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## Detection of Creative Accounting in Agricultural Enterprises

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### Abstract

The paper deals with the detection of creative accounting of enterprises in the agricultural sector to verify whether creative accounting is used to an increased extent by those farming enterprises that have been granted a bank loan; and then whether there is an effort to manipulate financial statements mainly in micro-small or medium and large enterprises. Four mathematical-financial models were applied to 150 accounting units with primarily agricultural activity to verify the hypotheses. Beneish M-score, Jones model, Altman Z-score and IN05 model were used. An increased risk of using creative accounting methods was identified in 28% of the investigated companies on average during the monitored period. Still, the assumption that the size of the accounting unit has a significant effect on the use of creative accounting methods was not proven. However, a higher motivation to manipulate financial statements can be expected in smaller accounting units due to their less stable financial position confirmed Altman Z-score and IN05 models. At the same time, a higher probability of using and a tendency to use creative accounting techniques were found among units that were granted a bank loan, which stems from the need to secure and maintain sufficient financing for business activities.

### Keywords

Agriculture, creative accounting, detection models, reporting.

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### Introduction

Creative accounting is one of the most sophisticated evergreens in the Czech and European and it can be said that even modern world crime. To inform shareholders and other stakeholders, often presented using the profit and several other indicators from accounting, it is necessary to deliver these results and indicators using real numbers. However, by applying creative accounting principles, this picture can be changed and demonstrate a different economic reality.

When reading the impacted articles on creative accounting, it is evident that the number of procedures and methods for detecting innovative accounting practices is growing over time. An increase in the sophistication of detection methods can also be observed over time. On the other hand, it can be said that the published knowledge of detection methods is a valuable source of information for further "creativity" for companies that practice creative accounting – agricultural enterprises without exception.

Due to the absence of a study that would deal with the detection of creative accounting in Czech enterprises in the agricultural sector and compare the results with foreign studies, this article was created. The article is divided into five chapters, with an introduction followed by a description of the supporting arguments through a review of recent studies from scientific databases. Methods and data sources are also described. The fourth chapter contains the results, and the concluding chapter summarizes the authors' findings.

Zborková and Hinke (2011) point to financial statements users approach to creative accounting. In many companies, the management comes up with the requirement for creative approaches in accounting. Remenaric and Kenfelja (2018) characterize creative accounting as follows: "The practice of creative accounting usually includes overstating assets, high stocks, decreasing expenses, changes of depreciation methods, or presenting provisions as an asset. Creative accounting techniques follow the changes of accounting standards, which are modified

in order to reduce financial information manipulation.” Durana et al. (2022) describe the manipulation of enterprises' financial statements using creative accounting methods. The ethical and moral level of creative accounting is also emphasized by Popescu et al. (2009). Popescu et al. (2009) illustrate creative accounting as one of the components shaping a moral and financial crisis. Dias et al. (2016) published research demonstrating the disagreement of some academics on creative accounting. In contrast, some academics emphasize the ethical level, some present creative accounting as an acceptable tool for fiscal optimization.

Creative accounting techniques are used across all sectors of the economy. In addition to the already mentioned manufacturing industry, many examples can also be found in agriculture. For instance, Blažek et al. (2020) describe the prevalence of techniques among agricultural corporations in Slovakia. These authors limited the research to creative accounting techniques for adjusting economic results to increase competitiveness and further optimize the tax base of Slovak agricultural enterprises. Their results were the inspiration for the creation of this article, as it emerged from them that a large number of companies in this sector tend to use creative accounting, which is harmful not only to entrepreneurs and their business partners but also to the state administration, as the real financial positions are not transparent companies.

Brandt et al. (2012) published a comprehensive set of firm-level total factor productivity (TFP) estimates for China's manufacturing sector that spans China's entry into the WTO. In contrast to earlier studies looking at total non-agriculture, including services, they found that TFP growth dominates input accumulation as a source of output growth.

An interesting detection method is Beneish M-Score Models. It was practically applied by Adamiková and Corejova (2021). Another relevant tool is the Jones model. Here is an inspiring article by Kliestik et al. (2022).

