Economics World, May-June 2018, Vol. 6, No. 3, 177-184
doi: 10.17265/2328-7144/2018.03.002

Measuring Financial Strength in the Public Sector: The Case of Greek Municipalities

Christos Pallis
Hellenic Open University, Patras, Greece
Konstantinos J. Liapis, Panagiotis M. Spanos
Panteion University of Social and Political Sciences, Athens, Greece

An important research field in public and private sectors, accounting is the identification of the factors of financial strength that affect the control and decision-making process. The paper examines the financial strength of the municipalities in Greece and their possible bankruptcy. In literature, important examples of forecasting and estimating financial strength for public sector have been presented, such as the Brown's 10-point test which measures the financial condition in the case of municipalities. The present survey focuses on the liquidity of the Greek municipalities using data for the financial year 2014 from all over the Greek territory. By implementing Brown's 10-point test for Greek municipalities and using quantitative methods, each point is becoming a separate independent variable which affects, with different estimator, the total score of financial condition. The model that has been developed appears to be effective in the case of Greek municipalities by providing a rating for their financial strength. The use of the proposed methodology can be used by both funding institutions (banks, grant providers, relevant ministry) on a programmatic basis to address liquidity problems.

Keywords: municipalities, financial performance, Brown's 10-point test

Introduction

Financial position is the result of long-term financial performance in the past, which takes place in the future. In this paper, financial strength is highly related to creditworthiness of each municipality and is reflected by the measurement of its financial condition through the application of the 10-point method (Brown, 1993; 1996). Comparison of the Brown method with a similar model of the private sector (Altman, 1968; 2000) is under research, given that aggregate actual data of municipalities' balance sheets are still insufficient for the overall assessment of its generalized model. Because it is necessary to extract an objective scoring method for the whole territory according to the financial data of each municipality, the economic data are transformed into corresponding variables; each point is presented as a mathematical equation and quantitative methods like regression analysis are used to extract the correlation between the 10 Brown points and the overall total score

Christos Pallis, Ph.D., Hellenic Open University, Patras, Greece.
Konstantinos J. Liapis, associate professor, Department of Economic and Regional Development, Faculty of Economics and Public Administration, Panteion University of Social and Political Sciences, Athens, Greece.
Panagiotis M. Spanos, Ph.D. candidate, Department of Economic and Regional Development, Faculty of Economics and Public Administration, Panteion University of Social and Political Sciences, Athens, Greece.
Correspondence concerning this article should be addressed to Christos Pallis, Hellenic Open University, Parodos Aristotelous 18, Patras 26335, Greece.

(score—10 to 20) in a relevant model. The relation that results with a high degree of correlation is checked for its significance and by using the Monte Carlo simulation it is attempted to extract the weight of the determinant for each point to obtain an accepted score (-4 to 20) or to have a financial situation with less possibility of bankruptcy. The survey shows that in the case of the municipalities of Greece, the factor that makes a municipality better in financial strength is the independence from external government grant (Brown's second point) or the ratio "total general funds revenues from own sources to total general funds revenues" (Brown, 1993, p. 22). On the other hand, the factor that makes a municipality in worst financial condition is the ratio "total general fund liabilities to total general fund revenues" (Brown, 1993, p. 22) which suggests the ability to service short-term liabilities from the normal flow of annual revenue.

Literature Review

In international literature, financial condition and financial performance are not often considered the same. Financial performance is limited to short-term horizons and relates to revenue generation and expenditure, while financial condition features with both short- and long-term extensions (Wang, Dennis, & Tu, 2007). In another view, the financial performance concerns the evaluation and reporting of data related to the quality, efficiency, and effectiveness of an organization (Carmeli, 2002). The use of private sector models (Altman) has been a research point for assessing the financial health of municipalities (Fischer, Marsh, & Bunn, 2015). In addition to the Brown method developed in this article, the measurement of the financial performance of local governments has long been the subject of research from both scientists and institutes-organizations. According to the Canadian Institute of Certified Accountants (CICA, 1997), the financial condition of a local government is the same as financial health measured based on sustainability, vulnerability, and flexibility within an overall framework governing the economic and financial environment. Groves, Godsey, and Shulman (1981) and Nollenberger, Groves, and Valente (2003) integrate the financial condition of a local government in its capacity to finance its services on an ongoing basis, distinguishing between cash solvency, financial solvency, long-term solvency, and solvency at service level (Ritonga, Clark, & Wickremasinghe, 2012). According to Kloha, Weissert, and Kleine (2005), the financial condition relates to the distress and the ability to carry out activities, debt servicing and meet the needs of society on a long-term basis. Similarly, Jones and Walker (2007) interpret the financial distress as the lack of ability to continue providing to citizens the same level and nature of services. Hendrick (2004) relates the economic condition of a local government to the ability of a local government to meet its financial obligations and community services. Berne and Schramm (1986) relate the financial condition of the local government to the possibility of fulfilling their financial obligations to their creditors (Ritonga et al., 2012). Rivenbark and Roenigk (2011) define the financial condition of a local government as its ability to meet short-term liabilities, services, and capital requirements as shows in their financial statements. In the case of the municipalities of Greece, previous research focuses on the estimation of the factors that affect the financial performance of the municipalities based on financial ratios by adopting the accrual basis and other quantitative characteristics such as the population or the income etc. (Cohen, 2008).

