

A Symposium on Evaluating Financial Management of Large Cities: An Application of Fuzzy Rule-Based Systems

Salwa Ammar
Department of Business Administration
Le Moyne College
Syracuse, NY 13214-1399
ammar@mail.lemoyne.edu

William Duncombe
Department of Public Administration
Syracuse University
Syracuse, NY 13244-1020
duncombe@maxwell.syr.edu

Bernard Jump
Department of Public Administration
Syracuse University
Syracuse, NY 13244-1020
bjump@maxwell.syr.edu

Ronald Wright
Department of Business Administration
Le Moyne College
Syracuse, NY 13214-1399
wright@mail.lemoyne.edu

INTRODUCTION

We who teach or practice public management have a love-hate relationship with performance measurement. On the one hand, it is hard to deny that public agencies should be focusing on serving their clients more effectively and efficiently as their bottom line. The reemergence of performance management and performance budgeting in the last decade reflects the general acceptance of this principle. However, the closer one gets to performance measurement in practice, the larger the warts appear. Performance measures almost by definition provide incomplete snapshots of an agency's operation, and performance comparisons across organizations can miss important differences in their legal and fiscal environments.

The objective of this symposium is to compare the financial management practices and overall financial performance of large cities. A well-run financial system lies at the heart of a government's control system and can provide important information for improving efficiency. For example, the newest form of cost accounting, activity-based costing, is a key component in several recent management reforms, such as business process reengineering and benchmarking.¹ Despite the importance of financial management, comparisons of the financial management practices of governments are relatively rare, and overall assessments of financial management performance are almost non-existent. Rating agencies claim to consider administrative factors in developing credit ratings, but the criteria and data used are kept vague.²

We undertake this task with a healthy respect for the difficulty of measuring with precision such a broad and illusive area. Appropriate financial management practices may depend on the context in which they are used, thus, evaluation systems should reflect the importance of context. Since measures of the quality of financial management are often

imprecise, the evaluation method should not be overly sensitive to small measurement errors in a few inputs. Most importantly, evaluations need to capture the breadth of this field by using a variety of performance measures that provide a reasonably complete picture of what public financial managers do.

The evaluations undertaken in this symposium take advantage of a new source of data, and a new evaluation methodology. Most comparative research on financial management has focused on a specific area of financial management, such as capital budgeting. As part of the Government Project (GPP), a joint project of the Maxwell School at Syracuse University and *Governing* magazine funded by the Pew Charitable Trust, detailed surveys on management were sent to state and local governments.³ The evaluation reported in this symposium uses the results from the GPP City Survey for financial management and capital management sent to the 35 largest American cities (in terms of revenue) in the spring of 1999. The survey results, combined with numerous financial documents and reports supplied by the survey participants, provide a rich database that is unprecedented in its breadth.

Evaluating such a wide variety of measures for a complex phenomenon, such as financial management, is a daunting task. In developing overall measures of management, we have employed a new methodology, fuzzy rule-based systems (FRBS), that can handle the complexity of management systems, and offers a number of advantages over traditional evaluation methodologies.⁴ First it allows evaluators to break down complex systems into manageable components that can be evaluated separately. A key part of the performance evaluations described in this symposium is the development of frameworks for each area that highlight key components and how they are related to each other. In addition, FRBS can use a variety of data types by converting data into comparable ordinal input measures that are not overly sensitive to

small measurement errors. The key advantage of FRBS lies in how individual components are combined into a performance measure. Instead of using simple and arbitrary additive methods, a series of rules-bases are developed for combining inputs. The rules-bases are a series of rules that reflect the judgment of the evaluator or experts in the field on what combination of inputs reflect poor, fair or good financial performance. By design, these rules-bases can reflect the complex contextual judgments commonly made by evaluators.

The symposium is organized into three papers. The first two papers provide overall assessments of capital management and financial management, respectively. Capital management is clearly an element of overall financial management, but it was separated from other financial management functions to reflect the unique long-term perspective it requires. As the first paper in the symposium, the paper on capital management includes a more complete description of the process of developing a fuzzy rule-based system for evaluation than we present in the other papers. To illustrate this process we have used the first city in our sample, Anchorage, Alaska, as an example.

The last paper in the symposium combines measures of financial management with information on the economy and finances of cities, and uses a FRBS to provide an overall assessment of financial performance. A comparison is made between credit ratings derived from this FRBS and actual Moody's bond ratings for these cities. This paper will provide some indirect evidence on the factors considered in the development of bond ratings, and the role of management information, in particular.

Given the typical data limitations and simplifications required in evaluating public management, the evaluation results should be viewed as a first step in the evaluation of city financial management. A key part of a fuzzy rule-based systems is the development of rules matrices that explicitly present the rules for combining inputs into evaluation results. Our

rankings reflect our judgments about what represents good financial management practices, and under which conditions. Other rules are certainly possible, and would produce different evaluations of city financial management. By bringing these judgments about what represents good performance to the surface, rules matrices open up the evaluation process to scrutiny and revision.

FOOTNOTES

1. Gary Conkins, Alan Stratton, and Jack Helbling. *An ABC Manager's Primer*, (New York: McGraw-Hill, 1993); and Richard Brown, Mark Myring, and Cadillac Gard, "Activity-Based Costing in Government: Possibilities and Pitfalls," *Public Budgeting & Finance*, 19 (Summer 1999): 3-21.
2. The administrative factors that are discussed in publications from the rating agencies are primarily related to financial management. Moody's Investors Service, "The Determinants of Credit Quality," *Municipal Credit Research*, (November 1999): 1-16; Standard & Poor's, *Public Finance Criteria*, (New York: Standard & Poor's, 2000); Fitch IBCA, "Local Government General Obligation Rating Guidelines," *Tax Supported Special Report*, (May 23, 2000): 1-11.
3. More information on the Government Performance Project is available on the project's web site, www.maxwell.syr.edu/gpp.
4. The basic tools of fuzzy rule-based systems, fuzzy set theory and fuzzy logic, have been used in the past ten years in numerous scientific and engineering applications, primarily in control systems and pattern recognition. See G. J. Klir, and B. Yuan, *Fuzzy Sets and Fuzzy Logic: Theory and Application* (Englewood Cliffs, NJ: Prentice Hall, 1995). However, application in the social sciences has been much more limited. See William Treadwell, "Fuzzy Set Theory Movement in Social Sciences," *Public Administration Review* 55 (January/February, 1995): 91-98.