27.2445 | 4.887338 | 31.65106 | 200.634 |
| **17** | 40.34 | 58.67 | 10.17 | 22.1 | 12.22 | 31.31 | 200.22 |
| **18** | 46.21 | 28.76 | 2.81 | 14.39 | 24.43 | 31.82 | 200.64 |
| **19** | 34.45884 | 22.78136 | 0.354777 | 24.67423 | 17.10056 | 31.50305 | 200.0963 |
| **20** | 46.21 | 40.72 | 0.35 | 29.81 | 14.66 | 31.81 | 200.25 |
| **21** | 52.09 | 64.65 | 12.62 | 11.82 | 19.54 | 31.63 | 200.76 |

Table No. 6 shows quintessences of liabilities corresponding to the ranges Y1 ε [30;31], and Y2 ε [200;201]. The irrigation prediction model allows for periodic revision of the intervals of the (Y1,Y2) pair, which further enhances the dynamic property of the model.

We have presented the results suggested by the inverse prediction model of the pair (Y1,Y2) for those randomly tested from the investigated organizations. For the pair (Y1,Y2), the following condition was adopted: y1 >= 20.173225 y2 >= 34.5452637.

**Table 7:Proposed threshold limits for the main components of liabilities**

| **Company Name** | | H1 | $H_2$ | $H_3$ | $H_4$ | $H_5$ |
|---|---|---|---|---|---|---|
| PJSC Rosneft Oil Company 2018-2019 | | **Factual** | | | | |
| | | 38.6 | 24.5 | 7.3 | 9.4 | 0.1 |
| | | **Predicted** | | | | |
| | **max** | 66.8 | 64.7 | 10.2 | 20.8 | 14.7 |
| | **average** | 39.8 | 51.4 | 2.7 | 9.1 | 6.1 |
| | **min** | 19.8 | 25.8 | 0.4 | 4.1 | 0.0 |
| PJSC Transneft Oil Company 2018-2019 | | **Factual** | | | | |
| | | 17.4 | 51.8 | 7.9 | 19.2 | 1.5 |
| | | **Predicted** | | | | |
| | **max** | 52.1 | 64.7 | 20.0 | 29.8 | 24.4 |
| | **average** | 25.9 | 52.9 | 6.0 | 19.5 | 20.2 |
| | **min** | 16.8 | 22.8 | 0.4 | 4.1 | 7.3 |
| PJSC BELUGA GROUP 2018-2019 | | **Factual** | | | | |
| | | 52.2 | 32.6 | 8.6 | 6.3 | 0.3 |
| | | **Predicted** | | | | |
| | **max** | 31.5 | 64.7 | 21.2 | 29.8 | 24.4 |
| | **average** | 19.9 | 58.0 | 13.6 | 26.0 | 23.3 |
| | **min** | 16.8 | 34.7 | 5.3 | 13.1 | 18.3 |
| RUSNANO JSC 2018-2019 | | **Actual** | | | | |
| | | 50.4 | 33.3 | 6.2 | 1.3 | 4.6 |
| | | **Predicted** | | | | |
| | **max** | 40.3 | 64.7 | 18.8 | 29.8 | 24.4 |
| | **average** | 22.1 | 55.8 | 11.0 | 23.1 | 22.3 |
| | **min** | 16.8 | 31.8 | 4.0 | 8.0 | 14.7 |

| Company Name | | H1 | $H_2$ | $H_3$ | $H_4$ | $H_5$ |
|---|---|---|---|---|---|---|
| PJSC "Magnit" 2018-2019 | | **Factual** | | | | |
| | | 22.0 | 11.6 | 7.4 | 15.9 | 7.9 |
| | | **Predicted** | | | | |
| | **max** | 75.6 | 64.7 | 24.9 | 29.8 | 24.4 |
| | **average** | 54.9 | 50.2 | 6.8 | 24.3 | 21.0 |
| | **min** | 16.8 | 4.8 | 0.4 | 4.1 | 3.7 |
| PJSC LUKOIL 2018-2019 | | **Factual** | | | | |
| | | 69.0 | 7.8 | 2.5 | 9.3 | 1.7 |
| | | **Predicted** | | | | |
| | **max** | 25.6 | 64.7 | 21.2 | 29.8 | 24.4 |
| | **average** | 17.8 | 61.7 | 17.9 | 28.4 | 24.2 |
| | **min** | 16.8 | 49.7 | 13.9 | 23.4 | 22.0 |
| PJSC TransContainer 2018-2019 | | **Factual** | | | | |
| | | 57.9 | 23.7 | 4.4 | 11.3 | 0.014 |
| | | **Predicted** | | | | |
| | **max** | 28.6 | 64.7 | 20.0 | 29.8 | 24.4 |
| | **average** | 18.3 | 61.5 | 15.1 | 27.8 | 23.8 |
| | **min** | 16.8 | 46.7 | 10.2 | 19.5 | 19.5 |
| | | **Predicted** | | | | |
| | **max** | 28.58 | 64.65 | 22.44 | 29.81 | 24.43 |
| | **average** | 18.24 | 61.54 | 18.02 | 28.17 | 24.14 |
| | **min** | 16.83 | 46.71 | 12.62 | 22.10 | 21.99 |

## Conclusion

We proposed maximum, average, and minimum threshold limits for the main components of liabilities of commercial organizations randomly tested with a training model. It is important to regulate financial stability in the conditions of the actual capital structure, to improve the overall financial situation. From the final results obtained by the constructed training model, we justify that for the tested commercial organizations «НК «Роснефть», PJSC Transneft Oil Company, PJSC BELUGA GROUP, RUSNANO JSC, PJSC "Magnit", PJSC LUKOILandPJSC TransContainer, from the H1-H5 components of the liabilities, other things being equal, the increase of the specific weight of the equity capital and the involvement of long-term loans are highly important.