Data-Methodology

According to Brown, all points in his methodology have equal importance (Brown, 1993) to evaluate financial performance for each municipality in its population cluster. After implementing Brown's methodology in the case of the Greek municipalities, this research attempts to estimate the importance of each point in calculating the total score from all municipalities by omitting the population clustering. Brown (1993; 1996) presented 10 major financial indices that concerned United States municipalities with population up to 100,000. For the implementation of Brown's method in the case of the municipalities of Greece it was necessary to separate the municipalities into four subgroups of the population according to the latest population census. These include municipalities of up to 10,000 (81), municipalities of 10,000 to 20,000 (83), municipalities of 20,000 to 40,000 (78), and municipalities of 40,000 or more (83). A necessary step in assessing the financial situation is the calculation of the 10 key financial ratios of all local governments according to the figures of the budgets and balance sheets. These indicators derive both from the accounts of the executed budget and the balance sheets of the Municipalities considering demographic data. The data used in the survey relate to the year 2014 and are official data by the Greek Ministry of the Interior. These data had to be transformed according to the criteria of the operational, investment, financing, and subsidized activities and be adapted to the existing data for Greek municipalities. The above methodology has limitations on the assessment of the financial condition of municipalities on a comparative basis among different population groups and does not constitute an absolute general score of good or bad financial performance. For example, the same municipality in a different population class could have a better or worse score than the one rated. Therefore, the use of the method and the extraction of a general rating category are more effective when it is done for all municipalities and not in a single sample of them.

Results

After rating all the municipalities with the financial condition score, the model is estimated by regression analysis on (or?) least squares method and the implementation of Monte Carlo Simulation is necessary to face decision-making problems. The results from regression analysis between the values of the 10 Brown points as independent variables and the total score (TOTAL) as dependent variable are shown in Table 1.

Therefore, the equation that calculates the total score for the case of Greek municipalities is:

$$\text{Total score} = 0.00001 \times P1 + 13.236 \times P2 - 15.999 \times P3 - 6.521 \times P4 + 1.379 \times P5 + 3.971 \times P6 + 0.052 \times P7 - 10.069 \times P8 + 0.003 \times P9 - 71.169 \times P10 \quad (1)$$

Table 1

Regression Analysis

ANOVA[a,b]						
Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	15,520.741	10	1,552.074	108.468	0.000[c]
	Residual	4,364.259	305	14.309		
	Total	19,885.000[d]	315[1]			

Notes. a. Dependent variable: total.

b. Linear regression through the origin.

c. Predictors: Point 10, Point 7, Point 6, Point 3, Point 8, Point 9, Point 1, Point 4, Point 5, Point 2.

d. This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.

[1] The total of municipalities is 325. The 10 municipalities that have not been considered are municipalities that either do not have an account or because of their data, it is not possible to extract an index (e.g. zero liabilities).

(Table 1 continued)

Coefficients[a,b]						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. error	Beta		
1	Point 1 (HB)	0.000	0.000	-0.039	-0.623	0.534
	Point 2 (HB)	13.236	1.588	1.566	8.336	0.000
	Point 3 (LB)	-15.999	3.845	-0.178	-4.160	0.000
	Point 4 (LB)	-6.521	1.910	-0.650	-3.415	0.001
	Point 5 (HB)	1.379	0.730	0.252	1.888	0.060
	Point 6 (HB)	3.971	0.679	0.218	5.845	0.000
	Point 7 (HB)	0.052	0.016	0.113	3.324	0.001
	Point 8 (LB)	-10.069	1.397	-0.304	-7.210	0.000
	Point 9 (LB)	0.003	0.001	0.100	2.614	0.009
	Point 10 (LB)	-71.169	12.961	-0.247	-5.491	0.000

Notes. a. Dependent variable: total (HB; High Best; LB; Low Best).

b. Linear regression through the origin.

