Chapter 15
Prediction of Corporate Failures for Small and Medium-Sized Enterprises in Europe:
A Comparison of Statistical and Machine Learning Approaches

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ABSTRACT

The risk of bankruptcy is naturally faced by all corporate organizations, and there are various factors that may lead an organization to bankruptcy, including microeconomic and macroeconomic ones. Many researchers have studied the prediction of business bankruptcy risk in recent decades. However, the research on better tools continues to evolve, utilizing new methodologies from various scientific fields of management science and computer science. This chapter deals with the development of statistical and artificial intelligence methodologies for predicting failures for small and medium-sized enterprises, considering financial and macroeconomic data. Empirical results are presented for a large sample of European firms.

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1. INTRODUCTION

Predicting corporate bankruptcies is an interesting topic of research with important implications for professionals working in the areas of management and finance. It is of direct interest to senior banking executives, businesspeople, and academic researchers dealing with this issue. The risk of bankruptcy arises when firms cannot cope with macroeconomic and microeconomic challenges that they face. The bankruptcy process causes many problems for lenders, suppliers, customers, employees, investors, shareholders, and business creditors.

Various concepts have been attributed to bankruptcy by researchers, such as failure, lack of liquidity, high insolvency, financial distress, default, and legal bankruptcy. However, in various articles, researchers use all of the above concepts, while defining bankruptcy in its legal sense, that is, the declaration of bankruptcy to be made by a decision of the judicial authorities, following the applicable law of each country. Therefore, a specific definition for corporate bankruptcy may not be easy to provide. In any case, a firm faces financial difficulties long before legal bankruptcy occurs. Thus, it is imperative for managers to be able to identify as early as possible financial problems and take action to avoid financial distress and ultimately bankruptcy.

While all firms face the risk of bankruptcy, small and medium-sized enterprises (SMEs) are particularly vulnerable as they often have limited means to overcome external shocks (Berger and Udell, 1998). The particular nature of SMEs and their importance for economic activity have led to various studies about the investigation and prediction of SMEs' failure risk. Such studies have conducted for several countries such as Belgium (Tobback et al., 2017), France (Abid et al., 2018), Italy (Calabrese et al., 2016; Cultrera and Brédart, 2015; Gordini, 2014), Russia (Lugovskaya, 2010), the United Kingdom (Altman et al., 2010), and the United States (El Kalak and Hudson, 2016), among others.

In Europe, SMEs play a major role in business activity, employment, and growth. According to data from the European Commission, SMEs account for 99% of all business in the European Union (EU), creating around 85% of new jobs, and providing more than 65% of the total private sector employment.[1] Therefore, it is no surprise that several studies, such as the ones noted above, on the prediction of bankruptcy for SMEs have used data from European countries. However, although country-specific studies contribute to the understanding of the factors that affect the risk of failure for SMEs in a country, the EU is a common market with countries sharing similarities in terms of economic and business policies, cultural similarities, and trade networks. Therefore, the examination of bankruptcy risk for SMEs in a cross-border European setting is important. International studies on bankruptcy prediction have been presented by Altman et al. (2017) and Laitinen and Suvas (2016), whereas Laitinen et al. (2014) focused on SMEs using a data set from 6 EU countries.

In this study, we follow a similar path and examine the development of bankruptcy prediction models for SMEs in European countries. Compared to the previous study of Laitinen et al. (2014), in this chapter a much larger sample is used involving more than 450,000 firm-year observations during the period 2011-2015. Different modeling specifications are considered combining financial data and macroeconomic factors, through statistical and machine learning approaches.

The rest of the paper is organized as follows. Section 2 describes the data used in the analysis. Section 3 outlines the methodologies employed in the study to develop bankruptcy prediction models, whereas section 4 presents the obtained results. Finally, section 5 concludes the paper and discusses some future research directions.