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## MACROECONOMIC FACTORS AS TOOLS FOR STIMULATION OR DESTIMULATION OF AGRIBUSINESS LOANS IN CRISIS SITUATION

*The study attempts to identify changes in the loan market for agribusiness enterprises, including farms in Poland, during the COVID-19 pandemic. The research used data from the Central Statistical Office and the Credit Information Bureau for 2017-2020. In the course of research, an econometric model was constructed explaining the volume of loans to the above-mentioned entities by commercial and cooperative banks in Poland during the pandemic. The program Statistica 13.3 was used. The analysis covers all loans granted in Poland on a monthly basis in 2017-2021. During this period, banks granted a total of 307 012 loans to individual farmers, and their volume amounted to almost PLN 30 billion. In the course of the research, it was found that in the years 2017-2021, the volume of loans for agribusiness entities, including farms, was decisively influenced by such factors as refinancing loan rate (stimulant), rediscount rate (destimulant), and general economic climate in manufacturing index (stimulant). The set of explanatory variables in the models may be a premise for the introduction of specific improvements in the credit policy of banks servicing agribusiness in the form of tightening or liberalizing credit requirements. The research results can also be used by banks to effectively plan future sales targets and interest income from these loans.*

**Keywords:** agribusiness enterprises, loan volume, COVID-19 pandemic

**Jel Codes:** G21, G23, G24, G28

### Introduction

Modernized agribusiness enterprises, including farms, are characterized by a greater demand for credit; moreover, these enterprises, operating in the conditions of a market economy and a competitive environment – similarly to economic entities from other sectors – must modernize their activities and conduct investments adjusting production to market requirements<sup>1,2</sup>. In scientific studies, it can be found that the

<sup>1</sup> E. Grzegorzewska: Indebtedness of agricultural enterprises in Poland in the face of the global economic crisis, *Zeszyty Naukowe SGGW. Polityki Europejskie, Finanse i Marketing* 10 (59)/2013, p. 268-276.

activity of farms is financed mainly by equity<sup>3</sup>. However, the share of this capital in financing agricultural activities depends on the amount of disposable income and the tendency to resign from current consumer spending<sup>4</sup>. Despite the agribusiness enterprise's ability to generate a financial surplus, its size for current and investment needs is often insufficient<sup>5</sup>. In such cases, it is necessary to use external financing sources. It is important that the share of financing (in the structure of financing sources) generally decreases with the increase in the size of an agribusiness enterprise, especially a farm<sup>6</sup>.

Decisions on the selection of the best financing structure for their activities must be made by owners and by taking the specificity of agriculture as an activity into account. This includes, among others, generally long production cycles – as a result of which there are large discrepancies between the period of incurring expenditures and the period of obtaining a return on investment<sup>7</sup>. Another variable that agribusiness men must take into account are the fluctuations of the market situation affecting the volume of demand and the achieved financial flows<sup>8</sup>. The most frequently used external source of financing for agribusiness in Poland is a bank loan<sup>9</sup>. Such a choice may result, inter alia, from the lack of tax benefits due to financial costs – especially in farms – as is generally the case with listed companies<sup>10</sup>. Previous studies have established that well-indebted agribusiness enterprises are characterized not only by

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<sup>2</sup> R. Bierlen, P.J. Barry, B.L. Dixon, B.L. Ahrendsen: Credit constraints, farm characteristics and the farm economy: Differential impact on feeder cattle and beef cow inventories, *American Journal of Agricultural Economics* 80 (4)/1998, p. 708-723.

<sup>3</sup> S. Juszczak, R. Balina: NBP interest rates and lending to non-financial enterprises, *Bank, Miesięcznik Finansowy* 2/2017, <https://alebank.pl/nauka-stopy-procentowe-nbp-a-akcja-kredytowa-dla-przedsiębiorstw-niefinansowych/?id=224675&catid=960> (access: 10.07.2022).

<sup>4</sup> J. Kulawik: Lending and financing agriculture on the eve of integration with the European Union, *Bank i Kredyt* 6/2003, p. 29-42.

