

# “Assessment of the impact of bank lending on business entities’ performance using structural equation modeling”

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# ASSESSMENT OF THE IMPACT OF BANK LENDING ON BUSINESS ENTITIES' PERFORMANCE USING STRUCTURAL EQUATION MODELING

## Abstract

The paper aims to assess the influence of bank lending on the performance of enterprises in the real sector. The relevance of the study for different countries, including Kazakhstan, Kyrgyzstan and Ukraine, is shown. Structural equation modeling of the impact of bank lending on the performance of enterprises in the real sector is carried out using Ukraine as an example. Six key indicators of real sector enterprises' performance for the period of 2007–2019 were selected as an information basis of the study. To assess the abovementioned impact, structural equation modeling was used, i.e., the Statistica program was selected as a software tool to evaluate the resulting model's adequacy and determine the level of statistical significance of its parameters. The obtained results prove that the business lending sector in Ukraine has significant potential for its development, which ultimately will have a positive effect on the efficiency of the real sector enterprises. Moreover, adopting a balanced state policy in the sector of corporate bank lending can give impetus to the development of the domestic sector of real production and help Ukrainian enterprises overcome the crisis caused by COVID-19.

## Keywords

evaluation, banks, loans, indicators, profitability, efficiency, structural modeling

## JEL Classification

D24, D25, G21

## INTRODUCTION

The cyclical nature of economic development, destabilization of national economies due to deepening globalization, global financial crises and, finally, the crisis caused by the SARS-CoV-2 coronavirus pandemic have led to a significant decline in business activity, which neither business entities nor government agencies worldwide were ready for (Strilets et al., 2020).

Developed countries direct significant amounts of financial and material resources to solve economic problems and support the business. They are saving their economies and supporting businesses through powerful government programs. For example, Germany is introducing one of the most extensive economic support programs for which almost 37% of its GDP is allocated. Italy plans to use 20% of GDP to counter the financial fallout from the pandemic. Unfortunately, there is no such opportunity in less developed countries (including Kazakhstan, Kyrgyzstan and Ukraine), so it is necessary to look for other funding sources that will help the economy and business get out of the crisis and ensure their development. Along with institutional factors that play a critical role in implementing economic reforms in

developing countries, the banking system can significantly impact the real economy. Therefore, bank lending as the only available source of additional financing for the real sector in Ukraine is becoming very important nowadays. Banks as socially responsible institutions can become active participants in the economic recovery process, which will allow them to achieve not only their own high commercial results, but also help stabilizing the socio-economic situation in the regions and preventing a sharp increase in unemployment due to business closures. Thus, bank lending to enterprises can be viewed as a means of overcoming the economic consequences of the coronavirus pandemic's restrictive measures and stimulating further economic growth in the country. It is necessary to intensify the banking sector's activities, the purpose of which should be to stimulate financial and economic activity by supporting business, which plays a key role in Ukraine's economy.

## 1. LITERATURE REVIEW

Studying the influence of bank lending on business development, especially on the real sector of the economy, has always been of interest to scientists.

Mamman and Hashim (2014) examined the impact of bank lending on economic growth in Nigeria. They analyzed the Nigerian economy's development for the period 1987–2012 and compared it with the volume of bank lending to the same period. The calculations allowed them to conclude the statistically significant impact of bank lending on Nigeria's economic growth. This suggests that bank lending has a significant impact on the performance of the Nigerian economy. Because of bank lending's strategic importance for economic growth, Mamman and Hashim (2014) called on Nigeria's federal government and the Central Bank of Nigeria (CBN) to strengthen the banking sector and stimulate business lending.

A similar study was conducted in 2015 by Pakistani scientists Tahir et al. (2015). They examined the relationship between bank lending and the private sector and Pakistan's economic growth. Economic growth was taken as a dependent variable, while bank credit to the private sector, interest rates, inflation, investment in GDP, and government consumption were used as independent variables. For the analysis, data from 1973 to 2013 were selected. The research results showed that bank credit had a significant relationship with economic progress; dependence was also significant in the short run. Regression analysis showed that bank credit hurt Pakistan's economic growth. However, such data on the impact of bank lending were obtained due to the existing restrictions and regulation of

interest rate on loans to businesses. These restrictions distorted the free capital market's economic incentives and distorted the impact of lending on businesses. As a recommendation, the authors proposed to liberalize the monetary policy in Pakistan.

