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Bankruptcy prediction in the agribusiness sector: Lessons from quantitative and qualitative approaches

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ABSTRACT

This study used the complexity theory to present an asymmetric and critical thinking approach. Its main purpose is fsQCA implementation for bankruptcy prediction of agribusiness entities and comparison with classical quantitative methods. The research comprises three phases: (1) calculation and evaluation of the predictive abilities and classification errors of 35 selected quantitative bankruptcy methods, both domestic and foreign, namely, multivariate discriminant analysis and logistic regression models; (2) fsQCA implementation for bankruptcy prediction of 14 agribusiness entities, comprising conditions that are typical of the agribusiness sector and financial and macroeconomic data; and (3) indication and comparison of the advantages and disadvantages of fsQCA against a background of classical bankruptcy prediction models. The findings indicate that managers should carefully build or/and select existing methods of bankruptcy prediction, and adjust them to the type, size, and risk of business activity.

1. Introduction

The negative consequences of the global economic crisis that affected economies in various countries to different extents highlighted the essential role of bankruptcy prediction. To better understand the financial crisis, Hausman and Johnston (2014) presented its anatomy and the timeline of major events, drawing attention to important conditions and factors leading to the financial collapse.

The change of the external conditions deteriorated the condition of the Polish economy as well. However, Poland was one of the few EU countries that achieved a gross domestic product increase over that period, while, for other EU members, the reverse was found to be true (World Economic Outlook, 2010). One of the negative consequences of the crisis is enterprise bankruptcy. While the bankruptcy of individual companies is, in fact, a positive mechanism for the elimination of unprofitable entities, if it takes the form of a "knock-on effect," it may significantly upset economic equilibrium.

As a rule, bankruptcy is a long-term process, wherein first symptoms surface a few months or even a few years before the entity has the premises to file for bankruptcy. One of the visible symptoms of oncoming bankruptcy is the deteriorating financial condition of an enterprise. Zorn, Norman, Butler, and Bhussar (2017) built on the resource-based view to suggest that valuable resources can reduce the likelihood of downsizing, leading to bankruptcy. Their study suggests that downsizing firms are significantly more likely to declare bankruptcy than those that do not engage in downsizing, and intangible resources help mitigate this likelihood. However, the authors do not find support for the role of physical and financial resources in preventing bankruptcy (Zorn et al., 2017). For top managers, James (2016, p. 498) suggested that strategically filing for bankruptcy can help firms preserve value and long-term viability. By renegotiating unprofitable contracts with key stakeholders, they can implement strategic changes that facilitate sustainable performance improvements. The findings suggest that declining firms might benefit from strategic bankruptcy when they have more intangible assets (James, 2016, p. 498). Over the past three decades, liquidation, discontinuance, and bankruptcy studies have presented approaches to describe organizational failure and its consequences (Amankwah-Amoah, 2016; Evans & Borders, 2014).

Therefore, there are possibilities of predicting negative phenomena for both the company and its environment, which is a chance for effective "recovery" and upholding market presence. One method of predicting bankruptcy are the so-called early warning models, which are based on large-scale comparisons of two types of enterprises—one that went bankrupt, and one that enjoys a good financial situation. Most of these models use financial ratios and their corresponding weights. Based on the findings, a company is deemed either bankrupt or non-

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bankrupt.

Following this introduction, the next section presents the theory of fuzzy-set qualitative comparative analysis (fsQCA) and quantitative methods in corporate bankruptcy research. Additionally, the study discusses the approach, and presents the method, results, limitations, and finally, the conclusions and recommendations.

2. fsQCA and the quantitative approach in corporate bankruptcy research

2.1. fsQCA methodology

This section introduces the fsQCA methodology, focusing on a detailed description of fsQCA. Ragin (2008) defined the two major paradigms of the approach: quantitative and qualitative. According to Vaisey (2009), Ragin's work is an alternative to quantitative analysis (which disregards causal complexity) and qualitative case-based methods (which lacks tools for generalizing across cases). Both limitations, Ragin (2008) stated, can be overcome by making explicit the set-theoretic logic of case-based research, and extending this logic to quantitative data via Boolean algebra. Ragin (1987) developed the set theory for comparing cases as configurations of conditions. FsQCA allows indicating types of cases as different configurations of attributes. Ragin's research described the use of fuzzy sets to address phenomena that vary by level or degree, and unravel causal complexity, further elaborating the set-theoretic basis for linking variable-based and case-oriented thinking (Ragin, 2008). Ragin (2008) also developed “possibility analysis” as the study of the conditions that make an outcome possible, as an alternative to the analysis of outcome probabilities.