<sup>5</sup> R. Barro, J. Ursúa, J. Weng: The Coronavirus and the Great Influenza Pandemic: Lessons from the "Spanish Flu" for the Coronavirus's Potential Effects on Mortality and Economic Activity, 26866/2020, p. 11-12. [https://www.nber.org/system/files/working\\_papers/w26866/w26866.pdf](https://www.nber.org/system/files/working_papers/w26866/w26866.pdf) (access: 10.07.2022).

<sup>6</sup> R. Kata: Endogeniczne i instytucjonalne czynniki kształtujące powiązania finansowe gospodarstw rolnych z bankami, *Oficyna Wydawnicza Politechniki Rzeszowskiej*, Rzeszów 2011, p. 426-429.

<sup>7</sup> M. Wasilewski, T. Felczak: Efektywność strategii płynności finansowej w gospodarstwach rolniczych o zróżnicowanej sile ekonomicznej, *Zarządzanie i Finanse*, 2 (2)/2013, p. 491-501.

<sup>8</sup> R. Kata: Premises and microeconomic determinants of using bank loans by farmers, *Roczniki Ekonomiczne Kujawsko-Pomorskiej Szkoły Wyższej w Bydgoszczy*, 5/2012, p. 241-260.

<sup>9</sup> A. Rosa: Farmers of Central Pomerania in the banking services market, [in:] D. Zawadzka, J. Sobiech (eds), *Growth and allocation of financial and tangible assets of farmers (agricultural enterprises and households) in Central Pomerania*, Publishing House of the Koszalin University of Technology, Koszalin 2014, p. 229-260.

<sup>10</sup> T. Felczak: Sources of financing the activities of individual farms in the opinion of managers, *Zeszyty Naukowe Uniwersytetu Szczecińskiego. Finanse, Rynki Finansowe, Ubezpieczenia* 74 (2)/2015, p. 83-101.

higher return on equity, but also especially in the case of farms with higher financial efficiency of their own work<sup>11,12</sup>.

In the literature on the subject, the variability of the economic situation is expressed in business cycles. These are recurring, although not always regular in terms of amplitude, fluctuations in economic activity with a period usually from two to ten years, or even several years<sup>13</sup>. These fluctuations are manifested in absolute changes, deviations from the trend or fluctuations in the dynamics of various economic variables. Modern business cycles usually last from two to eight years, and their average length is usually five years<sup>14</sup>. There are four phases in the classical business cycle:

- recession;
- depression;
- boom;
- expansion.

The economic slowdown caused by various reasons affects the loan market, including the loan market for the agro-business sector – especially for individual farmers, which may manifest itself in changes in the reported demand for bank loans, changes in the value, and the number of loans granted<sup>15</sup>. It is worth noting that the COVID-19 pandemic is mainly a humanitarian crisis, but it has significant socio-economic implications. One of its effects is the disruption of economic processes and a clear limitation of economic growth. For years, Poland belonged to countries with a stable economic growth rate faster than the EU average: in 2016-2019, the average annual growth rate in Poland amounted to 4.5%, and to 2.1% in the EU. This situation changed in 2020 when, as a result of the COVID-19 pandemic, Poland experienced the first decline in GDP since the transformation of the economy, which amounted to 2.7% compared to 2019. This was one of the smaller declines among countries in the EU, where the GDP decreased by approx. 6% on average<sup>16</sup>.

It is worth emphasizing that the economic slowdown contributed to the increased risk of losing financial liquidity in economic entities. This is due to the deteriorating financial condition of enterprises and difficult access to bank financing. It

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<sup>11</sup> W. Józwiak Wojciech: Ocena efektów kredytowania preferencyjnego w gospodarstwach osób fizycznych, *Zagadnienia Ekonomiki Rolnej* 4-5/1999, p. 13-26.

<sup>12</sup> D. Czerwińska-Kayzer, W. Poczta: Preferential loan as an instrument of structural changes in agriculture, *Więś i Rolnictwo* 3 (112)/2001, p. 99-113.

