MULTICRITERIA EVALUATION OF THE PERFORMANCE OF PUBLIC ENTERPRISES: THE CASE OF GREECE

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ABSTRACT

Within any national economy, public enterprises play an essential and vital role, serving specific social purposes and contributing in the formulation and control of national policies in strategic fields such as telecommunications, transport, energy, etc. However, the international economic changes, the continuous deregulation of the markets and the new competitive environment that is formulated, require the reformation of public enterprises so that they can operate in a more corporate way, while retaining their social and strategic role. Within this new context the evaluation of the financial performance of public enterprises is essential in order to ensure their viability. Especially in the case of Greece the aforementioned problem is more challenging than ever before. Focusing on the Greek case, this paper proposes a multicriteria decision aid methodology to evaluate the financial performance of public enterprises. The proposed approach is applied on 40 Greek public enterprises, and useful conclusions are drawn regarding the capabilities and the efficiency of the approach.

KEYWORDS: Public Enterprises; Public Sector; Performance.

INTRODUCTION

The creation of public enterprises by governments it is hoped to assist the development of strategic sectors in an economy, maintain employment levels, or raise the level of savings and investment. The private sector, it is assumed, would consume wastefully or remit its earnings abroad. To what extent though these hopes have been fulfilled remains a question. We can see nowadays production, quantity and quality of public enterprises, to have been dropped below projections, and the sector to impose on governments heavy fiscal and managerial burdens.

In the life cycle of many public enterprises it seems to operate a regressive tendency as Shepherd (1976) had observed and which seems to be true still nowadays. At the start, they may improve equity by providing essential services at prices below what they would otherwise had been. This creates a benefit to those needy groups of the society. But as time passes, these services become relatively less essential; the more powerful and adaptable consumers of the service tend to increase their use of it and increase their ability to extract favorable concessions for themselves. Therefore, after some years, public enterprises may not supply anymore the originally needy clientele but rather some nondeserving groups and highly flexible enterprises. One can also observe that public enterprises may shift from active, aggressive and purposive activity into a passive status. This would result in an immense burden on state finances that would continue to support such unproductive undertakings. Since new public enterprises are always created for a number of different reasons while others slip into passivity, the need may arise to return to partial or complete private status. The problem then is to define how this evolution occurs, and how the shift out of public finance can be engineered efficiently.

Given the above, the question arises of how we can beastly deal with such a sector in any economy. Indispensable part of any action, as regards governments, is a thorough evalua-

tion of the performance of public enterprises, which will indicate the symptoms as well as the causes of an existing situation. Greece has experienced a great governmental participation in economic activity that dates back to the early 20s with the first railway transportation undertakings, and the latter implementation of governmental projects in the banking, energy, telecommunications, armaments, ports, and housing sectors. During the 80s many private firms that were facing viability problems became public in order to control unemployment and to ensure that these firms would be reformed so that they could continue their operation. In the 90s, this policy has changed and there have been massive privatizations of public enterprises, while many public enterprises have entered the Athens Stock Exchange. Today's value-added of some 48 main Greek public enterprises is amounted to 1.8 billion drachmas, which composes a 7% of the Greek GDP at factor prices (Ministry of Finance 1997). Their investments are calculated to 17.7% of total Greek domestic investments, this comprising a 4% of GDP. Employment at the above enterprises represents a 10% of the total non-agricultural labor force. The contribution of Greek public enterprises to the success of the various national economic development plans has always in the past and today being considered essential (Ministry of National Economy 1983; Ministry of Finance 1997).

The above brief discussion of the current situation of Greek public enterprises indicates that the evaluation and monitoring of the financial performance of Greek public enterprises is significant for the government, the managers of these enterprises, as well as for the investors. The recent discussions for privatization and/or suppression or even reduction of those highly undesirable public enterprises pronounces this remark. The Greek government has recently announced the reformation and restructuring of several public enterprises that face significant operating and financial difficulties, and indicated its intention to proceed with carefully designed privatizations. Nevertheless, before the determination and implementation of specific measures it is necessary to perform an evaluation of the financial performance of public enterprises to identify their major weaknesses and problems. This requirement for assessing the performance of public enterprises, especially in the case of Greece, is pronounced by the rapidly changing economic environment mainly within the context of the European Union, and the expected deregulation imposed by European laws and directives on several strategic fields including telecommunications, power supply, transports, etc.