Dzwigol et al. (2020) studied the role of investment and bank lending in developing the global value chain, including the assessment of bank lending impact on the real sector of the economy in different countries.

Allen et al. (2017) assessed the interaction of bank lending dynamics, bank ownership structures, and crises in Central and Eastern European banking systems. Using a database of more than 400 banks for 1994–2010, they determined that the ownership structure significantly affects its lending activities. Lending activities are associated with the presence or absence of crises in the economy. The uncontrolled lending activity of banks stimulates the emergence of crises in the country's economy, and a balanced credit policy at the state level, on the contrary, stimulates economic development.

Based on the abovementioned, the question arises about the impact of enhanced banking supervision on bank lending and, in turn, on commercial activity and its effectiveness. Granja and Leuz (2017) answered this question. They concluded that enhanced supervision could correct shortcomings in bank management and lending practices, leading to increased lending and reallocation of loans. The increase in lending, in turn, stimulates the growth of business efficiency.

Talimova and Kalkabaeva (2015), researchers from Kazakhstan, described the main trends

in bank lending to the real economy in the post-crisis period of 2008–2009 under the influence of certain macroeconomic factors. The authors conducted a comparative analysis of Kazakhstan's economic indicators and other CIS countries based on the IMF 2009–2013 statistics. The study identified the main obstacles to enhancing the interaction of credit banking and real sectors of the economy, such as unbalanced lending, short-term bank financing, high concentration of credit risk in the real economy, inefficient use of credit, high cost of credit, etc. The authors proposed measures to improve the lending activities of second-tier banks, such as subsidizing interest rates to finance socio-economic development priorities or administrative restrictions on raising interest rates, providing government guarantees for loans to the real economy, reducing the share of non-performing assets in banks' balance sheets, developing regional elements of the banking system, etc. In 2017, another group of Kazakh scientists (Katenova et al., 2017) empirically examined the causal relationship between the development of the financial and banking sectors and Kazakhstan's economic growth. For calculations, data from 20 banks operating in the period from 2006 to 2015 were used. The research results show that bank lending significantly affects the economic growth of Kazakhstan. At the same time, GDP also has a significant impact on bank lending. Thus, there is a mutual causal relationship between bank lending and the economy (GDP). Both the economy and the financial sector do have a positive and significant impact on each other.

Tovar-García and Kozubekova (2016) studied the market discipline in the banking system of Kyrgyzstan by examining dynamic panel models and a dataset with banking information from 23 banks over an eight-year period. They found that banks with higher capital and liquidity ratios charge higher interest rates on loans.

Yehorycheva et al. (2019) conducted a study to assess the adequacy of support for enterprises by the banking system of Ukraine and to find ways to increase banks' influence on the development of the real sector. The authors identified three stages in the growth of the company's fi-

ancial balance, each of which can be supported by appropriate banking services. Empirical analysis showed that Ukrainian banks successfully provided only the first stage, namely, balancing enterprises' liquidity. The authors conclude that both enterprises and the banking system's problems lie in developing and implementing state economic policy and are exacerbated by the National Bank of Ukraine's restrictive monetary policy.

Kuznichenko et al. (2018) enhanced the existing methodology for assessing banks' regulatory capital adequacy ratio to evaluate the impact of bank lending on the economy's real sector.

Rudevskaa and Khlan (2019) tested the hypothesis about the positive impact of banking sector development on a country's economic growth. The study identified the main channels of influence of the banking sector on the country's economy. Based on statistical data from the National Bank of Ukraine, the authors analyzed the dynamics of integration, inclusiveness and financial stability of the banking sector in Ukraine. It was revealed that the banking sector's state sub-adaptively affected the economic system's development as a whole. It was determined that the significant integration of the banking sector into the economy stimulated the rapid penetration of crisis phenomena geographically, structurally and subjectively.

