



An analysis of the determinants of financial distress in Italy: A competing risks approach



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ABSTRACT

This paper investigates the influence and the effect of micro-economic indicators and firm-specific factors on different states of financial distress. In particular, a competing risks model is estimated taking into account the differences among variables leading firms to exit the market through bankruptcy, liquidation and inactivity. The determinants of financial distress for any exit route are identified on the basis of the influence on the hazard ratios of the significant variables selected for each state. Furthermore, the predictive performance of the competing-risks model over the single-risk framework is evaluated, with respect to different time windows, by means of some accuracy measures. The results reached on a sample of Italian firms provide support for the hypothesis that the factors influencing firms' way out strongly depend on the exit routes and highlighting the need to distinguish among them by means of a multiple-state approach.

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1. Introduction

Modeling firm survival and studying the effect of factors that determine firm's exit are drawing an increasing attention from both academics and practitioners over the last years. Most of the existing literature treats exit from the market as a homogeneous event or focuses on only one form of exit, separately investigating any decision to leave the market. Starting from the seminal paper of Altman (1968), researchers have essentially focused on the failing and non-failing dichotomous variable, examining the companies that actually went bankrupt by means of some models (logit, probit, discriminant analysis, survival analysis and so on) (Ohlson, 1980; Zmijewski, 1984; Lennox, 1999; Shumway, 2001; Brabazon & Keenan, 2004; Figlewski, Frydman, & Liang, 2012, among the others).

However, there are different exit options that may force a potentially distressed company to leave the business. Besides entering in involuntary exit procedure (such as bankruptcy), a firm could choose for a merger or acquisition or decide for a voluntary liquidation. Each type of exit is likely to be driven by different factors and can determine important implications for the stakeholders and, in general, for the whole economy (Harhoff, Stahl, & Woywode, 1998; Schary, 1991). Investigating the determinants leading to the different forms of distressed firm's exit can, therefore, be particularly relevant. In order to examine the effects of explanatory variables across the states of financial distress, a multi-state approach can be used (Headd, 2003; Hensher & Jones, 2007; Jones & Hensher, 2004, 2007; Rommer, 2005). Some studies analyze the different types of exit, whereas not much is said about the similarities or dissimilarities

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among factors determining them (Chancharat, Tian, Davy, McCrae, & Lodh, 2010; Esteve-Pérez, Sanchis-Llopis, & Sanchis-Llopis, 2010).

The aim of this paper is to give a contribution in this direction studying the determinants of the probability of alternative exit routes, with particular attention to the differences in the factors driving firms out of the market. The effects of micro-economic indicators and firm-specific variables on different states are examined by a competing risks hazard model. This model is used for determining the probability and hazard ratio of three mutually exclusive ways of exit, namely bankruptcy, liquidation and inactivity. The first category includes those firms that involuntarily exit the market; the second refers to firms that opt for a liquidation encouraged by several possible reasons (avoid involuntary exit, restructuring, etc.). The last category includes those firms that exit the market for reasons different from the previous ones. The active firms are selected as reference group. Unlike discrete outcome models (logit, probit), hazard models allow to account for both whether and when an event occurs, by tracking the evolution of the risk over time. Moreover, the competing risks model provides information regarding whether the effects of each variable change across the multiple states of financial distress.

Here we develop a four-state Cox proportional hazards competing risks model, in which the states are considered to be independent. In order to highlight the diverse role played by the explanatory factors, a single-risk model is also estimated in which all financial distress states are pooled together. The results obtained by the two model specifications are compared not only in terms of the significance and sign of the selected variables, but also on the basis of hazard ratio and financial meaning. A further comparison is made on the forecasting accuracy evaluating the capability of the models to predict firms' exits by means of some accuracy measures. The analysis has been carried out on a sample of Italian firms. In particular we refer to the building sector underlining its relevance not only in terms of relative weight of GNP, but also with respect to its role in the various objectives behind national development planning in many European countries.

To perform these approaches and provide empirical evidence, a set of explanatory variables is considered from which selecting the best-set of possible candidate indicators to be included in the estimated models. To this purpose, few considerations pointed out in the literature have been taken into account. Some company characteristics, such as age and size, affect the probability of failure. In particular, the likelihood of a firm to go bankrupt decreases with size and age (Bhattacharjee, Higson, Holly, & Kattuman, 2009; Esteve-Pérez et al., 2010). Corporate governance, specifically the structure of the firm's board of directors and ownership and the interaction among them, may also affect the probability of failure. The agency problem between the owners of a firm (its shareholders) and the management leads to inefficiency in case of ownership concentration (Zeitun, 2009). The legal form can be also considered as a potential indicator for risk measures. Private limited liability companies would face higher risk, as they would have less share capital to lose compared with public limited liability companies (Esteve-Pérez et al., 2010). From what concern the indicators of firm's financial performance, we consider the most relevant and effective indicators in highlighting current and prospective conditions of financial distress that refer to the different methodological proposals, from the pioneer works on the topic (Fitzpatrick, 1931, 1932; Smith & Winakor, 1930) since the more recent contributions (Altman & Hochkiss, 2006; Amendola, Restaino, & Sensini, 2011; Balcaen & Ooghe, 2006; Laitinen & Suvas, 2013; Ravi Kumar & Ravi, 2007; Xie, Shi, & Wu, 2008).

To anticipate the results, our findings reveal several differences in the factors determining firms' way out with respect to the exit routes. In particular, we find out that some firm-specific characteristics, such as age, legal form and size, have influence on the probability of being liquidated, inactive and bankrupted, thus confirming the empirical results available in literature. The profitability ratios also play a relevant role on the likelihood of going bankrupt. Then, for the single-risk model the variables selected show some similarities to those characterized by the inactive state and liquidation, whereas they are different for bankruptcy. Thus, our results corroborate the need to separately investigate the different forms of exit, and allow to better understand the effects of diverse explanatory factors. The method developed in this paper can be easily applied to data collected from other industries or countries.

The paper is structured as follows. In the next section, the statistical method is briefly reported. The predictors' dataset is introduced in Section 3. The results are discussed in Section 4, while Section 5 concludes.

2. Methodology

The Competing risks model is one of the most popular settings of the Multi-State Models (for details, see (Andersen, Borgan, Gill, & Keiding, 1993; Hougaard, 2000; Andersen, Abildstrøm, & Rosthøj, 2002)). It extends the simple mortality model for survival data and is based on one transient state (alive state) and a certain number of absorbing states, corresponding to death from different causes. Thus, all transitions are from the state alive.

Let $\tilde{T}$ and C be the failure time and the censoring time, respectively. Let $T = \min(\tilde{T}, C)$ be the observed time and let $\delta = I(T \leq C)$ be an indicator function, which is equal to 1 if the cause of failure is known, and zero otherwise. Thus, the observed data are given by (T, δ) .

Let D be the cause of failure (*event-causing failure*). Assume that the possible causes are numbered from 1 to K . The main feature of competing risks model is that from a given set of k causes, one and only one cause can be assigned to every failure. Analyzing competing risks data means to get insight the joint distribution of T and D . The fundamental concept in competing risks model is the *cause-specific hazard function*, i.e. the probability of failing due to a given cause k , after one has reached the time point t :

$$\lambda_k(t) = \lim_{\Delta t \rightarrow 0} \frac{P[T \leq t + \Delta t, D = k | T \geq t]}{\Delta t}, \quad k = 1, \dots, K. \quad (1)$$

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