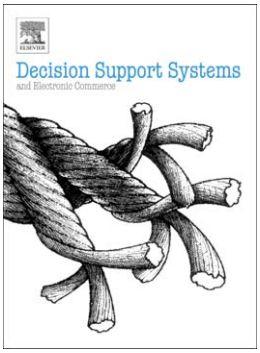


# Bankruptcy prediction for SMEs using relational data

Ellen Tobback, Tony Bellotti, Julie Moeyersoms, Marija Stankova, David Martens

PII: S0167-9236(17)30138-0
DOI: doi:10.1016/j.dss.2017.07.004
Reference: DECSUP 12865

To appear in: *Decision Support Systems*

Received date: 5 January 2017
Revised date: 19 May 2017
Accepted date: 14 July 2017

Please cite this article as: Ellen Tobback, Tony Bellotti, Julie Moeyersoms, Marija Stankova, David Martens, Bankruptcy prediction for SMEs using relational data, *Decision Support Systems* (2017), doi:10.1016/j.dss.2017.07.004

# Bankruptcy prediction for SMEs using relational data

Ellen Tobback[a,*], Tony Bellotti[b], Julie Moeyersoms[a], Marija Stankova[a], David Martens[a]

[a] *Department of Engineering Management, University of Antwerp, Belgium*
[b] *Department of Mathematics, Imperial College London, UK*

**Abstract**

Bankruptcy prediction has been a popular and challenging research area for decades. Most prediction models are built using financial figures, stock market data and firm specific variables. We complement such traditional *low-dimensional* data with *high-dimensional* data on the company's directors and managers in the prediction models. This information is used to build a network between small and medium-sized enterprises (SMEs), where two companies are related if they share a director or high-level manager. A smoothed version of the weighted-vote relational neighbour classifier is applied on the network and transforms the relationships between companies into bankruptcy prediction scores, thereby assuming that a company is more likely to file for bankruptcy if one of the related companies in its network has already failed. An ensemble model is built that combines the relational model's output scores with structured data and is applied on two data sets of Belgian and UK SMEs. We find that the relational model gives improved predictions over a simple financial model when detecting the riskiest firms. The largest performance increase is found when the relational and financial data are combined, confirming the complementary nature of both data types.

*Keywords:* Data mining; Relational data; Network analysis; Bankruptcy prediction; SME

*Corresponding author
*Email address:* ellen.tobback@uantwerpen.be (Ellen Tobback)