Structural equation modeling of the impact of bank lending on the performance of enterprises in the real sector is important for different countries, including Kazakhstan, Kyrgyzstan and Ukraine. Despite numerous studies analyzing the impact of bank lending on business development, most authors focus on studying the impact of lending on the economy as a whole (analysis of macroeconomic indicators), and not on studying the impact of lending on business entities' financial performance and their capital structure.

## 2. AIMS

The paper is aimed at assessing the impact of bank lending on the performance of enterprises in the real sector using structural equation modeling.

### 3. DATA AND METHODS

To assess the impact of bank lending on the real sector enterprises' performance, structural equation modeling through the example of Ukraine was chosen. The use of this method allows validating the relationships between the selected elements of the system of structural equations. According to the selected method, calculations were carried out using the Statistica software, which made it possible to assess the resulting model's adequacy and determine the level of statistical significance of its parameters.

Six key indicators were identified as an information base for studying the relationship between the business lending sector indicators, the efficiency of business entities, and their capital structure: two for each element studied. Indicators of the non-performing loans (NPLs) in the banking sector, indicators of business entities' efficiency and indicators of the capital structure of business entities in Ukraine are presented in Table 1.

Statistical data on the indicators selected for structural equation modeling for 2007–2020 are given in Table 2. Data on the indicators of the average profitability of business entities, the volume of their income from sales, the weighted average cost of capital and the average coverage ratio are calculated based on data on the activities of TOP-200 enterprises in Ukraine.

**Table 1.** Factors (indicators) for analysis

Elements investigated	Symbol	Indicator corresponding to the symbol
Indicators of the business lending sector	CREDIT.VOLUME	Lending to business entities, UAH million
	INTEREST.RATE	The weighted average interest rate on loans to business entities, %
Business entities' performance ratios	PROFITABILITY	The profitability of business entities (average value), %
	INCOME.VOLUME	The volume of income of business entities (average), UAH million
Indicators of the capital structure of business entities in Ukraine	W.A.C.O.C (weighted average cost of capital)	Weighted average cost of capital of business entities, %
	COVERAGE.RATIO	Average coverage ratio

Since data for 2020 is only available for two indicators required for calculations, it was decided to use data for 2007–2019.

The factors in Table 2 are explicit endogenous variables for the model used to formalize the implicit variables *BUSINESS.LENDING*, *BUSINESS.EFFICIENCY*, and *CAP.STRUCTURE*.

The aim of the structural equation modeling is to assess the dependence of business entities' efficiency (*BUSINESS.EFFICIENCY*) on

**Table 2.** Statistical data for structural equation modeling

Source: National Bank of Ukraine (n.d.), Vinnichuk and Holovniiov (2020).

Year	Indicators					
	CREDIT.VOLUME	INTEREST.RATE	PROFITABILITY	INCOME.VOLUME	W.A.C.O.C	COVERAGE.RATIO
2007	260476	13.5	0.111	5185.85	11.595	1.96
2008	443665	16	0.131	6574.42	3.879	2.48
2009	462215	18.3	0.006	4985.91	1.999	2.78
2010	500961	14.6	0.090	7512.13	4.164	1.97
2011	575545	14.3	0.130	9866.79	7.862	2.94
2012	605425	15.5	-0.018	8710.56	8.024	2.06
2013	691903	14.4	0.085	8691.42	9.547	1.87
2014	778841	15	0.031	9949.65	6.275	1.94
2015	787795	17.5	-0.004	11868	10.587	1.43
2016	822114	15.9	0.058	13093.29	4.039	1.38
2017	829932	14.6	0.116	18089.37	2.995	1.37
2018	859740	16.1	0.035	17329.4	4.326	1.33
2019	744648	15.2	0.044	16981.65	3.452	1.41
2020	724157	10.4	-	-	-	-