Descriptive statistics[a]			
	Mean[b]	Root mean square	N
Total	4.99	7.945	315
Point 1	912.751	1,248.556	315
Point 2	0.936	0.939	315
Point 3	0.051	0.088	315
Point 4	0.782	0.792	315
Point 5	1.367	1.454	315
Point 6	-0.169	0.435	315
Point 7	6.915	17.288	315
Point 8	0.174	0.240	315
Point 9	122.296	308.995	315
Point 10	0.019	0.027	315

Notes. a. Coefficients have been calculated through the origin.

b. The observed mean is printed.

Model summary				
Model	R	R Square[b]	Adjusted R square	Std. error of the estimate
1	0.883[a]	0.781	0.773	3.783

Notes. a. Predictors: Point 10, Point 7, Point 6, Point 3, Point 8, Point 9, Point 1, Point 4, Point 5, Point 2

b. For regression through the origin (the no-intercept model), R square measures the proportion of the variability in the dependent variable about the origin explained by regression. This cannot be compared to R square for models which include an intercept.

The above model, which correlates the results of the 10 points with the total score as a dependent variable, concerns the year 2014. The point which improves the financial condition is point 2 (total general fund revenues from own sources to total general fund revenues) and on the other hand, the point which makes the financial condition worse, is point 10 (debt service to total revenues). By applying the model to all the municipalities of the country, the financial condition is estimated as follows (Table 2):

In our opinion, the worst-performing municipalities (with E rating) have a higher probability of bankruptcy. After this point, the estimation of the correlation between financial condition and municipality return is examined with results shown in Table 3:

Table 2

Modeling Results Table (315 out of 325)

Rating	A	B	C	D	E
No. of municipalities	40	159	75	25	16

Table 3

Correlation Between MR and Rating

	MR	Rating
MR	1	
Rating	0.673087803	1

$$\text{Municipality return} = (E - F)/E \quad (2)$$

where, E is actual revenues and F is actual expenditures. From the aforementioned correlation analysis we observe that the results of the budget execution for the municipalities are positively correlated with the corresponding financial performance score. The above result is important because it relates budget execution results such as surplusor deficit (which is not included in 10 points) to the overall evaluation. Then, by using stochastic simulation methodology (Monte Carlo) based on the statistics of the economic indices (i.e. the 10 points), the weight of each point is estimated in order to determine an acceptable rating. At this point, we assume an acceptable result of not receiving the E rating.

Applying Monte Carlo Simulation

Fifty years ago, Hertz (1964) proposed a method, which applied Monte Carlo (due to the gambling aspect of the process) simulation to business decisions under uncertainty. Since then, this method has been popularized by the rapid development in information technology. Nowadays, many practical and theoretical problems involving risk and uncertainty in economics and management are solved using approaches, which follow the same principles originating from his work. According to Bennett and Ormerod (1984), Monte Carlo technique or stochastic simulation (due to the presence of random processes) typically generates estimates by randomly calculating a feasible value for each variable from a statistical probability distribution function which represents the range and pattern of possible outcomes. To ensure that the chosen values are representative of the pattern of possible outcomes, a quite large number of repetitive deterministic calculations (known as iterations) are made. Lorance and Robert (1999), as cited in Loizou and French (2012), list the various steps of carrying out a Monte Carlo simulation: the first step is to define the capital resources by developing the deterministic model of the estimate. The second step is to identify the uncertainty in the estimate by specifying the possible values of the variables in the estimate with probability ranges (distributions). The third step is to analyze the estimate with simulation—the model is run (iterated) repeatedly to determine the range and probabilities of all possible outcomes of the model. Prior to running the simulation, the model produces a single-point value (result) for the estimate. This value is known as the deterministic result, and generally is referred to as the base estimate before adding contingency. There are several software tool environments in which Monte Carlo simulations can be run with add-ins to spread sheets being the most popular (such as Crystal Ball, @risk and Model Risk commercial software packages). In this paper the simulation takes place by Monte Carlo method (assuming a normal distribution) according to the descriptive statistical data of each variable by using Palisade @risk software. The results are presented in Figures 1 and 2.