Mare et al. (2017) describe Z-Score as a technique for measuring bank insolvency risk. Lepetit and Strobel (2015) re-examine the probabilistic foundation of the link between Z-score measures and banks' probability of insolvency, offering an improved measure of that probability without imposing further distributional assumptions. The key output from their research is the finding “The log of the Z-score is shown to be negatively

proportional to the log odds of insolvency.”

Akpanuko and Umoren (2018) state that creative accounting practices are motivated by greed and intend to deceive the public, potential investors, and shareholders.

Sanhueza and Parada (2017) investigated the impact on creative accounting of IFRS. IFRS allows several possibilities, especially those related to the regulation of asset items and those in which manipulative techniques mainly focus on the applicability options of standards over subjectivity.

The relationship between fiscal and municipal policies to creative accounting is analyzed in detail by Hirota and Yunoue (2021). Their interesting finding is that “...municipalities engage in stockflow adjustments by increasing their expenditures and revenues through intergovernmental transfers, which represents creative accounting because it allows municipalities to delay improving their fiscal conditions.”

There is a higher demand for capital investments, and thanks to this, an agricultural entrepreneur can be expected to be more interested in financing business activities with a bank loan (Gancarczyk et al., 2022; Marjánski and Sulkowski, 2021; Stawasz-Grabowska, 2020; Blanco and Raurich, 2022; Toušek et al., 2021). The above facts led the authors to define the following hypotheses, which will be verified in this article:

H1: creative accounting is used to an increased extent by those agricultural enterprises that have been granted a bank loan,

H2: the effort to manipulate financial statements exists mainly in medium and large enterprises.

The stated hypotheses will be verified by applying mathematical-financial models to the financial statements of a statistically significant sample of Czech agricultural enterprises.

## **Materials and methods**

First, it was necessary to define a statistically significant sample set of subjects, including the method of obtaining it, based on the analysis. To apply the detection models, the following requirements were imposed on the companies in the sample: the subject is a legal entity; the issue is an agricultural enterprise; the entity has been in existence for at least six years between the calendar years 2010-2019; the entity reports

the financial statements in complete form; the entity's financial statements are available in readable form on the website of the commercial register (Czech Statistical Office, 2021).

The first step to obtaining a suitable database was securing a complete list of economic entities in the Czech Republic. The source was the open database of the Czech Statistical Office (2021). Business corporations with a predominant agricultural NACE and an existence of at least six consecutive calendar years were randomly selected from the data set. If any selected accounting entity did not report the financial statement in the commercial register in full length, did not report it in a legible form, in the scope of six

consecutive years, or did not send it to the register at all, the selection step was repeated for the remaining companies until it was reached of the desired data set of 150 enterprises. If the entity's financial statements were available for more than six years, the youngest data section was included in the file.

Enterprises were further divided according to the size of assets and turnover into two groups, namely micro-small and medium-large.

Another aspect of the classification of entities is their capital structure from the point of view of the amount of indebtedness, which is shown in Table 1.

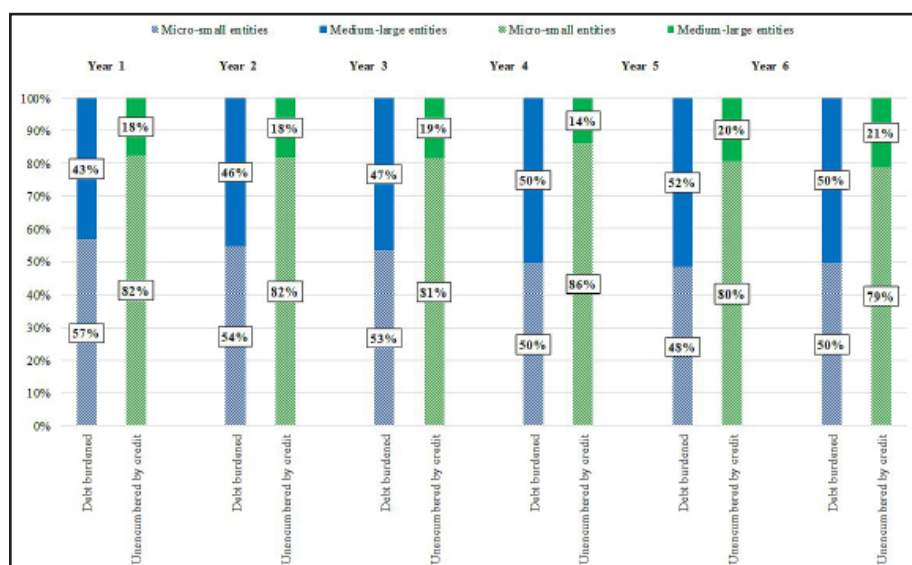
Number of entities	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Average
With a bank loan	99	101	107	107	104	103	104
Without a bank loan	51	49	43	43	46	47	47
With the share of foreign capital in total assets above 50%	56	57	59	54	58	54	56
With the predominant financing by foreign capital	44	49	52	46	46	43	47
With EBIT / interest expense > 0	105	102	110	96	94	85	99
With EBIT / interest expense > 3	89	78	78	70	66	59	73

