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Building Ease-of-Doing-Business synthetic indicators using a double reference point approach

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A B S T R A C T

Investment decision making may require the selection of the geographical areas where the investments will be mainly done. A large number of factors could influence this decision such as the country business atmosphere, the human development level of the country and/or its political and macroeconomic stability.

In this paper, we are mainly concerned with those aspects related to the ease of doing business in terms of countries' regulation. The World Bank Group publishes indicators on regulation for doing business, and they also provide a composite indicator. However, due to the aggregation method, this composite indicator does not fully reflect situations where a country performs well with respect to one indicator and very bad with respect to another. In this work, we propose the use of a Double Reference Point based methodology to obtain synthetic indicators allowing for different degrees of compensation. We will compare the obtained results with those obtained by the World Bank, highlighting the potential advantages of our approach. Comparison will be done taking into account the imprecision, ambiguity and uncertainty of the data by means of the Fuzzy Degree of Similarity between two rankings.

1. Introduction

Governments play a key role in the development of efficient, transparent and accessible regulations which must be easy to implement, in order to facilitate business creation and expansion. The World Bank Group, by means of the *Doing Business* project launched in 2002, provides objective measures of business regulations referred to property rights, cost of resolving disputes, economic interactions and protections against abuse (www.doingbusiness.org). In its last report, the World Bank ranked 189 countries based on 36 quantitative indicators belonging to 10 business regulation areas of concern.

In this paper, we are concerned with the aggregation method used to obtain the overall score used by the World Bank to rank the countries based on their ease to do business. The World Bank uses a simple averaging approach. However, each component indicator in the simple average relates to a different aspect of business regulation and the scores vary, often substantially, across indicators. A country can show a strong performance in one area of regulation and a weak performance in another, and an aggregation method based on the simple average does not always reflect this fact. Although the World Bank's database has been widely used by governments and academic researchers (see for example Botero et al., 2004; Blanchet, 2006; Schueth, 2010, 2015, or more recently Kumar, 2012; Quah, 2013; Boţa-Avram, 2014; Cooley, 2015; Gryshova et al., 2015) several authors have acknowledged some important weaknesses of the World Bank's Doing Business project. In a study published in 2008 conducted by an independent agency at the request of the World Bank, important methodological problems were highlighted, marking the necessity of making rankings more informative (World Bank, 2008).

In addition, several criticisms arise related to the quality of the information (Du Marais, 2009). Roham et al. (2009), in an attempt to address some problems related to the quality of information sources, proposed a method to obtain composite Ease-of-Doing-Business indicators based on Fuzzy Sets techniques. More precisely, they proposed the use of fuzzy linguistic modeling and they obtain composite indicators using Linguistic Ordered Weighted Aggregation Operators (LOWA). In their approach, each selected indicator is represented by a linguistic variable for which different linguistic labels are defined. Each of these labels is represented by a trapezoidal membership function. Aggregation is done using equal weights for the different indicators which have previously been classified using fuzzy clustering techniques. The authors finally rank the countries after a defuzzification process obtaining a linguistic description of their ease of doing business and they compare their results with those obtained by the World Bank

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for the case of Canada, finding very similar results between both methods. Indeed, Fuzzy Sets Theory can provide very useful tools to deal with the weaknesses of the data collected for the indicators. On the other hand, construction of fuzzy numbers for each of the indicators reflecting the uncertainty, ambiguity, imprecision and lack of credibility of the data provided by the World Bank requires a very high level of expertise.

Nevertheless, in this paper, we would like to focus on the aggregation method used to build the synthetic indicators, given that the methodology proposed can be applied to any system of indicators, regardless the way they are obtained. Besides, in order to compare the rankings, we will be using the same weights as the World Bank's methodology for the indicators. Obviously, the methodology proposed can be easily adapted to other weights, if they were considered more appropriate. A number of methodologies have been developed to build synthetic indicators (see, e.g., Nardo et al. (2005) for a review), and there is no single methodology accepted by the entire community. Most of the existing aggregation techniques are based on applications of (arithmetical or geometrical) weighted means, (including the World Bank's approach). In this case study, one of our main concerns (in accordance with Roham et al., 2009) is the high variability observed on the performance of the indicators for each economy. Given that the great majority of the techniques that exist to derive synthetic indicators are compensatory, bad behaviors in certain indicators are somehow hidden in the final measure. In practice, depending on the aggregation method chosen, the compensatory character among indicators varies (Munda, 2008). In this way, this compensation can be: full (general additive methods), partial (partially-compensatory multicriteria methods, like Diaz-Balteiro et al. (2011), where a compromise programming based technique is used, or Blancas et al. (2010), who use a goal programming based scheme), or zero (non-compensatory multicriteria methods based on outranking methods, like for example Huth et al. (2005)). From our point of view, the aggregation method should allow both approaches, compensatory and non-compensatory, to obtain final synthetic indicators.