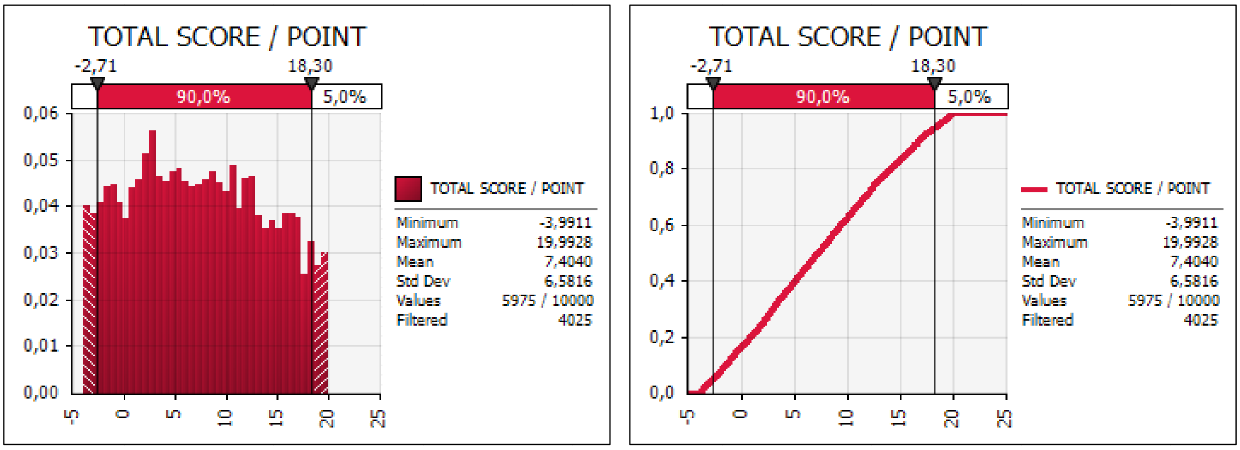

Figure 1. Model test in simulation conditions for acceptable score.

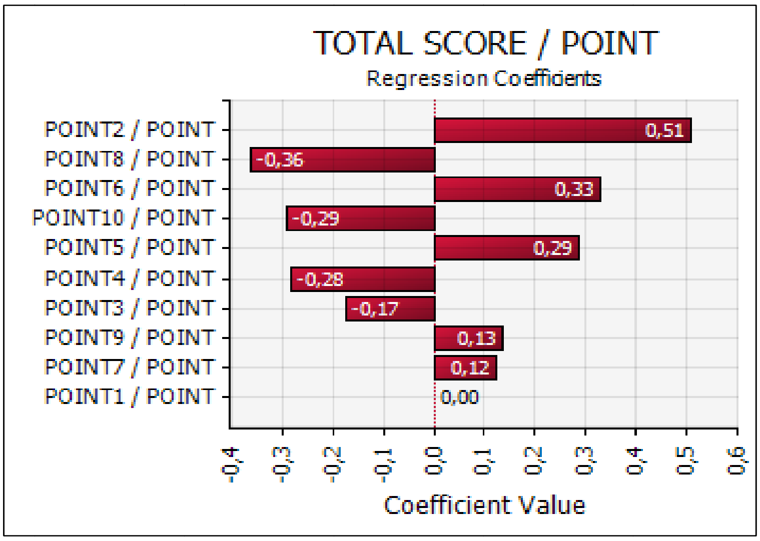

Figure 2. Weight of coefficients to extract an acceptable score.

According to the results of the above methodology, the factors that affect the financial condition in a range (-4 to 20) or these which influence with a relative weight in the assessment of a municipality at rating A, B, C, and D are shown in Figure 2. Among the 10 points, nine points influence the final acceptable evaluation in the same direction as the corresponding assessment. For example, the second point where the municipality receives a score like its result (the higher result, the higher score), is positive and so on. The coefficient which is directed against the score that characterizes it, refers to point No. 9, i.e. the ratio of long-term loans to population. This fact, however, does not raise concerns because the coefficient in the model is very low, so its effect is basically neutral. The same could be mentioned for No. 1 index as the result will be constantly neutral. While the initial rating was based on the categorization per population group, the final model ultimately isolates the population impact, which is also presumed by the very low coefficients of these points.