Note 1: foreign capital consists of foreign liabilities and accruals on the liabilities side.

Note 2: on average 104 entities out of 150, i.e., 69% of all entities, use a bank loan as a form of asset coverage, on average 56 entities out of 150, i.e., 38% of all entities, cover their assets with foreign capital and in 47 entities out of 150, i.e., 31 % of all entities, foreign capital exceeds the value of own capital. On average, over the monitored period, 73 companies out of 150, i.e., 49% of all companies, show a three-fold excess of interest costs by EBIT, these companies can generate very good profits for the payment of interest from the use of external sources for financing.

Source: own processing (2022)

Table 1: Number of entities by level of indebtedness.



Note: The structure of enterprises burdened with credit is relatively balanced, so both types of enterprises are equally represented. In contrast, the group of subjects without bank credit is dominated by micro-small enterprises whose operations and assets are covered by other sources.

Source: own processing (2022)

Figure 1: Structure of entities according to indebtedness status.

The following Figure 1 shows the structure of entities according to debt status:

The analysis of the financial statements of the companies within the sample is carried out using the following mathematical and financial models:

1. Beneish's M-score, which identifies the manipulation of the company's profit by using a combination of financial indicators in a linear regression model consisting of 8 variables, 8 parameters, and one constant. It compares the resulting value with the critical value of -1.78. Moreover, if the calculated value of the M-score is lower than the critical value, the company did not use earnings management techniques in the monitored period.

The formula is as follows (Beneish and Vorst, 2020):

$$\begin{aligned}
 MSCORE = & -4.840 + 0.920 * DSRI_t + \\
 & + 0.528 * GMI_t + 0.404 * AQI_t + \\
 & + 0.892 * SGI_t + 0.115 * DEPI_t - \\
 & - 0.172 * SGAI_t + 4.679 * TATA_t - \\
 & - 0.327 * LGVI_t
 \end{aligned}
 \tag{1}$$

The Beneish M-score was successively applied to 5 accounting periods. To calculate the GMI indicator, the cost of sales was considered power consumption. In the SGAI indicator, the cost of sales, management, and overhead represents the sum of power consumption and personnel costs. The amount of accruals in the TATA indicator represents the difference in the values of working capital, total CF, income tax payable, and long-term liabilities of the current period compared to the previous period, less the depreciation of fixed assets of the current period. DSRI is the day's sales receivables index, AQI is presented with the asset quality index, DEPI is the depreciation index, and LGVI is the leverage index.

For calculation purposes, extreme values for each indicator were discarded, and indicators with an error value were excluded. The erroneous or extreme value occurred when the business did not report sales, accrued assets, non-current assets, or liabilities.

2. Jones' non-discretionary accrual model evaluates whether businesses use guesswork and accruals to manipulate the financial statement. The general formula calculates

the difference between two accounting periods, but observing the development over a more extended period provides better results.

$$X = \frac{\text{total assets}_{t-1} + (\text{turnover}_t - \text{turnover}_{t-1})}{\text{total assets}_t + \text{tangible fixed assets} / \text{total assets}_{t-1}}
 \tag{2}$$

where  $t$  represents the current accounting period and  $t+$  the previous accounting period, if non-discretionary additions compared to the value of total assets in one period are lower than in others. The model shows discretionary expenditures in future periods to be higher, which assumes possible data manipulation.