**Table 3.** Normalized initial data for modeling

Year	Indicators					
	CREDIT. VOLUME	INTEREST. RATE	PROFITABILITY	INCOME. VOLUME	W.A.C.O.C	COVERAGE. RATIO
2007	0.000	0.000	0.868	0.015	1.000	0.391
2008	0.306	0.521	1.000	0.121	0.196	0.714
2009	0.337	1.000	0.163	0.000	0.000	0.901
2010	0.401	0.229	0.724	0.193	0.226	0.398
2011	0.526	0.167	0.997	0.372	0.611	1.000
2012	0.576	0.417	0.000	0.284	0.628	0.453
2013	0.720	0.188	0.692	0.283	0.787	0.335
2014	0.865	0.313	0.328	0.379	0.446	0.379
2015	0.880	0.833	0.094	0.525	0.895	0.062
2016	0.937	0.500	0.509	0.619	0.213	0.031
2017	0.950	0.229	0.901	1.000	0.104	0.025
2018	1.000	0.542	0.358	0.942	0.242	0.000
2019	0.808	0.354	0.413	0.915	0.151	0.050

the structure of their capital in Ukraine (*CAP.STRUCTURE*) and the state of the business lending sector (*BUSINESS.LENDING*); that is why *BUSINESS.EFFICIENCY* appears as an exogenic variable that depends on *CAP.STRUCTURE* and *BUSINESS.LENDING*.

Before starting calculations, it is necessary to normalize the selected initial data, since the chosen indicators have different values of the vectors  $X = (x_1, x_2, \dots, x_n)$  and they must be brought to a single scale (Table 3).

## 4. RESULTS AND DISCUSSION

After the computations, the assessment results were obtained (Table 4).

The rows of Table 4 correspond to the next path's record in the Path1 language; the columns show the estimations of the free parameter, standard errors, t-statistic values, and p-statistic significance levels. This table assesses the regression model parameters that relate to the *BUSINESS.EFFICIENCY*, *CAP.STRUCTURE* and *BUSINESS.LENDING* factors.

**Table 4.** Structural equation modeling results of the indicators' relationship

Record	Model estimates			
	Parameter estimate	Standard error	T statistics	Probabilistic level
( <i>BUSINESS.EFFICIENCY</i> ) – 1 → [ <i>PROFITAB</i> ]	-0.093	0.101	-0.921	0.357
( <i>BUSINESS.EFFICIENCY</i> ) – 2 → [ <i>INCOME.V</i> ]	0.313	0.095	3.292	0.001
( <i>DELTA1</i> ) → [ <i>PROFITAB</i> ]	–	–	–	–
( <i>DELTA2</i> ) → [ <i>INCOME.V</i> ]	–	–	–	–
( <i>DELTA1</i> ) – 3 – ( <i>DELTA1</i> )	0.112	0.046	2.436	0.015
( <i>DELTA2</i> ) – 4 – ( <i>DELTA2</i> )	0.021	0.036	0.577	0.564
( <i>BUSINESS.LENDING</i> ) → [ <i>CREDIT.V</i> ]	–	–	–	–
( <i>BUSINESS.LENDING</i> ) – 5 → [ <i>INTEREST</i> ]	0.164	0.254	0.645	0.519
( <i>CAP.STRUCTURE</i> ) → [ <i>W.A.C.O.</i> ]	–	–	–	–
( <i>CAP.STRUCTURE</i> ) – 6 → [ <i>COVERAGE</i> ]	3.596	4.812	0.747	0.455
( <i>EPSILON1</i> ) → [ <i>CREDIT.V</i> ]	–	–	–	–
( <i>EPSILON2</i> ) → [ <i>INTEREST</i> ]	–	–	–	–
( <i>EPSILON3</i> ) → [ <i>W.A.C.O.</i> ]	–	–	–	–
( <i>EPSILON4</i> ) → [ <i>COVERAGE</i> ]	–	–	–	–
( <i>EPSILON1</i> ) – 7 – ( <i>EPSILON1</i> )	0.000	0.000	–	–
( <i>EPSILON2</i> ) – 8 – ( <i>EPSILON2</i> )	0.074	0.030	2.449	0.014
( <i>EPSILON3</i> ) – 9 – ( <i>EPSILON3</i> )	0.101	0.042	2.425	0.015
( <i>EPSILON4</i> ) – 10 – ( <i>EPSILON4</i> )	0.039	0.065	0.599	0.549
( <i>ZETA1</i> ) → ( <i>BUSINESS.LENDING</i> )	–	–	–	–
( <i>ZETA2</i> ) → ( <i>CAP.STRUCTURE</i> )	–	–	–	–
( <i>ZETA1</i> ) – 11 – ( <i>ZETA1</i> )	0.013	0.031	0.416	0.677
( <i>ZETA2</i> ) – 12 – ( <i>ZETA2</i> )	0.000	0.000	–	–
( <i>BUSINESS.EFFICIENCY</i> ) – 13 → ( <i>BUSINESS.LENDING</i> )	0.287	0.086	3.340	0.001
( <i>BUSINESS.EFFICIENCY</i> ) – 14 → ( <i>CAP.STRUCTURE</i> )	-0.116	0.297	-0.391	0.696
( <i>BUSINESS.LENDING</i> ) – 15 → ( <i>CAP.STRUCTURE</i> )	0.143	0.903	0.159	0.8741

