



# An application of multicriteria decision aid models in the prediction of open market share repurchases

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## ABSTRACT

This study presents the first attempt to develop classification models for the prediction of share repurchase announcements using multicriteria decision aid (MCDA) techniques. We use three samples consisting of 434 UK firms, 330 French firms, and 296 German firms, to develop country-specific models. The MCDA techniques that are applied for the development of the models are the UTILités Additives DIScriminantes (UTADIS) and the ELimination and Choice Expressing REALity (ELECTRE) TRI. We adopt a 10-fold cross validation approach, a re-sampling technique that allows us to split the datasets in training and validation sub-samples. Thus, at the first stage of the analysis the aim is the development of a model capable of reproducing the classification of the firms considered in the training samples. Once this stage is completed, the model can be used for the classification of new firms not included in the training samples (i.e. validation stage). The results show that both MCDA models achieve quite satisfactory classification accuracies in the validation sample and they outperform both logistic regression and chance predictions. The developed models could provide the basis for a decision tool for various stakeholders such as managers, shareholders, and investment analysts.

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## 1. Introduction

The last two decades have witnessed a dramatic increase in the use of share repurchases. For example, as Grullon and Michaely [20] highlight, expenditures on share repurchase programs (relative to total earnings) increased from 4.8% in 1980 to 41.8% in 2000, while more recent data from Standard and Poor's show that share repurchases among companies that comprise the S&P 500 reached a record 172 billion US dollars during the third quarter of 2007. In the EU-15, the value of share repurchases of industrial companies increased from 6.15 billion Euros in 1989 to 58.84 billion Euros in 2005, with their value over the entire period reaching 252.94 billion Euros [48]. Given the growth in the importance and popularity of share repurchases, it is not surprising that this topic has attracted considerable attention in the literature, with numerous studies examining the short-and long-run valuation effects [24,36] as well as the determinants and motives of share repurchases [20,5].

In the present paper we deviate from existing studies by proposing the application of multicriteria decision aid (MCDA) techniques for the prediction of firms' announcements of open

market share repurchases.<sup>1</sup> While past studies have employed MCDA techniques in other finance and accounting problems such as bankruptcy prediction, mergers and acquisitions, auditing, etc. with promising results [15,41,26], there is a lack of studies focusing on share repurchases announcements, and we aim to close this gap in the literature.<sup>2</sup> The development of such a model is necessary because it is not possible to use models built for other important business events (e.g. bankruptcy) or to draw any conclusions from their application. There are two reasons for this. First, the decision makers (e.g. analysts, investors, etc.) have different objectives, and the models are built with different goals in mind. Second, different business events are being driven by different factors and theoretical reasoning, and as such the underlying variables (criteria) also differ. As we discuss in more

<sup>1</sup> Obviously, the purpose of this study is not the development of a new MCDA technique [49, 12], the exhausting comparison of alternative techniques based on simulations [14] or comparisons of a more theoretical nature [13]. However, since our sample involves a set of real alternatives (i.e. firms), our study offers some indications as for the ability of the MCDA methodologies to infer accurate models from real data in a decision making problem that has not been examined before within this context, and the characteristics of which are difficult, if not impossible, to be reproduced in a simulated environment.

<sup>2</sup> Multicriteria decision aid techniques have also found applications in various other fields like faculty evaluation [6], managing inter-enterprise collaborative relationships [46] strategic performance of healthcare organizations [18], and decisions related to reverse logistics [7].

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detail in Section 4, a model with the ability to predict share repurchases could have practical implications for various decision makers (e.g. existing shareholders, prospective investors and peer firm managers), and especially for investment managers who could use it as the basis for an investment strategy.

While some studies have tried to explain the determinants of share repurchases [5], to the best of our knowledge, up to date only Andriosopoulos and Hoque [2] test the out-of-sample prediction accuracy of their model using logistic regression.<sup>3</sup> However, the MCDA methods proposed in the present study pose various advantages over traditional statistical and econometric methods such as discriminant analysis and logistic regression. For example: (i) they do not make any assumptions about the normality of the variables or the group dispersion matrices, (ii) they are not sensitive to multicollinearity or outliers, (iii) they can easily incorporate qualitative data, and (iv) they are also very flexible in terms of incorporating any preferences of the decision maker.