<sup>13</sup> R. Beck, P. Jakubik, A. Piloju: Key Determinants of Non-performing Loans: New Evidence from a Global Sample, *Open Economies Review*, 26 (3)/2015, p. 525-550.

<sup>14</sup> D. Hübner, M. Lubiński, W. Małecki, Z. Matkowski: *Koniunktura gospodarcza*, PWE, Warszawa 1994, p. 12-13.

<sup>15</sup> A. Berger, R. Demsetz, P. Strahan: The consolidation of the financial services industry: Causes, consequences, and implications for the future, *Journal of Banking and Finance*, 23/1999, p. 135-194.

<sup>16</sup> M. Wąsiński, D. Wnukowski: Skutki pandemii COVID-19 dla gospodarki światowej, *Biuletyn Polskiego Instytutu Spraw Międzynarodowych*, 84/2020, p. 1-2.

is evident in the initial phase of the crisis when the supply of credit is limited<sup>17</sup>. Despite the decline in GDP, the Polish financial system entered the COVID-19 pandemic in fairly good shape, was sufficiently resistant to shocks, and was characterized by a lack of significant imbalances in the banking system. However, the strength and nature of the shock related to the pandemic significantly increased the credit risk and, moreover, the risk of an excessive restriction of credit availability in the economy<sup>18</sup>. The scale of the macroeconomic shock related to the COVID-19 pandemic significantly increased the probability of debt service problems by some borrowers. At the same time, there was a risk of excessive limitation of credit availability<sup>19</sup>. It was particularly important concerning enterprises or individual farms, as it was partly related to the suspension of investment projects. It should be emphasized that corporate loans account for approx. one-third of the banks' loan portfolio and are sensitive to the economic situation. In total, due to its inconvenient duration, the pandemic crisis may cost the banking sector nearly PLN 14 billion in additional loan write-offs for 2020-2022. At the end of April 2020, the banks' earnings fell by 43.8% year-on-year, and ten commercial banks reported a loss. The biggest burden turned out to be write-offs for provisions and a decline in lending. The high level of credit losses at the start of the pandemic was largely due to the write-downs of expected credit losses. For banks, this was related to the sudden deterioration of the macroeconomic outlook.

At the same time, limiting the supply of loans to enterprises may adversely affect the liquidity situation of enterprises and their solvency and, consequently, the country's economic situation<sup>20</sup>. The economic shock caused by the COVID-19 pandemic continues to adversely affect all sources of bank income. Among other things, it makes it difficult to raise capital and increases the risk of limiting lending. Declining the profitability of the banking sector is a key challenge in the long run. Even before the pandemic, a gradual decline in bank profitability was observed, particularly in the group of small- and medium-sized banks. However, because of a high level of own capital, the expected materialization of credit risk related to the impact of COVID-19 does not threaten the stable operation of banks.

The economic slowdown caused by the COVID-19 pandemic is visible in many sectors of the economy. At that time, the share of non-performing loans increased, and the growth rate of loans to the non-financial sector decreased. The type structure of demand for loans also changed, which – in the following years – had an impact on

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<sup>17</sup> P. Mikołajczyk: Krótkoterminowe kredyty bankowe dla przedsiębiorstw w warunkach kryzysu finansowego, *Nauki o Finansach*, 2/2014, p. 125-128.

<sup>18</sup> C. Cheng, J. Barceló, A.S. Hartnett, R. Kubinec, L. Messerschmidt: COVID-19 Government Response Event Dataset (CoronaNet v.1.0), *Nature Human Behaviour*, 4 (7)/2020, p. 756-768.

<sup>19</sup> A.L. Dias, E.C. Manuel, G. Dutschke, R. Pereira, L. Pereira: Economic crisis effects on SME dynamic capabilities, *International Journal of Learning and Change*, 13 (1)/2021, p. 65-78.

