

## Chapter 2

# Measuring the Financial Crisis in Local Governments through Data Mining

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### ABSTRACT

*In local government, the financial analysis is focused on evaluating the financial condition of municipalities, and this is normally accomplished via an analytic process examining four dimensions: sustainability (or budgetary stability), solvency, flexibility and financial independence. Accordingly, the first goal the authors set out to achieve in this chapter is to determine the principal explanatory factors for each of the above dimensions. This is done by examining a wide range of ratios and indicators normally available in published public accounts, with the aim of extracting the most significant explanatory variables for sustainability, solvency, flexibility and financial independence. They use a rule induction algorithm called CHAID, which provides a highly efficient data mining technique for segmentation, or tree growing. The research sample includes 877 Spanish local authorities with a population of 1000 inhabitants or more. The developed model presents a high degree of explanatory and predictive capacity. For the levels of budgetary sustainability the most significant variables are those related to the current margin, together with the importance of capital expenditure in the budgetary structure. On the other hand, the short-term solvency depends on the liquid funds possessed by the entity. The flexibility, however, depends mainly on the financial load per inhabitant of the municipality, on the total sum of fixed charges. Finally, financial independence depends fundamentally on the transfers that the entity receives and on the fiscal pressure, among other elements.*

DOI: 10.4018/978-1-60566-906-9.ch002

## INTRODUCTION

In the context of private enterprise, profitability is the main variable analyzed and monitored by researchers and company managers. At the theoretical level, the DuPont Model establishes the relationships between profitability and a group of variables and accounting ratios such as asset turnover, sales margin and financial leverage. However, in the public sector and even more specifically in the area of local government this concept is overshadowed by other magnitudes that reflect the success or otherwise of management performed in the public interest. Interest is thus focused on evaluating the financial condition of municipalities, and this is normally accomplished via an analytic process examining four dimensions: sustainability (or budgetary stability), solvency, flexibility and financial independence (Groves et al., 2003).

Accordingly, the first goal we set out to achieve in this chapter is to determine the principal explanatory factors for each of the above dimensions. This is done by examining a wide range of ratios and indicators normally available in published public accounts, with the aim of extracting the most significant explanatory variables for sustainability, solvency, flexibility and financial independence. We seek to quantify these relationships and their explanatory variables and thus obtain the relevant profiles, i.e., the combinations of economic-accounting features of the best municipalities with respect to their levels of sustainability, solvency, flexibility and financial independence (Zafra-Gómez et al., 2009a; 2009b; 2009c).

In this context, drawing up a body of rules making it possible to determine the probability of an organization presenting a better or worse financial condition is a crucial issue. The importance for the public manager is determined by the fact that the latter officer must be aware of the variables to be controlled when seeking a stable financial situation with regard to the four elements being considered. Moreover, the utility

of this methodology is that it provides a control instrument for municipal supervisory agencies (central or regional government) as those local authorities that face an Emergency Financial Condition would be obliged to draw up a viability plan to improve it, and their autonomy would be reduced by the supervision by such agencies. Taxes would have to be increased, within legal limits, and/or the services provided would have to be cut back, with the ensuing loss of popularity. Another real consequence that would affect the financial condition of such local authorities would be the denial to them of access to indebtedness facilities for investment projects. At the other extreme, those authorities presenting an excellent financial condition would be subjected to fewer controls and supervision, and thus their autonomy would increase; they would have greater access to certain forms of financial assistance and to indebtedness facilities.

This analysis makes use of a rule induction algorithm called CHAID (Chi-squared Automatic Interaction Detector, Kass, 1980), which provides a highly efficient data mining technique for segmentation, or tree growing, so that a tree of rules may be derived to describe different segments within the data in relation to the output (dependent) variable, allowing us to classify local governments according to the different values of their accounting ratios (explanatory variables or predictors).

The chapter begins with a review of the main empirical studies carried out to measure financial crises affecting local authorities. We go on to outline our methodological proposal to achieve the above aims, explaining the analytic technique to be applied, and then describe the sample and the variables. Subsequently, the main results of the analysis are discussed, firstly by means of an exploratory analysis, and then from an explanatory viewpoint. Finally, we highlight the most important issues raised in this chapter and suggest future areas for investigation.

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