The structural equations system is presented as follows:

$$\left\{ \begin{array}{l} PROFITABILITY = -0.093 \cdot BUSINESS.EFFICIENCY + 0.112 \\ INCOME.VOLUME = 0.313 \cdot BUSINESS.EFFICIENCY + 0.021 \\ CREDIT.VOLUME = BUSINESS.LENDING + 0.000 \\ INTEREST.RATE = 0.164 \cdot BUSINESS.LENDING + 0.074 \\ W.A.C.O.C = CAP.STRUCTURE + 0.101 \\ COVERAGE.RATIO = 3.596 \cdot CAP.STRUCTURE + 0.039 \\ BUSINESS.LENDING = 0.287 \cdot BUSINESS.EFFICIENCY + 0.013 \\ CAP.STRUCTURE = -0.116 \cdot BUSINESS.EFFICIENCY + \\ \quad 0.143 \cdot BUSINESS.LENDING + 0.000 \end{array} \right. \quad (1)$$

It is necessary to provide the economic interpretation of all the equations of the above system and to assess the relationships between the latent variable *BUSINESS.EFFICIENCY* and the endogenous variables *PROFITABILITY* and *INCOME.VOLUME* (the first two equations of the resulting system of structural equations). With an increase in business efficiency by 1%, the profitability of business entities will decrease by 0.093%, the amount of income, on the contrary, will increase by 0.313%. That is, one can observe an inverse relationship between the latent variable *BUSINESS.EFFICIENCY* and the endogenous variable *PROFITABILITY*. It is not logical in terms of classical economic theory but fully reflects the economic conditions in Ukraine, when the most efficient enterprises try to evade taxation, showing minimal profits or even losses from their activities. On the contrary, there is a direct relationship between the latent variable *BUSINESS.EFFICIENCY* and the endogenous variable *INCOME.VOLUME*, because it is the net income indicator that most adequately indicates an increase in an enterprise's efficiency in Ukraine.

The assessment results concerning business lending sector (*BUSINESS.LENDING*) are shown in the third and fourth equations (formula (1)). Based on the above, it can be concluded that the business lending sector and the volume of business loans are directly interrelated, i.e., a 1% growth in business loans will lead to a proportional development of the business lending sector by 1%. The fourth equation shows that if the average market interest rate increases by 1%, lending will increase by only 0.164%.

The next two equations of the system show the dependence of the latent variable *CAP.STRUCTURE* on the explicit variables *W.A.C.O.C* and *COVERAGE.RATIO*. The capital structure of business entities in Ukraine directly depends on the weighted average cost of the business entities' capital. If the weighted average cost of capital changes by 1%, the same change in enterprises' capital structure is occurred. The sixth equation also shows a direct relationship between business entities' capital structure and the coverage ratio's average value. With the increase in the average value of the coverage ratio by 1%, a change in the capital structure by 3.596% is occurred.

The following conclusion can be drawn regarding the equations describing the relationship between the latent implicit variables (the 7th and 8th equations, respectively): there is a direct relationship between the development of business lending sector and the level of efficiency of business entities in Ukraine, i.e., with an increase in lending to business entities by 1%, their efficiency increases by 0.287%.

Assessing the relationship between the indicators of the business lending sector, the efficiency of business entities and indicators of their capital structure, one can make a conclusion about an reverse relationship between the capital structure of business entities and their efficiency, as well as a direct relationship between the capital structure of business entities and the business lending sector.