We use a sample of 530 open market share repurchases that were announced in France, Germany and the UK between 1997 and 2006 and an equally matched control group. There are a number of reasons for which we focus on these three countries. First, they are the three largest economies in the EU, in terms of GDP, number of listed companies, etc. Therefore, some of the largest and most important European firms operate in these three countries. Second, data from von Eije and Megginson [48] indicate that over the period 1989–2005, these three countries accounted for a combined 76.16% of the total value of share repurchases by industrial firms in the EU-15 (UK: 49.38%, France: 19.95%, Germany: 6.82%). Thus, our study provides an extensive coverage in terms of open market share repurchases in the EU. Third, there are important differences between these countries. For instance, the majority of UK firms are widely held companies whereas France and Germany have a more concentrated ownership structure [32]. Hence, differences in the level of shareholder protection can potentially lead to different managerial attitudes towards shareholder value maximization. Consequently, this could result in different attitudes on firms' cash utilization and the choice of firm payout decisions. For example, in France firms tend to be family owned, and in Germany firms are less widely held than UK firms. Thus, it is likely that share repurchases in Germany, and especially in France, would not be such a popular payout mechanism as it is in the UK. Moreover, managers have different attitudes and priorities in different countries regarding the management of their firms. For instance, Brounen et al. [10] find that shareholder wealth maximization is one of the most significant priorities for managers in the UK. In contrast, managers in Germany and France place more emphasis on other factors such as leverage optimization. Finally, the magnitude of the market reaction to the announcement of the intention to repurchase shares in the open market differs significantly among these countries [34,17]. Thus, differences in the operating environment can have a significant impact on the markets' perception and reaction to such announcements, as well as the managerial incentives and implications for making such announcements. Consequently, the simultaneous application of the MCDA

techniques in these three countries, allows us to test their usefulness in different institutional and regulatory settings, and in countries with potentially different managerial attitudes.<sup>4</sup>

We develop two MCDA models for each country, using the UTilités Additives DIScriminantes (UTADIS) and ELimination and Choice Expressing REality (ELECTRE) TRI methods. These two methods use different modeling forms (i.e. value functions and outranking relations), thus enabling the investigation of the generalizing ability of different MCDA models in the prediction of share repurchases. For benchmarking purposes we compare the classification accuracies of the MCDA models with the ones obtained by logistic regression. Thus, we develop a total of nine models. All the models are estimated and tested using a ten-fold cross-validation approach. Our results show that the MCDA models classify correctly around 70% of the firms in the validation sample, and they outperform logistic regression in all the cases.

The remaining of this research study is organized as follows. Section 2 presents the data, variables and methodology. Section 3 provides a discussion of the empirical results. Section 4 discusses the practical usefulness of the developed models, along with some differences between the UTADIS and the ELECTRE TRI models. The conclusions are in Section 5.

## 2. Data, variables and methodology

### 2.1. Data

This study considers a total of 530 repurchasing firms and 530 non-repurchasing control firms, operating in France, Germany and the UK. The sample was constructed as follows. First, we identified all the announcements of intention to repurchase ordinary shares in the open market, using news articles posted in Perfect Analysis and Factiva databases from 1st January 1997 until 31st December 2006.<sup>5</sup> Then, information on the share prices and accounting data was obtained from DataStream and Worldscope. Finally, repurchasing firms with available accounting and stock market data were randomly matched by country and year with a control sample of domestic firms that have not made an open market share repurchase announcement between 1997 and 2006. This procedure resulted in three country-specific samples consisting of 434 UK firms, 330 French firms, and 296 German firms.

Table 1 presents information on the number of firms in the samples by year and country. One can see that in France and Germany the number of share repurchase announcements shows a large increase in 1998 (in France) and 1999 (in Germany). This is due to the fact that share repurchases as a payout mechanism was prohibited in these two countries prior to 1997.

### 2.2. Variables

As it is always the case, there is a large list of financial variables that could be used in the development of an empirical model. However, from a practical point of view, when designing a

<sup>3</sup> The focus of studies on the determinants of share repurchases, which traditionally use econometric techniques, lies on the significance of the overall explanatory power of the model and the significance of the coefficients of the variables, while no attention is given to the classification ability of the model. However, when the objective is the development of a classification model for distinguishing between repurchasing and non-repurchasing firms, as in the present study, the focus of interest is on whether the firms can be correctly classified, especially in a holdout sample. Thus, these two strands of the literature, approach the problem from a quite different perspective.

<sup>4</sup> The comparison of the results obtained across different studies would not be possible due to differences in the datasets, the time period, the methods used to validate the models, the employed variables, and so on. In other words, there would be no common basis for such a comparison.

<sup>5</sup> The study focuses on this period because it was not until 1998 that share repurchasing was allowed to take place more freely in both Germany and France. The Perfect Analysis and Factiva databases report any news announcements that were available in the press made by UK and European firms. Only firms that announced their intention to repurchase ordinary shares in the open market were included in the sample. The list of repurchasing firms that formed our starting basis was initially used in the study of Andriosopoulos and Hoque [2], and it is available from the authors upon request.

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