<sup>20</sup> M. Falagiarda, A. Prapiestis, E. Rancoita: Public loan guarantees and bank lending in the COVID-19 period, *Economic Bulletin Boxes*, 6/2020, p. 120-137.

the structure of the loan portfolio. The important thing is that credit losses are not compensated by new loans. The National Bank of Poland announced in October 2021 that the demand for bank loans remained low, with only 15% of the surveyed companies applying for a loan. At the same time, there was an increase (y/y) in the availability of bank financing; moreover, approx. 84% of submitted applications obtain a positive credit decision. According to the NBP, the balance of the expected loan demand in the fourth quarter of 2021 increased, and the increase in debt is more often announced by large companies<sup>21</sup>. It is worth emphasizing, however, that enterprises currently have their own (large) funds at their disposal. The debt of the non-financial corporation sector in the reports of the Central Statistical Office decreased by 2% y/y. For the first time, the decline in debt was caused by the negative growth rate of long-term debt, a decline of 1.6% y/y and short-term debt, a decline of 2.8% y/y. In the case of individual farmers, the trend was different. The data of the National Debt Register shows that the average debt of a farmer who has a loan increased by 5% over the last year and amounted to nearly PLN 68,500.

### **Methodological issues**

The aim of the research was to identify the relationship between changes in major macroeconomic and mesoeconomic factors and the volume of loans to agribusiness enterprises, including farms in Poland, during the intensified COVID-19 pandemic (i.e., in 2017-2021). The explanatory variables adopted for the analysis are presented in Table 1. Potential independent variables are marked from  $X_1$  to  $X_{19}$ . Explained variable  $Y$  is the volume of loans granted to enterprises of agribusiness, including individual farmers (PLN million).

The data for the analysis was collected in the MS Excel 2016 program, statistical analysis was carried out in the Statistica 13.3 program, and  $p < 0.1$  was adopted for the level of significance. A variance analysis was carried out; in addition, the normality of the distribution was carried out using the Shapiro-Wilka test. When the assumptions of the normality of the distribution were met, Pearson's correlation was used to determine the existence of a correlation relationship between variables. To construct a predictive model, the correlation calculus and the forward stepwise regression calculus were used. The analysis covered all loans granted in Poland in the monthly system in 2017-2021; therefore, 60 monthly ranks from the four-year research period were analyzed. In total, during this period, banks granted 307,012 loans for the agribusiness sector, and their volume amounted to PLN 29.984 billion. The source of research materials was data from the Credit Information Bureau and the Central Statistical Office.

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<sup>21</sup> Szybki Monitoring NBP, NBP, [https://www.nbp.pl/home.aspx?c=/ascx/koniunktura\\_prezentacja.ascx](https://www.nbp.pl/home.aspx?c=/ascx/koniunktura_prezentacja.ascx) (access: 10.07.2022).

**Table 1. Potential variables adopted in the research**

X <sub>1</sub>	Price indices of consumer goods and services (previous year = 100)
X <sub>2</sub>	Registered unemployment rate (%)
X <sub>3</sub>	Average monthly salary in the national economy (PLN)
X <sub>4</sub>	Average monthly nominal pension of individual farmers (PLN)
X <sub>5</sub>	Average monthly nominal gross salary in the enterprise sector (PLN)
X <sub>6</sub>	Average employment in the enterprise sector (thousand)
X <sub>7</sub>	Retail sales of goods (constant prices) divided by sales in the corresponding period of the previous year multiplied by 100 (%)
X <sub>8</sub>	Refinancing loan rate (%)
X <sub>9</sub>	Rediscount rate (%)
X <sub>10</sub>	Lombard loan rate (%)
X <sub>11</sub>	Dynamics of wheat purchase prices (without seed) (%)
X <sub>13</sub>	Dynamics of cattle purchase prices (excluding calves) (%)
X <sub>14</sub>	Dynamics of pig purchase prices (%)
X <sub>15</sub>	Dynamics of milk purchase prices (%)
X <sub>16</sub>	Total sold production of industry (constant prices), analogous period of the previous year = 100%
X <sub>17</sub>	Imports of goods (constant prices) (%)
X <sub>18</sub>	General economic climate in manufacturing index (%)
X <sub>19</sub>	Registered unemployed persons (as of the end of the year) (thousand)

Source: own study.