Conclusions

The aim of this research is to find a common methodology for assessing the financial condition in the case of Greek municipalities. Elements from the Ministry of the Interior were used for all municipalities and Brown's 10-point method was implemented, combining reporting, balance sheet, and demographic data. In all groups of municipalities, Brown method was used and a total score of comparative presentation in the same group was calculated for their financial condition. To estimate a model of a common assessment which includes all municipalities, an initial assessment was necessary according to the population group they belonged to. After calculating the coefficients which define the common total score by using regression analysis, the Monte Carlo simulation was applied to calculate the weight of each determinant in an acceptable range of financial condition (-4 to 20). For Greek municipalities, it was found that the point which improves the financial condition is the independence from external government grants (point 2) and on the other hand, the point which makes the financial condition worse, is the ability to service short-term liabilities from the normal flow of annual revenue (point 8). The model that has been developed appears to be effective in the case of Greek municipalities by providing a rating for their financial strength. The use of the methodology which is developed in this article can be used by both funding institutions (banks, grant providers, relevant ministry) on a programmatic basis to address liquidity problems. The next point of research is to correlate the results of the Brown model with the results of implementing Altman's method based on existing data capabilities.

References

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance*, *23*(4), 589-609.

Altman, E. I. (2000). Predicting financial distress of companies: Revisiting the Z-score and ZETA models. Stern School of Business, New York University.

Bennett, J., & Ormerod, R. N. (1984). Simulation applied to construction projects. *Construction Management and Economics*, *2*, 225-263.

Berne, R., & Schramm, R. (1986). *The financial analysis of governments*. Prentice-Hall.

Brown, K. W. (1993). The 10-point test of financial condition: Toward an easy-to-use assessment tool for smaller cities. *Government Finance Review*, *9*, 21-26.

Brown, K. W. (1996). Trends in key ratios using the GFOA financial indicators databases 1989-1993. *Government Finance Review*, *12*, 30-34.

Carmeli, A. (2002). A conceptual and practical framework of measuring performance of local authorities in financial terms: Analysing the case of Israel. *Local Government Studies*, *28*(1), 21-36.

CICA. (1997). Indicators of government financial condition. Canadian Institute of Chartered Accountants, Toronto.

Cohen, S. (2008). Identifying the moderator factors of financial performance in Greek municipalities. *Financial Accountability & Management*, *24*(3), August, 0267-4424.

Fisher, M., Marsh, T., & Bunn, E. (2015). Fiscal health analysis of Texas and its municipalities. *Journal of Business & Economics Research*, *13*(2), 115-122.

Groves, S. M., Godsey, W. M., & Shulman, M. A. (1981). Financial indicators for local government. *Public Budgeting & Finance*, *1*(2), 5-19.

Hendrick, R. (2004). Assessing and measuring the fiscal health of local government: Focus on Chicago suburban municipalities. *Urban Affairs Review*, *40*(1), 78-114.

Hertz, D. B. (1964). Risk analysis in capital investment. *Harvard Business Review*, *42*, 95-106. Reprinted in Harvard Business Review, September/October 1979, pp. 169-182.

Jones, S., & Walker, R. (2007). Explanators of local government distress. *Abacus*, *43*(3), 396-418.

Kloha, P., Weissert, C. S., & Kleine, R. (2005). Developing and testing a composite model to predict local fiscal distress. *Public Administration Review*, 65(3), 313-323.

Loizou, P., & French, N. (2012). Risk and uncertainty in development: A critical evaluation of using the Monte Carlo simulation method as a decision tool in real estate development projects. *Journal of Property Investment & Finance*, *30*(2), 198-210.

Lorance, R. B., & Robert, V. W. (1999). Basic techniques for analysing and presentation of cost risk analysis. AACE International Transactions, Association for the Advancement of Cost Engineering.

Nollenberger, K., Groves, S. M., & Valente, M. G. (2003). *Evaluating financial condition: A handbook for local government.* Washington, DC, International City/County Managers Association.

Rivenbark, W. C., & Roenigk, D. J. (2011). Implementation of financial condition analysis in local government. *Public Administration Quarterly*, *35*(2), 241-267.

Ritonga, I., Clark, C., & Wickremasinghe, G. (2012). Assessing financial condition of local government in Indonesia: An exploration. *Public and Municipal Finance*, *1*(2), 37-50.

Wang, X., Dennis, L., & Tu, Y. S. J. (2007). Measuring financial condition: A study of US states. *Public Budgeting & Finance*, *27*(2), 1-21.