In this paper an innovating approach based on multicriteria analysis is proposed for the evaluation of the financial performance of the Greek public enterprises. More specifically, the FINEVA (FINancial EVAluation; Zopounidis et al. 1996b) multicriteria knowledge-based decision support system is used for the development of a model that will facilitate the ranking of Greek public enterprises from the best to the worst ones according to their financial performance. A total of 40 main Greek public enterprises are searched, and financial ratios (a three year average) are constructed for each one, by reviewing their balance sheets and income statements for the period 1993-1995. These firms, the largest in the area, are in a corporate form and according to the Greek tax law are obliged for reporting their balance sheets and income statements. Others, which do not have that obligation, and are smaller in nature, were totally unavailable for evaluation. The expert analyst who was used in the process of our analysis has been a former director of the Organization for the Restructuring of Public Enterprises (the main body which overlooks Greek public enterprises).

The rest of the paper is organized as follows. Section 2 provides reviews of previous research on the evaluation of the performance of public enterprises, giving special emphasis on the Greek case. Section 3 presents briefly the proposed multicriteria methodology that is based

on the FINEVA multicriteria knowledge-based decision support system. Section 4 is devoted to the presentation of the application of the FINEVA system to evaluate the financial performance of Greek public enterprises. Finally, section 5 concludes the paper and presents some possible future research directions.

PREVIOUS RESEARCH

Various studies that have examined in the past the issue of the performance evaluation of public enterprises include Shepherd (1965; 1976), Pryke (1981), Millward (1982), Fernandes and Kreacic (1982), Short (1983), Marchand et al. (1984), Kirkpatrick et al. (1984), Rees (1984), Nellis (1986; 1989), Pestieau (1989). The majority of previous studies examine the development of a general framework for performance evaluation of public enterprises, through the determination of the appropriate performance evaluation criteria. Several authors have pointed out that the criteria for the evaluation of public enterprises' performance are directly related to the objectives of each public enterprise (Rees 1984; Pestieau 1989). This raises another significant issue, that of determining the objectives of public enterprises. Bearing in mind that public enterprises may have a social as well as a commercial role, it is apparent that there are multiple objectives in the operation of public enterprises including efficiency (technological and allocative), profitability, income distribution and contribution to the implementation of macroeconomic policies (Rees 1984).

Except for studies on the methodological aspects of performance evaluation of public enterprises, there were also studies employing descriptive and statistical approaches (mainly regression analysis) to identify the characteristics of the performance of public enterprises. Gantt and Dutto (1968) studied the financial performance of 64 public enterprises from 26 countries. Through a descriptive analysis they found out that there were significant differences among European, Latin American, African and Asian public enterprises regarding their flow of funds ratios. Similar differences were also observed for public enterprises of different industrial sectors (only petroleum and electrical enterprises were found to have positive flow of funds ratios, while the rest had to be supplied with funds to cover their expenditures). Furthermore, through regression analysis they concluded that investment in public enterprises does not depend on profitability, while the transfers from the central government are significantly lower than the mean for European public enterprises and significantly higher than the mean for Latin American ones.

A regression analysis approach was also employed in the study of Finsinger (1984) to compare the performance of public and private enterprises in the German automobile and life insurance markets, in terms of their pricing policy, their cost effectiveness, and their service quality. He concluded that public enterprises not only do they compete successfully with private firms, but they also outperform them.

As far it concerns the case of Greece, most studies regarding the performance of Greek public enterprises were descriptive ones. Provopoulos (1982) examined 23 Greek public enterprises from the sectors of energy, utility, transportation, communication, manufacturing, trade, and banking, and tried to study within each sector some major facets of public enterprises' financial performance (i.e., profitability, investment patterns, financial needs, and the extent of net government transfers), and also compare group performances between each other. The data employed in this study concern the accounts of fixed assets, receipts and expenditures on current accounts, depreciation, and transfers to and from government (all expressed as percentages of economic activity). The results of the descriptive analysis that is performed indicate that, in

general, public enterprises in the energy, manufacturing, and banking sectors during the period under investigation (1971-1980) seemed to perform better than enterprises in the other sectors of the economy. Of course, the number of firms that belong to these other sectors is not negligible, so, not a very promising picture could be given for the entire world.