The results of the conducted research can be used by banks and other interested institutions to determine the impact of individual macroeconomic and mesoeconomic variables in subsequent years on a dependent variable. Their changes may be the basis for introducing credit policy improvements by increasing or liberalizing credit requirements. Research results can also be used to define, for example, the future summary level of loans granted or interest revenues and can also be useful to shape the sales goals of commercial and cooperative banks.

## FINDINGS

Table 2 includes the results of the variance analysis, which was carried out in order to determine whether there is a statistically significant relationship between the variable *Y* (i.e., the volume of loans for agribusiness enterprises, including farms in PLN million in a monthly system and variables independent of X<sub>1</sub> to X<sub>19</sub>).

**Table 2. Analysis of variance – dependence of the dependent variable  $Y$  on the set of predictors**

Effect	Sum of squares	Number of degrees of freedom (df)	Mean square	$F$ -test statistic	$p$ -value
Regression	87,769.013	2	43,374.226	6.411	0.018
Rest	472,233.852	45	10,300.108		
Total	553,274.887				

Source: own research.

Studies have shown that there is a relationship between the volume of loans granted to agribusiness enterprises, including farms ( $Y$ ) and a team of accepted predictors. The dependence was confirmed at level  $p = 0.018$ . The value of statistics  $F$  also indicates that these variables were significant and not accidental. The next stage of the research was aimed at clarifying which independent variables had a key impact on  $Y$  and the direction of this dependence. Research results in this respect are presented in Table 3.

**Table 3. The influence of the set of predictors on the volume of loans for agribusiness enterprises, including farms in PLN million ( $Y$ )**

Time series (months) $N = 60$	Non-standardized coefficient		t-Student statistics	$p$ -value
	$b$	$SDE$		
Constant	840.555	866.832	2.012	0.049
$X_8$ Refinancing loan rate [%]	1,082.994	557.068	3.484	0.033
$X_9$ Rediscount rate [%]	-1,005.542	4,966.035	-4.056	0.021
$X_{18}$ General economic climate in manufacturing index [%]	314.644	37.344	4.753	<0.001

Source: own research.

As a result of the tests, the following variables entered the model:

- $X_8$  Refinancing loan rate [%];
- $X_9$  Rediscount rate [%];
- $X_{18}$  General economic climate in manufacturing index [%].

It should be emphasized that two variables were stimulants (i.e., the increase in refinancing loan rate by one percentage point was associated with an average of loans for this sector of the economy by nearly PLN 1.083 billion). Research also shows that the increase in the overall climate of the economic situation, also by one percentage point, was associated with the increase in the volume of these loans by nearly PLN 315 million. One of the variables (i.e., the rediscount rate) was a desstimulant because its increase by one percentage point was associated with a decrease in the volume of loans granted to the agribusiness sector by over PLN 1.006 billion. It should be added that, generally, the increase in this rate reduces the creation of money and vice versa. The rediscount rate is mainly used to calculate the price, after which the central bank accepts bills of exchange from commercial banks. It is also worth noting that this rate has the middle level among the five interest rates of the

National Bank of Poland. The higher level has a Lombard rate and discount rate, while the lower level has a reference rate and the lowest deposit rate.

In the next stage of the analysis, an attempt was made to determine to what extent the set of adopted predictors explains the volatility of the volume of loans for agribusiness  $Y$  (Table 5).

**Table 4. The level of interest rates of the National Bank of Poland from 08 September 2022 (%)**

Depository rate	6.25
Reference rate	6.75
Rediscount rate	6.80
Discount rate	6.85
Lombard rate	7.25

Source: Podstawowe stopy procentowe NBP, NBP, <https://www.nbp.pl/home.aspx?f=/dzienne/stopy.htm> (access: 10.07.2022).

**Table 5. Parameters of the influence of the set of model predictors on the dependent variable  $Y$  (the volume of loans for agribusiness)**

Statistics	Value
Correlation Coefficient (Multiple $R$ )	0.755
Multiple $R^2$	0.570
Adjusted $R^2$	0.452

Source: own research.