3. Altman's Z-score evaluates the financial health of the company based on the expected values of economic indicators as regressors - Altman's Z-score, similarly to Beneish's model, works with indicators of financial analysis and, based on their deviations from expected normal values, considers the company's financial situation and, consequently, the presence of elements of creative accounting in financial statements. Net working capital was calculated as the value of current assets less current liabilities. The formula for the calculation is as follows :

$$\begin{aligned}
 Z = & 0.717 * x_1 + 0.847 * x_2 + 3.107 * x_3 + \\
 & + 0.420 * x_4 + 0.998 * x_5
 \end{aligned}
 \tag{3}$$

Where:  $x_1$  = net working capital/total assets;  $x_2$  = retained earnings/total assets;  $x_3$  = earnings before interest and taxes/total assets;  $x_4$  = book value of equity / current a non-current liabilities;  $x_5$  = sales/total assets. If the calculated value of the Z-score is higher than the constant 2.7, the model assumes a good financial position of the company. If the calculated value is between 1.2 and 2.7, the model assumes an uncertain financial position of the company. A calculated value lower than 1.2 means that the company is in a situation with the risk of bankruptcy in the foreseeable future.

4. Bankruptcy model IN05 – evaluates the financial situation of the company, according to the formula:

$$\begin{aligned}
 IN05 = & 0.13 * x_1 + 0.04 * x_2 + 3.97 * x_3 + \\
 & + 0.21 * x_4 + 0.09 * x_5
 \end{aligned}
 \tag{4}$$



Where:  $x_1$  = total assets / current a non-current liabilities;  $x_2$  = EBIT/interest expense;  $x_3$  = EBIT/total assets;  $x_4$  = sales/total assets;  $x_5$  = current assets/current liabilities. Moreover, if the value of the index is lower than the constant 0.9, the company will go bankrupt with a high probability and will no longer create value. If the index is in the range of 0.9 to 1.6, a crash cannot be reliably determined, but it will likely continue to build value. Usually with a value higher than 1.6, the company is probably healthy or creating value.

The models are applied at the level of individual enterprises for five consecutive years between 2010 and 2019. This period is chosen to obtain the most up-to-date data and thus ensure better usability of the analysis results. The year 2020, which was significantly affected by the COVID-19 pandemic and therefore considered less compared to previous years, is excluded from the database.

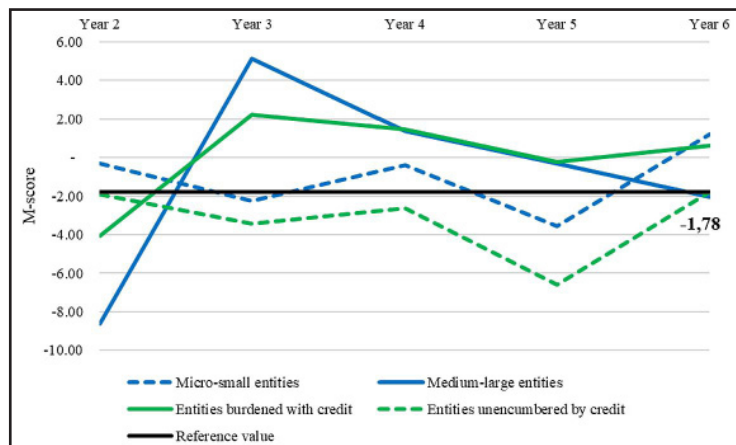
## Results and discussion

### Beneish M-score results

First, all eight values for calculating the M-score were determined separately for micro-small enterprises, medium-large enterprises, enterprises burdened with credit, and enterprises without bank credit. Detailed results are available upon request. The following Figure 2 shows the comparison and, at the same time, the development of the average M-score for all types of monitored enterprises.

