

Data Envelopment Analysis and Debt Management Plan

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ABSTRACT

The World Trade Organization(WTO) has been trying to equilibrate business ever since. Different studies have been done to propose the most reliable method for compensating the debt of un-health countries. In this paper, I review some of the available method for studding this research question and proposing a new strategy to deal with this problem. We argue that by using data envelopment analysis (DEA) the technical efficiency of each country who is a member of WTO can be calculated and in the second step this variable can be used as an independent variable for further research. Using dummy variable can help us to distinguish countries from each other. Using statistical tests, the variables which have more power in separating insolvent member countries from healthy countries. along the significant financial factor to predict financial compensation, the output of countries can increase accuracy of the model.

Keywords: Strategy Plan, Technical efficiency, Stochastic Frontier, data envelopment analysis

I. INTRODUCTION

External debt of a country can be defined as the total public and private debt in all the acceptable currencies, services and goods [1]. It should be mentioned that financial debt can be predicted by suitable models to avoid losing investment opportunities [2]. By providing the necessary warnings, it is possible for countries to take into account the occurrence of a financial debt and take appropriate measures in the light of these warnings. Money market and financial market need to know the level of the country's debt because it has direct relationship with the level of its financial development. According to previous researches the level of financial development of a country influences the consumption and saving rates of individuals who are living in that country and as we know these rates can change individuals' wellbeing easily [3]. Therefore, the prediction of financial debt and bankruptcy of countries has always been one of the issues of interest to investors, creditors and governments [4]. In fact, having knowledge about the current and future financial condition of a country can help its government and policy makers to develop new and suitable policies to deal with unpredictable situations. Financial statements provide various definitions of financial debt compensation. Gordon (1971) introduced this concept

as a reduction of the country's profitability, which increases the probability of the inability to repay interest and debt [5]. According to available researches moving toward a higher level of sustainability is a big concern for all the countries who are participating in the global market [6], so having a tool to predicts possible ways to compensate the financial debt of a country will help its government and policy makers to be prepared. in fact, these tools will give them enough knowledge and freedom to use all of their potential to get benefits of all the available resources. The first research in the field of bankruptcy prediction was conducted by Patrick in 1931[7]. He examined 13 financial ratios for twenty different insolvent countries a 9-year period. He concludes that all ratios used to some extent can predict bankruptcy, but among them the ratio of net profit to special interest, special interest to debt and special interest to fixed assets are the best financial ratios for bankruptcy prediction. Compensation for financial debt occurs when a country fails to comply with one or more clauses related to a debt contract, such as keeping the current ratio or the ratio of the value of the asset to the total assets, which is said to be defaulted. Other cases of compensation for financial debt are when the cash flows of the country are not sufficient to repay the debt, and also when the value of the country is numerically negative [8].

II. Proposed Research Method

Different kind of methods can be used to study this specific research question. Merwin (2013) studied the financial ratios for bankrupt and non-bankrupt countries for a six-year period [9]. He used different ratios such as capital to total assets, the particular interest to total debts and the current ratio are suitable financial indicators to predict the bankruptcy of countries. Using 105 broke countries and 205 healthy countries, Ohlson(2012) work was the most comprehensive research ever carried out, and his extracted prediction model predicted bankruptcy of countries for the first to third years, with 85.1%, 87.6%, 82.6%, and the variables of total debt to total assets and the ratio of net income to total assets were the best segregation ratios in their model [10]. In another study Rennes (2009) designed a model in which information from 949 countries between years (2002-2008) was used [11].

We are arguing that the first step in these kinds of research can be calculating the technical efficiency values of the selected countries. Technical efficiency can be calculated by using different methods such as Data Envelopment Analysis (DEA) or stochastic frontier method. then in the second step this index will be used as a variable to study the financial debt compensation of countries. Data Envelopment Analysis (DEA) is a useful means for measuring efficiency that can measure all aspects of the country's activities and provide a measure of efficiency by examining inputs and outputs [12]. DEA estimates efficiency index by getting help from a linear programming approach. Using DEA, efficiency can be estimated with an input- or output- oriented approach. In calculating technical efficiency by DEA method use multiple inputs and output case. Our inputs can be total asset, total debt, sale's cost and our outputs are income on sale and the profit. Using DEAP software, technical efficiency is calculated. In output-oriented approach we are trying to which answer the following question: 'How much output can be expanded without changing input usage'? [13] ratio of obtained output to the maximum amount of output. T_c points out that all decision-making units are under CRS economic index. T_v is the activity of the decision-making units under VRS economic index. The CCR model is the CRSDEA general model and the BCC model is the general model of VRSDEA [14].

When a DMU is evaluated by the CCR model, there will be:

$$\begin{aligned} & \text{MIN} \\ & \text{Subject to } \sum_{j=1}^n \lambda_j x_j \leq \theta x_0 \\ & \sum_{j=1}^n \lambda_j y_j \geq y_0 \\ & \lambda_j \geq 0, j=1,2,\dots,n \end{aligned}$$

When a DMU is evaluated by the BCC model

$$\begin{aligned} & \text{MIN} \quad \Phi \\ & \text{Subject to } \text{Subject to } \sum_{j=1}^n \lambda_j x_j \leq \Phi x_0 \\ & \sum_{j=1}^n \lambda_j y_j \geq y_0 \\ & \sum_{j=1}^n \lambda_j \\ & \lambda_j \geq 0, j=1,2,\dots,n \end{aligned}$$

It should be mentioned that in studying the financial performance of countries different ratios can be used such as total debt to total assets, net income to total assets, and working capital to total assets. A dummy variable can be used to separate insolvent countries from healthy one base on Article 141 of the trade Code, insolvent countries are countries whose accumulated losses exceed 50% of their capital. Value (1) represents healthy and value (0) shows insolvent countries. The financial ratio distinguishes stability, growth, profitability and activity of countries. Efficiency is a relative concept and a comparison between real and ideal performance. Both CCR and BCC methods are calculated. The difference between these two models is in the assumption of constant or variable returns to scale. In BBC model the assumption refers to scale VRS and in CCR model assumption refers to CRS. The Level of efficiency in Data Envelopment Analysis is determined relative to facility boundary. The boundary of facilities formed by the linear components of the decision-making units and determining the smallest input level which has to be used to produce a given output level [15,16]. fact in calculating technical efficiency using DEA method we will calculate the difference between each unit with the optimal units which is located on the frontier.

III. CONCLUSION

Prediction of financial debt compensation refers to one of major research at financial area. By predicting financial debt compensation and finding the problem and solving it, it can achieve satisfactory results. It should be mentioned that only those countries who have a long-term plan regarding their socio-economic goals can take a step forward to compensate their debt and be closer to stability and growth [17]. In literature on financial debt compensation, majority of researchers have focused on financial ratios of countries to predict financial debt compensation. As mentioned earlier these predictions can help a country to predict upcoming problems and shocks and try to develop the most efficient ways to deal with them. These policies and predictions have direct impact on the level of financial development of a country and it will change the consumption and saving rate of its citizens [18,19]. It is noticeable that efficiency of country affects its financial health and operations. In this research a strategy was suggested to predict financial debt compensation in which efficiency of countries is used as a predictor variable. We are arguing that the first step in these kinds of research can be calculating the technical efficiency values of the selected countries [20]. Technical efficiency can be calculated by using different methods such as Data Envelopment Analysis (DEA) or stochastic frontier method. then in the second step this index will be used as a variable to study the financial debt compensation of countries.

IV. REFERENCES

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