As a result of multiple regression analysis for the influence of the set of predictors on  $Y$ , the level of the correlation coefficient was 0.755 – which confirms the existence of a significant correlation between the volatility of the volume of loans for agribusiness ( $Y$ ) and the variability of the assumed independent variables. The multiple determination coefficient was adjusted based on the size of the group, and it was found that the model explains at least 45.2% of the variation in  $Y$  – which means that there are also other factors influencing the level of credit volume for this sector.

## Conclusions



1. In the course of the research, it was found that in the years 2017-2021, the volume of loans for agribusiness entities, including farms, was decisively influenced by such factors as refinancing loan rate (stimulant), rediscount rate (destimulant), and general economic climate in manufacturing index (stimulant).
2. The conducted research was exhaustive and concerned the volume of loans to agribusiness enterprises, including farms in Poland, granted by banks in 2017-2021 during the COVID-19 pandemic. The developed model, in this respect, may be useful *ceteris paribus* to estimate the volume of these loans in the future, especially for production purposes.
3. The results of the conducted research may be used by banks and other institutions to determine the impact of individual explanatory variables on the explained variable. Their changes may be a reason to introduce improvements in the lending policy of banks servicing agriculture in the form of tightening or liberalizing credit requirements. Banks can also use the research results to stimulate or destimulate lending to agribusiness. They can also be used to plan future sales targets and interest income from these loans.
4. It was found, among other things, that there is a relationship between macroeconomic factors and the situation on the market of loans for enterprises from the agribusiness sector. The impact of the general economic situation index may be particularly important as it influenced the change in the actual volume of these loans.
5. There was a cyclical nature of the economic situation in the research period, and selected indicators describing its activity changed along with it. The impact of economic changes on the loan market for agribusiness enterprises, including individual farmers, was confirmed. The obtained research results may be useful for other researchers who want to conduct more detailed analyses in this area. The research results may also be useful for both commercial and cooperative banks, whose interest is the effective prediction of the volume of loans granted to agribusiness enterprises in Poland.

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## **Czynniki makroekonomiczne jako narzędzia zwiększania lub zmniejszania kredytów dla agrobiznesu w sytuacjach kryzysowych**

### **Streszczenie**

Celem niniejszego artykułu było podjęcie próby identyfikacji zmian na rynku kredytów dla przedsiębiorstw agrobiznesu, w tym gospodarstw rolnych w Polsce, w okresie pandemii COVID-19. W badaniu wykorzystano dane Głównego Urzędu Statystycznego i Biura Informacji Kredytowej za lata 2017-2021. W toku badań m.in. skonstruowano model ekonometryczny objaśniający wielkość kredytów udzielonych wyżej wymienionym podmiotom przez banki komercyjne i spółdzielcze w Polsce w czasie pandemii. Wykorzystano program Statistica 13.3. Badaniami objęto wszystkie kredyty udzielone w Polsce w/w podmiotom w szeregach miesięcznych w latach 2017-2021. W tym okresie banki udzieliły rolnikom indywidualnym łącznie 307 012 kredytów, a ich wolumen wyniósł prawie 30 mld zł. W toku badań stwierdzono m.in., że na wielkość tych kredytów decydujący wpływ miały takie czynniki, jak: stopa kredytu refinansowego (stymulanta), stopa redyskonta weksli (destymulanta) oraz poziom wskaźnika ogólnego klimatu gospodarczego w przetwórstwie przemysłowym (stymulanta). Zbiór zmiennych objaśniających w modelach może stanowić przesłankę do wprowadzania określonych usprawnień w polityce kredytowej banków obsługujących agrobiznes w postaci zaostrzania lub liberalizowania wymogów kredytowych. Wyniki badań mogą być również wykorzystywane przez banki do skuteczniejszego planowania przyszłych celów sprzedażowych i przychodów odsetkowych z tych kredytów.

**Słowa kluczowe:** przedsiębiorstwa agrobiznesu, wolumen kredytów dla agrobiznesu, pandemia COVID-19

**Kody JEL:** G21, G23, G24, G28

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