2.2. Quantitative methods in corporate bankruptcy research

Scholars conducted the first studies in the field under investigation as early as the 1930s (Fitzpatrick, 1932). However, Altman (1968) is commonly considered the forerunner of early warning models—the first one used for bankruptcy prediction in discriminant analysis. Springate (1978), Taffler (1982), and Fulmer, Moon, Gavin, and Erwin (1984) also carried out analyses using these models. Subsequently, Zavgren (1985), Aziz, Emanuel, and Lawson (1988), Platt and Platt (1990), and Beynon and Peel (2001) developed other early warning models on the basis of logistic regression. Yang, Platt, and Platt (1999) compared and examined four different methods, namely, Fisher discriminant analysis, back-propagation neural network (NN), probabilistic NN, and probabilistic NN without the patterns normalized to bankruptcy prediction, and used financial ratios (non-deflated and deflated) from the US oil industry. The study of probabilistic NN without pattern normalization and Fisher discriminant analysis achieves the best overall estimation results, while discriminant analysis produces superior results for bankrupt companies (Yang et al., 1999). The changing of conditions of enterprises functioning as a result of market globalization intensification and significant technical and technological progress reveal a need for new methods on bankruptcy processes diagnosis (Bauer & Agarwal, 2014; Calabrese, Marra, & Osmetti, 2015; Jones, 2017; Jones, Johnstone, & Wilson, 2016). Balcaen and Ooghe (2006), as well as Kumar and Ravi (2007), presented a synthetic overview of scientific publications on methods of bankruptcy prediction. Aziz and Dar's (2006) findings indicated that research into bankruptcy prediction uses statistical methods most often (64%), methods of soft calculation techniques in 25% of the cases, and theoretical models in 11% of them. The most popular methods of bankruptcy prediction are discriminative methods (30%) and logit analysis (21%), while other methods used are NN (9%) and decision trees (6%). Consequently, extant research focuses on models compiled on the basis of discriminative analysis and logistic regression. Ciampi (2015) applied logistic regression to a sample of 934 Italian small enterprises (SEs), and proposed an SE default prediction model built based on both financial ratios and corporate governance characteristics. The accuracy rates obtained by this model were then compared to those from a second model, based on the same sample of firms, which used only financial ratios as predictive variables. These primary findings suggest that the relationship between corporate governance mechanisms and firm survival has specific connotations for SEs, different from those of medium and/or large enterprises. Most notably, for SEs, CEO duality and a reduced number of outside directors on the board (no more than 50%) significantly and negatively correlate with small company default, while ownership concentration negatively correlates with SE default—the presence of a majority shareholder ensures stability, lowers conflict levels between owners, and is a key element in the realization of a broad convergence between strategic behaviors and entrepreneurial motivations, one of the main strengths of the SE. Finally, combining economic-financial with corporate governance variables improves SE default prediction accuracy rates, compared to predictions based only on economic-financial variables (Ciampi, 2015, p. 1013).

In the Polish economy, research on company bankruptcy emerged over 30 years later as a result of a change in the political system from a centrally planned economy into a market economy. The research was initially based on multiple discriminant analysis or logistic regression. Subsequently, other statistical methods gained more interest, such as probit analysis and NN. Hitherto, there are over 100 Polish early warning models in use (Grzegorzewska & Stasiak-Betlejewska, 2014; Korol, 2010).

Both foreign and Polish methods of bankruptcy prediction, as a rule, do not take into consideration the specificity of the line of business in which the companies function. Most have come into being on the basis of statistical material from industrial companies; they have limited use when it comes to bankruptcy prediction in specific economy sectors, including agriculture. One distinctive feature of this sector is the cyclical and seasonal character of the production process resulting from the dependence on seasons and climatic conditions. Additionally, climatic conditions may determine substantial deviations in production volume, which, in turn, affect the financial condition of these enterprises. Moreover, significant postponements of the inferred outlays and results influence sales income because of a relatively long process of production and the aforementioned seasonality of economic processes.

The first studies concerned with the evaluation of financial condition of the subjects operating in the agricultural sector were published in the 1960s and 1970s. One of the first to analyze the threat level of the inability to repay loans with the use of discriminant analysis were Reinsel and Brake (1966), Krause and Williams (1971), Bauer and Jordan (1971), Johnson and Hagan (1973), and Dunn and Frey (1976). Research that covered the solvency of agribusiness entities also applied logistic regression (e.g., Miller & LaDue, 1988; Mortensen, Watt, & Leistritz, 1988; Turvey & Brown, 1990). In the twenty first century, research into the insolvency of agribusiness enterprises continues to be valid (Argilés, 2001; Featherstone, Roessler, & Barry, 2006); however, the prognostic capabilities of the proposed systems of credit evaluation are diverse. Some authors worked out models for certain types of agricultural enterprises by allowing for size and location, or the type of the activity they run, for instance. These models typically contain ratio characteristics of farms, not agribusiness enterprises; hence, they have limited application possibilities for enterprises. In Poland, analyses referring to bankruptcy in agriculture are scarce; they commonly refer to individual farms (Grzegorzewska, 2016). The study by Boratyńska (2016) focused on implementing fsQCA and asymmetric thinking to corporate bankruptcy evaluation in the food industry. It examined the main reasons for corporate bankruptcy, namely, lack of financial liquidity, exceptionally high level of liabilities, losses, weak management, and late recovery actions.