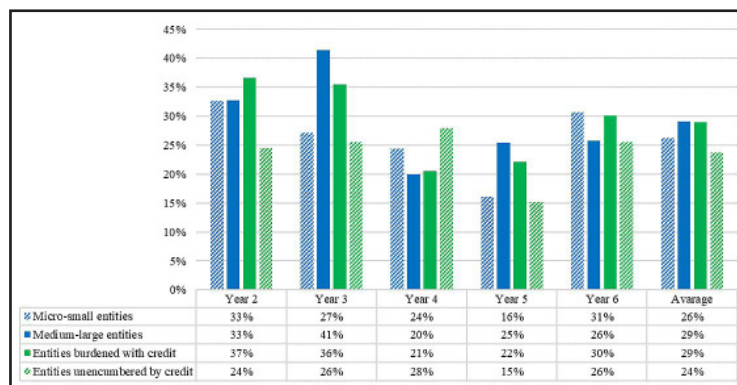
It is evident from the graph that only the average value calculated for enterprises without credit burden is in the zone below the reference value of -1.78 for the entire monitored period. Therefore, the probability of accounting manipulation is not assumed for them.

Figure 3 shows that medium-sized enterprises and enterprises burdened with credit use creative accounting techniques with the highest risk.



Source: own processing (2022)

Figure 2: Evolution of the calculated M-score compared to the reference value.



Note: the percentage shows the share of the total number of monitored enterprises of the given category in the given year.

Source: own processing (2022)

Figure 3: Companies with a calculated M-score above the reference value.

Nevertheless, the resulting values showing an average annual proportion of manipulators between 24-29% for each type of subject are relatively balanced.

**Results of the Jones non-discretionary accrual model**

Table 2 shows the year-on-year development of model values on average for individual types of enterprises. The most significant fluctuation between the measured values appears in micro-small enterprises and enterprises unencumbered by bank credit.

The model anticipates a stable development of the measured values, and if the values fluctuate, there is an assumption that these subjects are using creative accounting methods. To evaluate this indicator at the level of individual enterprises, a value that differed more than two times from the previous period was designated as a fluctuating value, i.e., the year-on-year movement was higher than +/-100%.

Figure 4 shows the result of positive detection of fluctuating accruals for the examined types of business, which on average reaches 11-21% of the total number of subjects of the given type during the monitored period. A higher incidence of inconsistent use of accruals occurs in micro-small enterprises and enterprises not burdened with loan. Micro-small enterprises are often not subject

to the obligation to verify the financial statements by an auditor, so there is no validation of the correctness of the use of accounting methods by an independent third party, which could be an explanation for the increased positive detection in these enterprises. The reason for lower average value for enterprises burdened with loan may be greater caution in applying creative accounting methods for fear of losing the bank's trust.

**Altman Z-score results**

The Figure 5 shows the average Z-score values and their movement in individual bands for each observed period.

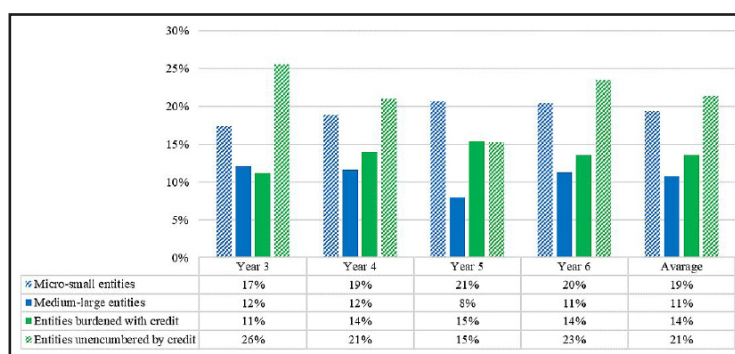
Above the value of 2.7, the upper reference value, appear micro-small and unencumbered enterprises, which on average qualified for the group of enterprises with a good financial position. Between the value of 2.7 and the lower reference value of 1.2, there are, on average, companies burdened with bank loans whose financial stability cannot be determined with certainty. Medium-sized enterprises move between the zone of good and uncertain economic situation. The average value of the Z-score of none of the groups of enterprises fell below the threshold value of 1.2, indicating impending financial problems.