The study of Vavouras (1986) works on similar grounds as regard the categories of public enterprises, and the time period (1975-1982) to which all the comparisons refer. He has additionally calculated separate average financial indices for a total of 15 available public enterprises and for each one of the above years. At the aggregate sectoral level, data variables used are value added, number of employees, gross fixed capital formation, and turnover. At the corporation level, data variables used are the above variables as also net fixed assets, profits, capital employed, and nominal share capital. The study indicates that at the sectoral level only the average index of labor productivity was improved during the examined period (with a noticeable increase in the energy sector) while there was a reduction during this period in the investment index and the average index of net value generation (although an increase was observed for this last index in the manufacturing sector). The overall performance indices provided a very disappointing situation: profitability indices exhibited a steady fall over the eight years of study and the same was true for the financial position index (ratio of nominal share capital to capital employed), and the technology index (ratio of capital employed to labor). The only overall indices that showed a positive trend were the productivity indices but still their rise was attributed to the underinvestment that characterized the whole period and which is reflected in the technology index.

Apart from these two previous studies, Lioukas and Papoulias (1990) depart from balance sheets evaluation criteria and report on multiple indicators (goal achievement, ability to acquire resources, flexibility/adaptability to changing environment, social justice) that are met in the wider literature on organizational effectiveness. Their data is derived from questionnaire material dispatched to Greek public enterprises by the Ministry of National Economy. A total of 110 Greek public enterprises are searched. Through regression analysis the authors tried to identify which factors are most closely associated with good performance. Good performance as dependent variable is measured by two sets of effectiveness indicators: those related to "efficiency", as for example profitability or return-on-capital, total factor productivity (ratio of value added to labor or capital employed), and capacity utilization, and those referring to "innovation", as for example acceptance of new ideas, or modernization of investments. Intensity of state control, competition, internal decentralization and internal management systems all come under statistical scrutiny as explanatory variables. State controls, which in general are very tied, are found to be negatively associated with enterprise effectiveness. Decentralization of decision making as well as development of internal systems are all found to be positively associated with effectiveness. Policy directions that are suggested include loosening of state control with emphasis on *ex post* rather than *ex ante* control, depoliticization of management, exposure of public enterprises to competition particularly in international markets, organizational and managerial modernization through internal decentralization and development of internal systems and processes.

This brief review on the assessment of public enterprises' performance clearly indicates that significant research has been devoted to the establishment of the formal theoretical grounds on which the performance evaluation process should be based, as well as on the description of the characteristics of public enterprises. Nevertheless, little has been done on the development of performance evaluation models integrating all the performance evaluation

criteria into a single evaluation index that can be used to derive decisions. The subsequent sections of the paper illustrate how such a performance evaluation index can be developed through a multicriteria decision aid approach, based on financial data of Greek public enterprises. Of course this proposed approach is also applicable in any other country, while the performance evaluation criteria, except for the financial characteristics of public enterprises, can also include any other information (quantitative or qualitative) regarding their social and economic role.

MULTICRITERIA METHODOLOGY: THE FINEVA SYSTEM

The FINEVA system is a multicriteria knowledge-based decision support system for the assessment of corporate performance and viability. The basic characteristic of the FINEVA system is the combination of an expert system with a multivariate statistical method (principal components analysis) and the multicriteria method UTASTAR, to estimate the corporate performance and the viability of firms. Figure 1 outlines the structure of the FINEVA system (more details can be found in Zopounidis et al. 1996b).

The expert system provides an initial evaluation of firms based on the methodology followed by expert financial/credit analysts (a detailed description of the expert system part can be found in Matsatsinis et al. 1997). The expert system analyzes some financial ratios as well as some strategic variables (quality of management, market niche/position, organization, etc.) and sorts the firms in four groups, the not satisfactory, the medium, the satisfactory and the very satisfactory firms. The principal components analysis can be used by the decision maker to identify the most significant financial ratios, and to determine the behavior of the firms in order to identify firms with similar financial behavior and characteristics.

