# Creditworthiness evaluation of Italian SMEs at the beginning of the 2007–2008 crisis: An MCDA approach

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## ARTICLE INFO

## ABSTRACT

In this paper we use a Multi-Criteria Decision Analysis (MCDA) approach in order to evaluate the creditworthiness of about 40,000 Italian Small and Medium-sized Enterprises (SMEs) viewed as potential applicants for bank loans in the three-year period 2006–2008, a timespan embracing the beginning phase of the recent economic and financial crisis. This approach is able to consider simultaneously different factors affecting the firms' solvency level. The results obtained in terms of classification into homogeneous rating classes, scoring and migration probabilities show that the proposed approach is able to unveil early signal of recession in the Italian SMEs sector. Furthermore, some comparisons between our approach and a couple of known methodologies for creditworthiness assessment show the goodness of our method.

## 1. Introduction

In this paper we analyze the dynamics of the creditworthiness of about 40,000 Italian Small and Medium-sized Enterprises (SMEs) during a period embracing the beginning phase of the recent economic and financial crisis, from 2006 to 2008, by using a Multi-Criteria Decision Analysis (MCDA) approach.

Italy is among the countries in the European Union with the highest number of micro enterprises and SMEs. Economic and financial crisis heavily affected Italy causing a decrease in GDP, stagnation of demand, credit shortage. According to the Cerved report on Italian SMEs, Italy entered recession in the second quarter of 2008, a sizeable number of SMEs were expelled from the market due to insolvency or since they have voluntarily chosen to liquidate their operations, even if many solid SMEs succeeded in growing despite the crisis (see Cerved, 2014), so that the final effect is not taken for granted. We choose to focus on the time span 2006–2008, frequently labeled as pre-crisis period (as in European Central Bank, 2015), to unveil possible early signals of recession in the Italian SMEs sector.

In the literature, the topic of creditworthiness evaluation has been mainly addressed by using statistical and econometric techniques. Actually, an alternative stream of research focused on credit risk assessment by using MCDA.

MCDA is a well-known family of approaches for supporting decision making in evaluating alternatives taking into account multiple (often conflicting) criteria. Many methodologies which fall within MCDA have been widely adopted to support several kinds of real-life decision problems, as showed in Figueira, Greco, and Ehrgott (2005), including financial decisions. Moreover, there are recent applications of MCDA techniques to support decision problems for SMEs (see Section 2).

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This contribution places itself within this second line of research and uses a modified version of a particular MCDA technique known as MUlticriteria RAnking MEthod (MURAME), that has recently been adopted for credit risk evaluation (Corazza, Funari, & Siviero, 2014; Corazza, Funari, & Gusso, 2015). Fundamentally, the paper intends to deal with the following research questions: (i) Was there a reduction of the credit quality of Italian SMEs during the beginning phase of the crisis? (ii) How was the behavior of SMEs in terms of credit migration from a given rating class to another one over time? (iii) Was the creditworthiness dynamic similar among groups of SMEs? (iv) Is a MURAME-based approach able to catch the creditworthiness dynamic of the enterprises investigated? Under these points of view, the purpose of our contribution is twofold: methodological as we develop a novel tool for the creditworthiness evaluation, and applicative as we apply this tool to a meaningful economic phenomenon.

As sources of information we use some specific accounting indicators obtained from the balance sheet data provided by the Italian database AIDA, which provides financial and commercial information of Italian companies. In particular, it gives for each firm the detailed balance sheet, drafted according to the IV CEE directive. We classify SMEs into homogeneous groups from the point of view of their creditworthiness and compute the transition, or migration, probabilities, that is the probabilities of moving from a given rating class to another one in a given period of time.

The results obtained unveil early signals of recession in the Italian SMEs sector. In essence, they show a reduction of the credit quality over time for SMEs in almost all the rating classes and an increasing tendency for SMEs to change rating class from 2007 to 2008. Moreover, the results acquired highlight some differences among the groups of SMEs in terms of both the credit dynamics and the relative importance of the accounting indicators within each rating class.

It is worth noting that the approach employed would be able to take into consideration, whenever they were available, different sources of information such as, for example, the financial and the economic positions of the firms, the quality of their management, their operational efficiency, the characteristics of the economic sector in which the firms are involved and their level of competitiveness, as well as other accounting information available from balance sheets and their accompanying disclosures. In addition, the method would also be able to incorporate the preference structure of the Decision Makers (DMs). The participation of the DM (namely the bank) could take place at different levels: in selecting the evaluation criteria, in expressing preference towards a given accounting indicator or even towards certain applicants, meaning that the DM could use in his creditworthiness analysis pieces of information that could be not available to external rating agencies. For these reasons, creditworthiness evaluation based on MCDA techniques can be considered compliant, in some sense, with the Basel capital framework that allows banks to develop internal credit risk models along with those developed by external specialized agencies and allows the judgement of experts to be incorporated into the model (as observed in García, Giménez, & Guijarro, 2013; Corazza et al., 2014).

The remainder of this paper is organized as follows. In Section 2 we provide a brief review of the economic and financial literature on SMEs. Section 3 synthetically describes the MURAME technique we adopted in this paper to analyze the creditworthiness of Italian SMEs. In doing so, we decided to give emphasis to the qualitative description of the procedure rather than to its formal presentation, for which we refer to the specialized literature. In Section 4 we present the data and the results obtained by applying the methodology to the sample of Italian SMEs. In Section 5 we perform some comparisons between our MCDA-based approach and a couple of known methodologies for creditworthiness assessment. Finally, in Section 6 some considerations conclude the study. Appendix at the end of the article provides some tables that integrate the display of the results obtained in the creditworthiness analysis.

## 2. Review of the literature

SMEs, which represent more than 90% of the firms in OECD member countries (OECD, 2011), constitute a source of growth for the economies of many countries and, thanks to their relatively lean structure, are able to quickly adapt to changes in economic conditions (see Altman & Sabato, 2005). These companies, with respect to the large ones, typically over-react to the phases of growth and decrease of the economic cycle. For this reason, in the first case, they constitute for the banking system a source of above-average profit, as the percentage of solvent companies increases on average; in the second case, they are a source of above-average risk, since the percentage of applicants who will be able to repay their loans is reduced on average.

The economic and financial literature on SMEs has investigated several issues, some of which were stimulated by the new Basel capital accords: Basel II (Basel Committee on Banking Supervision, 2004), that permitted banks to distinguish separately the exposures to SMEs, and Basel III (Basel Committee on Banking Supervision, 2010), the more recent regulations strengthening the regulatory capital framework with the aim of promoting a more resilient banking sector.

Along this line of research, Dietsch and Petey (2002) proposed an internal credit risk model for SME loans and compared the results obtained in terms of capital requirements with those derived from the advanced internal ratings-based (IRB) approach defined under Basel II. In their empirical analysis on French SMEs, they found significantly lower capital requirements than those derived under Basel II. The effects of Basel II on the bank capital requirements have been investigated also by Altman and Sabato (2005) in case of US, Italian and Australian SMEs. They found that banks may take advantage of lower capital requirements when SMEs are considered as retail.

The relationship between probabilities of default and asset correlations and its comparison with what assumed by Basel II have been analyzed by Dietsch and Petey (2004) for a set of German and French SMEs. Their findings show that SMEs are riskier, with lower asset correlation and that probabilities of default and asset correlations are positively related to each other,