

Chapter 7

Evaluating Business Performance Using Data Envelopment Analysis and Grey Relational Analysis

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ABSTRACT

Financial ratios are used in a variety of ways today. Empirical research is getting bigger, with a special focus on predicting business failure, the strength of a company, investment decision making, etc. This chapter focuses on two methodologies suitable to deal with many data to evaluate business performance. They are data envelopment analysis and grey relational analysis. The empirical part of the chapter conducts an empirical analysis with the aforementioned two approaches. Firms are ranked based on their performances and detailed interpretations are obtained so that managers within businesses can get useful information on how to utilize such an approach to modelling. This study implicates that using the two mentioned approaches can be useful when making investment decisions based on many data available for the decision maker. This is due to the methodology being suitable to handle big data and correctly quantifying the overall financial performance of a company.

INTRODUCTION

Global business practices place big pressure on companies to achieve the best possible results in terms of profits, sustainability, the social component of the whole business process, etc. The competition is rising almost daily. Thus, companies need to re-evaluate their performances continuously in order to

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remain competitive as well as increase their competitiveness. On the other hand, investors who seek to employ their resources into companies, expect to achieve excellent returns on investment, based upon excellent results of the business they are investing in.

Both companies and investors need objective information on the performance of the whole business. For a company, this gives insights into where it stands in a similar group, branch or industry regarding the whole process of the business operation. Managers of companies can have a better understanding of the business operation performance when the measurement of such performance is objective and complete. This indicates if a company is performing optimally, with the company's goals brought to completeness or not. If a timely and continuous evaluation is made, this could help achieve business goals more quickly and of better quality, with timely corrections of plans. On the other hand, the information on the company's total performance is important for potential and existing investors to get insights on the quality of the business they are interested in investing in. Based on investor's preferences, goals and limitations, a quality and comprehensive analysis of potential investments can help achieve his goals with fewer costs. Besides managers and investors, business banks could also benefit from such detailed analysis with a strong quantitative base, i.e. mathematical models and methods, due to their valid assumptions and robustness. Financial ratios have been extensively analysed over the last couple of decades. Although it is not difficult to calculate them, the interpretation of their combinations is far more complex. Thus, many different authors have researched such complexity: Hafeez (2002), Lau and Sholihin (2005), Philips and Louvieris (2005), Craig and Moores (2005), Prieto and Revila (2006), Fernandes et al. (2006), Wier et. al. (2007), Chen et. al. (2009), Cardinaels and van Veen-Dirks (2010), etc. To achieve objective comparisons, different models and methods have been developed to rank companies based upon their performances.

The problem observed in this chapter is how to correctly use the financial ratios data when comparing the performance of selected companies, with the basis in finance theory. Namely, big data asks for the correct methodologies to be used. Furthermore, the selection of financial ratios should be based on theory, which is rarely found in existing literature (as it will be seen in the literature review section). That is why the purpose of the paper is to examine previous research on the topic of decision-making based on financial ratios data and to provide insights into the correct analysis based on financial theory. This chapter will primarily focus on two methods which enable objectivity in the decision-making process. The Data Envelopment Analysis (DEA), which was first developed for production companies, is a good stepping stone in evaluating the relative efficiency of companies based upon different criteria. The second methodology, the Grey Relational Analysis (GRA), is a relatively unknown one, belonging to the Grey Systems Theory (GST), a set of models, methods and approaches developed to model uncertain events and concepts.

Both approaches will be observed simultaneously in this chapter in order to evaluate relative business performance among selected companies for which public data is available on a stock market. The complementarities of both approaches will be examined as well, with checking the robustness of results. Thus, the empirical part of the chapter will focus on publicly available data on a sample of companies to evaluate their overall performance, from the individual company's standpoint and the investor's point of view. This is done since a company often does not have full information and disclosure on their competitors. That is because they can only use publicly available information. From the point of view of the investor, he often cannot get some insider information and has to make his investment decisions based upon, again, publicly available data. Data will include a sample of 21 companies which constitute the stock market index as an example to interpret the results on.

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