In particular, according to the tested organizations, according to the results of the last round, the preferred changes in terms of passive components are as follows:

- For «НК «Роснефть»- with the average values of the prediction compared to the actual data in 2018-2019, the increase of the equity capital ratio and the involvement of long-term loans are preferable.
- For PJSC Transneft Oil Company- with the average values of the prediction compared to the actual data, in 2018 it is preferable to increase the specific weight of equity capital, and in 2019, to increase the specific weight of equity capital and attract long-term loans
- For PJSC BELUGA GROUP - according to actual data in 2018-2019 it is preferable to raise long-term loans.
- For RUSNANO JSC- according to actual data in 2018-2019 it is preferable to raise long-term loans.
- For PJSC "Magnit"- according to actual data in 2018-2019 increasing the proportion of equity capital and raising long-term loans are preferable.
- For PJSC LUKOIL- according to actual data in 2018-2019 it is preferable to raise long-term loans.

- For PJSC TransContainer- according to actual data in 2018-2019 it is preferable to raise long-term loans.

When considering the issue of preference for long-term loans, it is advisable to carry out the restructuring of the capital structure, provided it does not harm the financial stability of the organization. If the main components of the liabilities reach the maximum threshold limit, it is possible to rebuild the financial stability in the current, short-term, and long-term perspectives in the tested arrangements.

**Recommended Among the Main Advantages of the Training Model**

- The results of each testing of the training model are included in the main database, which makes it possible to continuously expand the statistical sample dynamically.
- The training model applies to commercial organizations in any country and has no direct dependence on the currency of a specific country.
- With the training model, it is possible to predict the lower and upper, as well as the average threshold limits of the main components of the liabilities in the case of the pair Y1;Y2, and based on them to estimate the real possibilities of forming a preferred capital structure,
- With the training model, it is possible to identify the most important components of the liabilities corresponding to the life stage of the specific organization being tested.

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**Declarations**

Author declares that all works are original and this manuscript has not been published in any other journal.

## Reference

- A. Berk, (2007). The role of capital market in determining capital structure: Evidence from Slovenian public and private corporations. Acta Oeconomica, 57, 123-155.https://doi.org/10.1556/aoecon.57.2007.2.1
- Altman E. I., (1984) A further empirical investigation of the bankruptcy cost question. Journal of Finance. № 39(4). P. 1067-1089.https://doi.org/10.1111/j.1540-6261.1984.tb03893.x
- Booth, L., Aivazian, V., Demirguc-Kunt, A., &Maksimovic, V. (2001). Capital structures in developing countries. The Journal of Finance, 56, 87-130. doi:10.1111/0022-1082.00320
- Bottou, Léon, (2012)."Stochastic gradient descent tricks." Neural Networks: Tricks of the Trade. Springer Berlin Heidelberg, 421-436.https://doi.org/10.1007/978-3-642-35289-8_25
- Frielinghaus, B. (2005). Mostert and C. Firer. Capital structure and the firm's life stage. S.Afr. J.Bus. Manage,36(4), pp 9-18.https://doi.org/10.4102/sajbm.v36i4.640
- Harris M., (1991). Raviv A. The theory of capital structure. Journal of Finance. N 46. P. 297-355.https://doi.org/10.1111/j.1540-6261.1991.tb03753.x
- Jensen M. C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. The American Economic Review. Vol. 76. N 2. P. 323-329.
- Kraus A. A, (1973). state-preference model of optimal financial leverage / A. Kraus, R.H. Litzenberger. Journal of Finance. Vol. 33. P. 911-922.https://doi.org/10.1111/j.1540-6261.1973.tb01415.x
- Markowitz, H.M. (March 1952). "Portfolio Selection". The Journal of Finance. 7 (1): 77-91.https://doi.org/10.1111/j.1540-6261.1952.tb01525.x
- Quang Duy, (2022). PHUNG, Tai Cong NGUYEN. The Effect of Capital Structure on FinancialPerformance of

Vietnamese Listing Pharmaceutical Enterprises. Journal of Asian Finance, Economics and Business Vol 9 No 8 0001-0006. Pp. 329-340.

- Schultz, P. (2003). Psedo Market Timing and the Long-Run Underperformance of IPOs. The Journal of. Finance, Vol. LVIII, No. 2, 483-516https://doi.org/10.1111/1540-6261.00535
- Sharp, U.F. (2014). Investments. U.F. Sharp, G.D. Alexander, D.V. Bailey Per. from English. A.N. Burenina, A.A. Vasina. - Moscow: NITs INFRA-M, 2014. - XII, 1028 p
- U NOREEN (2019). Impact of Capital Structure on Profitability: A Comparative Study of Islamic and Conventional Banks of Pakistan: The Journal of Asian Finance, Economics, and Business. Volume 6 Issue 4. Pages.65-74.https://doi.org/10.13106/jafeb.2019.vol6.no4.65
- Vine S. (2009). Global financial crisis. - M.: Alpina Business Books, S. 272.
- Warner J.B., (1977). Bankruptcy cost: some evidence Journal of Finance. Vol. 3. Issue 2. P. 337-347.https://doi.org/10.1111/j.1540-6261.1977.tb03274.x