With an increase in the indicators of the capital structure of business entities by 1%, their activities'

efficiency will decrease by 0.116%. Simultaneously, if business entities' capital structure changes by 1% towards a 1% increase, the business lending sector will grow by 0.143%.

**Table 5.** Main summary statistics

Main summary statistics	Value
Discrepancy function	1.352
Maximum residual cosine	0.000
Maximum absolute gradient	18.102
ICSF criterion	0.000
ICS criterion	0.000
Chi-square statistic	16.226
Degrees of freedom	6.000
Chi-square p-level	0.013
RMS stand. residual	0.170

After the model's economic interpretation, it is compulsory to check the adequacy of the model, which can be verified by analyzing the criteria such as non-centrality fit indices, main summary statistics, and normal probability plot.

Main summary statistics of studying the relationship between the indicators is shown in Table 5.

Analyzing summary statistics, one can conclude about the adequacy of the constructed model.

**Table 6.** Noncentrality indices of the model

Indicators	Noncentrality fit indices		
	Lower 90% conf. bound	Point estimate	Upper 90% conf. bound
Population Noncentrality Parameter	0.013	0.576	1.778
Steiger-Lind RMSEA Index	0.046	0.310	0.544
Mcdonald Noncentrality Index	0.411	0.750	0.994
Population Gamma Index	0.628	0.839	0.996
Adjusted Population Gamma Index	-0.302	0.436	0.9851

**Table 7.** Single sample indices of the relationship between the indicators

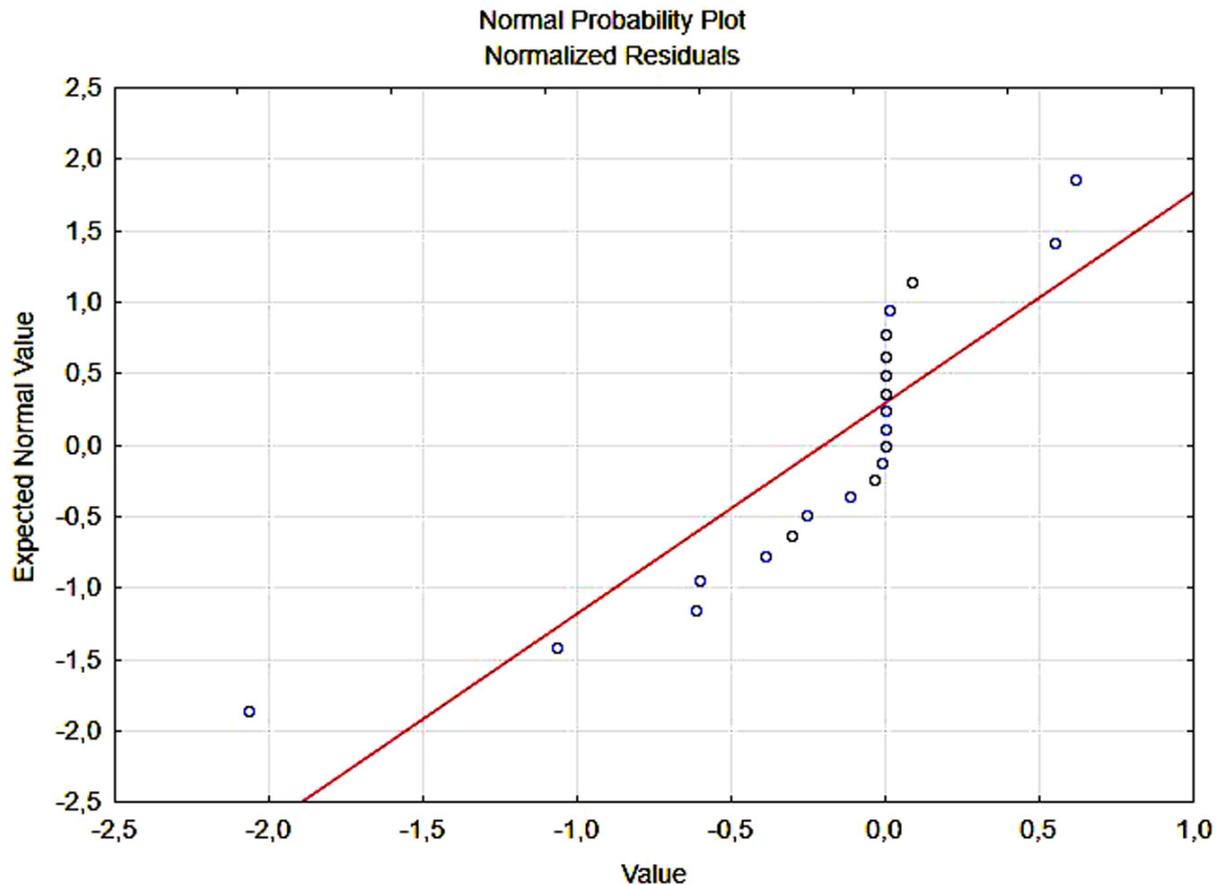
Other Single Sample Indices	Volume
Jorescog Index (GFI)	0.736
Adjusted Jorescog Index (AGFI)	0.076
Akaike Information Criterion	3.852
Schwarz Criterion	4.558
Brown Kudek Cross-Validation Index	7.352
Chi-square for an independent model	42.189
Degrees of freedom for an independent model	15.000
Bentler-Bonet Normalized Consent Index	0.615
Bentler-Bonet Non-Normalized Consent Index	0.057
Bentler-Bonet Comparative Consent Index	0.624
James-Mulaik-Brett Consent Index	0.2461