Figure 1. Structure of the FINEVA System (Source: Zopounidis et al., 1996b).
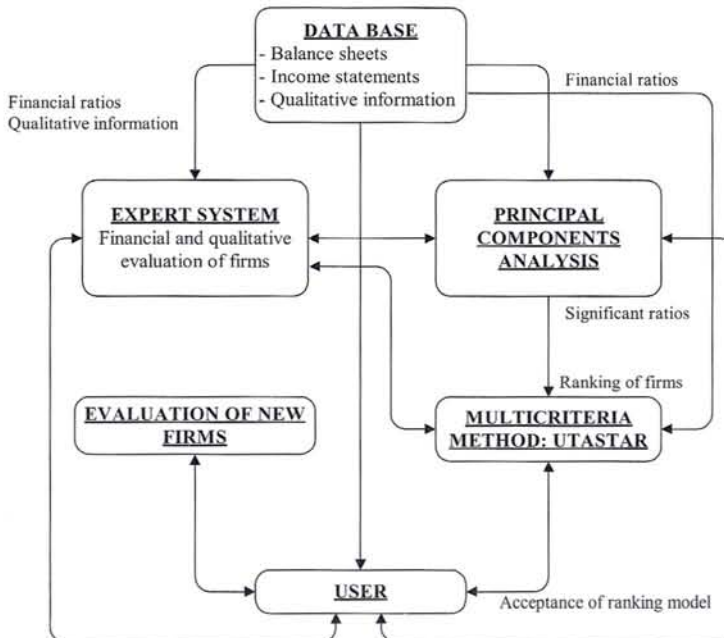
The UTASTAR multicriteria method ranks the firms from the most dynamic to the worst and most risky ones, or sorts them in classes of risk and indicates the competitive level of firms (Zopounidis 1987). It also provides the relative importance of each criterion in the firms' ranking or segmentation. In the case of corporate assessment, once the decision maker (i.e. the financial manager) has expressed (sometimes with the help of the expert system's results) his judgement as a ranking of the firms according to classes of risk, the system through the UTASTAR ordinal regression method optimally estimates the multicriteria additive utility functions which are as consistent as possible with the decision maker's ranking. The additive utility function has the following form:

$$u(\underline{g}) = p_1 u_1(g_1) + p_2 u_2(g_2) + \ldots + p_n u_n(g_n)$$

where $\underline{g} = (g_1, g_2, \ldots, g_n)$ is the vector of firm's performance on n evaluation criteria, $u_1(g_1)$, $u_2(g_2)$, ..., $u_n(g_n)$ are the estimated marginal utilities normalized between 0 and 1, p_1, p_2, ..., p_n are the relative weights of utilities $u_i(g_i)$ associated to criterion g_i, and $u(\underline{g})$ is the global utility of $\underline{g}$. A significant feature of this multicriteria method is that, besides the quantitative criteria, it also allows the use of qualitative criteria which examine some aspects of the firms that can not be measured using quantitative techniques. The estimation model derived by the UTASTAR multicriteria method, is used as a basic knowledge in the expert system part (as a production rule based on the ranking or segmentation model), for the evaluation of new firms inserted in the data base.

An application of the UTASTAR multicriteria method to the assessment of bankruptcy risk can be found in Zopounidis (1987), while Zopounidis et al. (1996a) and Doumpos et al. (1997) applied the FINEVA system to assess corporate failure risk, and to evaluate the financial performance of Greek transportation firms, respectively, with satisfactory results in both cases.

APPLICATION

The FINEVA system was applied to evaluate the performance of Greek public enterprises. The objective of this application is to develop a model for ranking the public enterprises from the best to the worst ones according to their financial behavior. This is accomplished through the application of the UTASTAR method. On the other hand, the expert system part of the FINEVA system was not employed in this case study since the knowledge that has been represented in its knowledge base does not consider the special character of public enterprises (it is designed to assess the corporate performance of commercial and industrial firms). Throughout the application the former director of the Organization for the Restructuring of Public Enterprises was employed as an expert analyst. The development of the ranking model was performed so as to be consistent with the preferences and the judgment policy of this expert analyst. The experience and the knowledge of the expert analyst are an important and useful factor to achieve the development of the evaluation model.

Sample and data

The sample used in this case study consists of 40 major Greek public enterprises, which are in a corporate form, and they are obliged for reporting their financial statements. Other

Greek public enterprises that are not considered in this case study are enterprises that either they are not obliged for reporting their balance sheets and income statements, or they did not provide essential information to perform the evaluation. Since the objective of the proposed methodology is to support the expert analyst in the evaluation of the Greek public enterprises through the development of the appropriate evaluation model, the sample considered was divided into two parts. The first part, referred to as the reference set, consists of 20 Greek public enterprises which are representative of the sample considered. The expert analyst was asked to define a preordering of the public enterprises included in the reference set from the best ones to the worst ones according to their financial performance (the evaluation criteria that are used will be discussed below). This preordering served the development of the evaluation model that meets the expert analyst's preferences and evaluation policy. Then, this model was applied to the second part of the sample considered, referred to as the extrapolation set that consists of the remaining 20 Greek public enterprises. Table 1 presents the Greek public enterprises that are included in the sample considered, divided into the reference and the extrapolation set.

Table 1. Greek public enterprises considered in the application.