Partial results (available on request) showed the authors the representation of the type of subjects in particular intervals of the Z value,

Jones model	Year 2	% movement	Year 3	% movement	Year 4	% movement	Year 5	% movement	Year 6
Micro-small entities	0.69	-17%	0.58	-22%	0.45	-172%	- 0.32	-34%	- 0.21
Medium-large entities	0.88	-16%	0.74	-17%	0.61	53%	0.93	-28%	0.68
Loan encumbered entities	0.82	-23%	0.64	-10%	0.57	41%	0.81	-39%	0.49
Loan unencumbered entities	0.63	3%	0.65	-44%	0.36	-417%	- 1.16	-50%	- 0.58

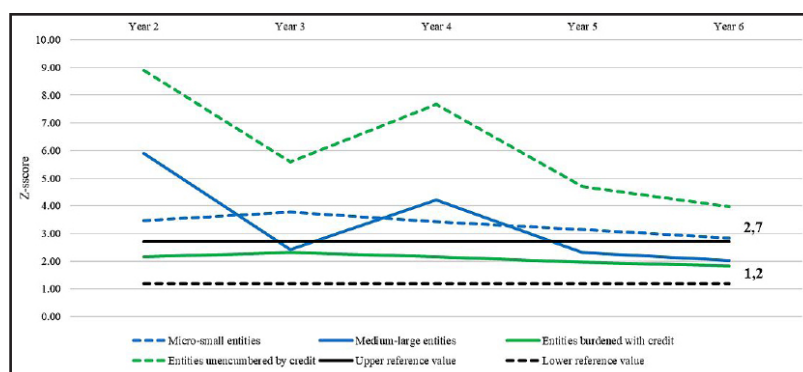
Source: own processing, 2022

Table 2: Average values of the Jones model and their interannual movement.



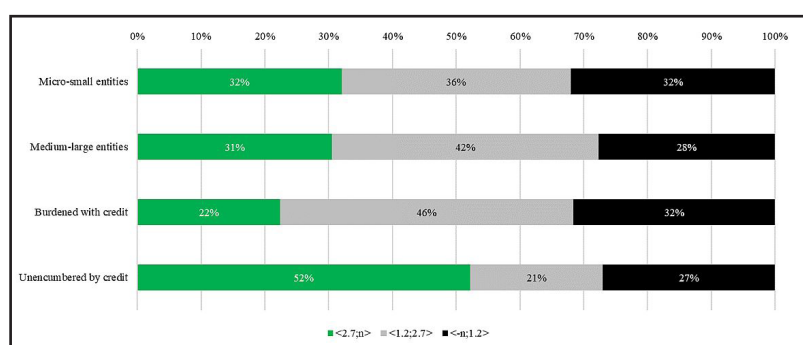
Source: own processing (2022)

Figure 4: Entities with accrual volatility detected by the Jones model.



Source: own processing (2022)

Figure 5: Average Z-score values in the monitored period.



Source: own processing (2022)

Figure 6: Composition of enterprises by type and achieved Z-score in an average of 5 years.

measured at the enterprise level. What is interesting about these results is the fact that, although the number of companies in a good financial situation for individual years is almost unchanged, in the last two monitored years, which are in most cases 2018 and 2019, there was an increase in companies in the black zone, indicating the risk of bankruptcy, and regardless of the business category.

Figure 6 (showing the average representation of the type of enterprise in the detection intervals for 2-6 years) shows that 27-32% of enterprises from each category are in the black zone, indicating financial instability. Deviating results for individual companies only occur in the green zone, which indicates a good financial situation, and the grey zone, when looking at the loan burden, where companies that have not received a bank loan appear to be the most stable.