The next step is to analyze the non-centrality indicators of the model (Table 6). These indicators show the degree of model adequacy by assessing the Noncentrality Parameter of the statistics  $\chi^2$ . To assess the model's adequacy in terms of the non-centrality model, the following confidence intervals are used: the lower limit of the 90% confidence interval, the point estimate, and the upper limit of the 90% confidence interval. The following indicators were analyzed using the Statistica program: Population Noncentrality Parameter, Steiger-Lind RMSEA Index, McDonald Noncentrality Index, Population Gamma Index, and Adjusted Population Gamma Index. Generally, all these indices' values indicate the normal fit of the model.

Also, it is necessary to consider other indices (Table 7), in particular the Akaike Information Criterion and the Schwarz Criterion. The model with the lowest value of these indices is considered the best. Thus, the resulting model can be considered as adequate.

The model adequacy can be also proved by its compliance with the normal distribution of residuals, analyzed on the normal probability plot (Figure 1).

The points are close enough to the line, which indicates the adequacy of the resulting model.



**Figure 1.** Verifying the model of the relationship between indicators of the business lending sector, the efficiency of business entities and their capital structure

## CONCLUSION

As a result of computations, it can be concluded that there is a direct relationship between the development of bank lending and business entities' performance in Ukraine. With an increase in lending to business entities by 1%, the efficiency of their activities also increases, but only by 0.3%. When determining the relationship between the banks' lending, the performance indicators of business entities and their capital structure, the conclusion can be made about an inverse relationship between the capital structure of business entities and their efficiency, as well as a direct relationship between the capital structure of real sector enterprises and bank lending indicators. This is proved by the fact that with an increase of business entities' capital structure indicators by 1%, the efficiency of their activities decreases by 0.1%. Simultaneously, if the capital structure of business entities changes by 1% upward, the bank lending sector will grow by 0.1%.

Thus, one can conclude that the business lending sector in Ukraine has significant potential for its development, which ultimately will have a positive effect on the performance efficiency of the real sector enterprises using lending services (for each percent of the growth in lending to business entities, there will be an increase in the efficiency of enterprises' performance by 0.3%). This situation indicates the need to expand the use of lending as an instrument of state economic policy in the manufacturing sector: in the public sector by providing concessional loans to enterprises strategically important for the Ukrainian economy, and in the private sector – by the NBU policy of encouraging banks to lend to the real sector. Therefore, adopting a balanced state policy in the sector of corporate bank lending can give

impetus to the development of the sector of real production and contribute to the recovery of Ukrainian enterprises from the crisis caused by COVID-19. In the future, the research results can serve as a model for analyzing the situation with bank lending in other countries, including Kazakhstan and Kyrgyzstan.

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