On the other hand, the World Bank's approach to build the composite indicator, uses the so-called distance to frontier scheme, which measures, for each indicator, the distance of a given country to the best performance of all countries. We believe that this scheme is just a range normalization approach, and this frontier is not necessarily a good reference level. In practice (see Section 3 for further details), this normalization can produce poorly scaled results when the original data have several outlier values. Rather than this, we propose the use of a scheme where reference levels can be established for each indicator. It must be taken into account that the best performance may not be necessarily good, or conversely, the worse performance is not necessarily bad. Therefore, ideally, the reference levels can be given by experts or by the user (in which case the results obtained can be interpreted as an absolute measure). In the topic under study, it is also possible that these reference levels are different for different users, depending on the type of business they wish to start. Alternatively, the reference levels can be determined in a statistical way (in which case the results obtained can be interpreted as a relative measure), but taking somehow into account the values of all the units, and not only the extreme ones.

As seen, given the multidimensional nature of the problem, multiple criteria decision making techniques are particularly suitable for building synthetic indicators. Many methods exist for solving multiple criteria decision making problems. Most of them try to find efficient solutions for the multiple criteria problem, understood as feasible solutions such that it is not possible to improve one of the objectives without worsening at least some other one. Some of the methods just generate a set (or all) of efficient solutions of the problem, and the decision maker (DM) chooses one among them (a posteriori methods). Others ask the DM for some preferential information, and then generate the efficient solution that best fits these preferences (a priori methods). Finally, a third group of methods carry out several iterations, where the preferential information is gradually incorporated, and the method stops when a satisfactory enough solution has been found (interactive methods). The reference point based methods (see Wierzbicki, 1980) constitute a link between the two latter classes. The decision maker (DM) is asked to give desired (reference) levels for each objective. Then, a single objective problem is solved where a so-called achievement scalarizing function (which measures the closeness of each feasible solution to the reference point) is optimized. Under mild conditions, the optimal solution of this problem is assured to be efficient for the original multiple criteria problem. This formulation can also be complemented with preferential weights that indicate how important is for the DM to achieve each of the reference levels (see Ruiz et al., 2009). Finally, this scheme can be easily embedded in an interactive framework, where reference levels and weights can be updated after each iteration has been carried out and the corresponding solution has been shown to the decision maker (DM), until he decides to stop. For further information about Multiple Criteria Optimization Methods in general, see Miettinen (1999). Later on, Wierzbicki et al. (2000) suggested a double (reservation-aspiration) reference point approach to obtain objective rankings, and this scheme was later on adapted (see, Cabello et al., 2014; Ruiz et al., 2011) to build synthetic indicators.

In this paper, we propose to apply the double reference point technique to build synthetic indicators, using the system of Ease-of-Doing-Business indicators proposed by the World Bank. This way, we allow the use of reference levels given by the user, and both compensatory and non-compensatory indicators can be built. To the best of our knowledge, this is the only methodology that combines both features (reference levels and compensatory/non-compensatory schemes), and this makes it particularly useful for this case study. The rest of the paper is organized as follows. The World Bank's methodology to build the Ease-of-Doing-Business synthetic indicators is briefly outlined in Section 2, while the double reference point approach is presented in Section 3. In Section 4, we show the results obtained with our approach and compare them with the World Bank's results, and we will show the advantages of the double reference point scheme. Besides, we will introduce the concept of fuzzy degree of coincidence between the positions in two different rankings, taking therefore into account the imprecision, ambiguity and fuzziness of the data. Finally, some conclusions are drawn in Section 5.

2. World Bank's methodology for the construction of the Ease-of-Doing-Business composite indicator

In its last report (World Bank, 2016b), the World Bank ranked 189 countries, $\{C_k\}_{k=1}^{189}$ based on 36 quantitative indicators, $\{I_i\}_{i=1}^{36}$, classified in 10 different business regulation areas, $\{T_j\}_{j=1}^{10}$ (see Table 1 and Table 1A in Appendix A).

The idea behind the calculation of the Ease-of-Doing-Business (EDB) composite indicator is to measure, for each indicator, the distance between the performance of a given country and the best performance observed among all countries (distance to frontier). Then, a simple averaging approach is used to obtain the synthetic indicators. Namely, for each country, the World Bank follows two main steps.

2.1. Step 1

Individual component indicators are normalized to a common unit where each of the component indicators $\{I_i\}_{i=1}^{36}$ (except for the total tax rate, $I_{23,}$ see World Bank, 2016b,c) is rescaled using the linear transformation

$$\frac{|worst_i - I_i|}{|worst_i - best_i|}, \quad i = 1, \ldots, 36, \tag{1}$$

where $worst_i$ is the worst performance and $best_i$ is the best performance (frontier) for indicator i. The best performance represents the best performance on the indicator across all countries since 2005 or the