### Results of Bankruptcy model IN05

Figure 7 presents the achieved IN05 values for individual entities, confirming the good financial position of companies unencumbered by loan. While according to the M-score, on average, 32% of micro-small and 28%

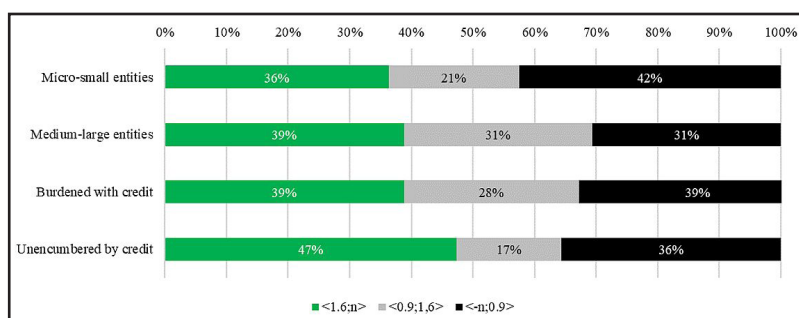
of medium-sized enterprises were in the risky black zone, according to the IN05 model, it is 42% and 31%. This was done by moving some of the micro-small subjects from the indeterminate grey area to black. In the case of medium-sized enterprises, the trend is the opposite; a more significant part of the grey zone has moved into the green.

Although both models work with the ratio of sales and EBIT to total assets, each uses different variables to calculate liquidity and indebtedness. Another factor is the width of the grey zone interval, which for the Z-score is the extreme values of 1.2 to 1.7, while for the IN05 model, this interval is more than half as narrow. It is also necessary to consider the conditions in which the model was created - IN05 is directly applicable to Czech economic and accounting requirements. Therefore, the result of this model should have more weight than Altman's Z-score, which is a foreign product.

### Detection of the presence of creative accounting according to the size of the company

From the Table 3, it is clear that the detection of a higher risk of applying creative accounting techniques prevails in micro-small businesses.





Source: own processing (2022)

Figure 7: Composition of enterprises by type and achieved IN05 value in an average of 5 years.

The reason may be their poorer financial stability, proven by the Z-score and IN05 models. At the same time, these may be units without mandatory financial, so they are not subject to increased control.

Model	Subject type			Difference
	Micro-small		Medium-large	
M-score	26	<	29	-3
Jones model	19	>	11	9
Z-score	33	>	29	4
IN05	42	>	31	12

Source: own processing (2022)

Table 3: Evaluation of the propensity to use creative accounting techniques in enterprises by size (in %).

Based on the predominant outputs from the models, the hypothesis that there is an increased effort to manipulate financial statements in medium and large agricultural accounting units is rejected.

### Detection of the presence of creative accounting according to the company's credit load

As Table 4 shows, except the Jones model, all other methods show a higher risk of using creative accounting methods for credit-burdened enterprises. In particular, the IN05 and Z-score models work with indicators of liquidity, indebtedness, and profitability. Indebted companies with a high proportion of fixed assets do not appear to be liquid, and the low profitability of assets caused by insufficiently quickly generating profit, which would otherwise be used for financing, in turn, worsens the company's performance.

Based on the predominant outputs from the models, the hypothesis is confirmed, according to which the manipulation of financial statements occurs mainly in agricultural enterprises that have been granted a bank loan. At the same time, these businesses are more motivated to use creative accounting.

Model	Subject type			Difference
	Debt burdened		Unencumbered by credit	
M-score	29	>	24	5
Jones model	14	<	21	-8
Z-score	33	>	28	5
IN05	39	>	36	3

Source: own processing (2022)

Table 4: Evaluation of the propensity to use creative accounting techniques according to credit load (in %).

## Conclusion

In the research, it was possible to verify both formulated hypotheses. The H2 hypothesis was rejected, according to which there is an increased effort to manipulate financial statements in medium and large agricultural accounting units. On the contrary, hypothesis H1 predicting that creative activities in accounting appear mainly in agricultural enterprises granted a bank loan, was confirmed. Furthermore, the applicability of individual detection tools to Czech agricultural economic entities was assessed. IN05 model was tested in the environment of Czech legislation and economy and should therefore be well used for analysing domestic companies.

In contrast, The Jones, M-score, and Z-score models are foreign products, so they were tested on foreign economic entities operating under different legislation and under different economic conditions. This must be kept in mind when applying them because the models will not show an explanatory power comparable to the Czech detection tools. Nevertheless, as mentioned above, the deviation between these models and the IN05 model was not evaluated as significant.

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