Reference set	Extrapolation set
Duty Free Shops	Pireaus Port Organization
Olympic Catering	Corinth Canal Corp.
Greek Sugar Corp.	Greek Fuel and Mineral Oil Corp.
Greek Export Promotion Organization	Greek Local Development Corp.
Greek Hospital Supplies Corp.	Greek Aspropirgus Refinery
Olympic Aviation	Public Gas Corp.
Greek Railways Organization	Madeconian Refineries and Chemicals
International Petroleum Trade Corp.	Greek Telecommunications Organization
Public Real Estate Corp.	Greek Electricity Organization
Greek Vehicles Corp.	Public Petroleum Corp.
Water Supply and Sewerage Systems Corp. of Athens	Athens Urban Transport Organization
Public Corporation for Housing and Urban Development	Public Petroleum Corp. – Exploration and Exploitation of Hydrocarbons
Helexpo S.A.	Greek Radio-Television
Larko S.A.	Olympic Airways
Privileged Corp. of General Warehouses of Greece	Elefsis Shipyards S.A.
Ipirus Metallurgic Corp.	Greek Industrial Reconstruction Organization
Athens-Pireaus Electric Buses	Greek Aerospace Corp.
Thermal Buses S.A.	Greek Post
Pyrkal S.A.	Olympic Marin S.A.
Greek Arms Corp.	Athens-Pireaus Electric Railways Corp.

The time period of the analysis concerns the years 1993-1995. This is the more recent period for which complete data could be obtained concerning the performance of the public enterprises that are considered. For this three-year period the complete financial data have been collected using the annual financial statements of the public enterprises (i.e. balance sheet and income statement). Of course the analysis could also include other information to consider also the special character and role of public enterprises. However, the diversity of public enterprises considered in this application prohibits the use of such criteria. For instance, there are public enterprises that have a clear social role (e.g. the Athens Transport Organization, the Greek Post, the Greek Local Development Corporation, etc.), public enterprises that combine their social role with a corporate form while operating in a monopolistic environment (e.g. the Greek Telecommunication Organization, the Greek Electricity Organization, the Greek Railways, etc.), as well as public enterprises that operate in a competitive market environment (e.g. Greek Radio-Television, Greek Sugar Corporation, the Greek Fuel and Mineral Oil Corporation, etc.). This wide diversity of public enterprises makes difficult the use of a set of qualitative criteria that are applicable to consider the special character of all these enterprises.

Consequently, using the detailed financial data of the public enterprises, initially 15 financial ratios were calculated, including profitability, solvency, and managerial performance ratios (Table 2).

However, the incorporation in the analysis of such a large set of financial ratios could lead to the development of a complicated evaluation model. Therefore, it was decided to reduce the number of the criteria to be considered in the model building process, in order to be able to construct a simple and yet reliable evaluation model that meets the expert analyst's preferences. Since the whole multicriteria methodology that is used, is based on the incorporation of the expert analyst's preferences in the developed model, it was decided not to use a statistical methodology (e.g. principal components analysis) for the selection of the financial ratios to be considered in the model building process. It should be also noted that the diversity in the sample of public enterprises that is considered regarding their role and financial characteristics makes even more difficult the application of a statistical approach for the determination of the most significant evaluation criteria. Instead, through a direct interrogation procedure with the expert analyst six financial ratios were selected: (g_1) Earnings before interest and taxes/Total assets, (g_2) Gross profit/Total assets, (g_3) Total liabilities/Total assets, (g_4) Current assets/Current liabilities, (g_5) Inventories·365/Cost of sales, and (g_6) Accounts receivable·365/Sales. The first two ratios (i.e. g_1 and g_2) involve the profitability of the public enterprises, ratios g_3 and g_4 are related to their solvency, while ratios g_5 and g_6 involve their managerial performance.

Table 2. Initial set of financial ratios.

| Profitability ratios	
Earnings before interest and taxes/Total assets	Gross profit/Total assets
Net income/Net worth	Net income/Gross profit
Solvency ratios	
Current liabilities/Total assets	Current assets/Current liabilities
Total liabilities/Total assets	Quick assets/Current liabilities
Long term debt/(Long term debt + Net worth)	
Managerial performance ratios	
Financial expenses/Sales	Inventories·365/Cost of sales
General and administrative expenses/Sales	Trade accounts receivable·365/Sales
Accounts receivable·365/Sales	Trade current liabilities·365/Sales

Presentation of results

Based on the aforementioned six financial ratios, initially the reference set was used to develop an additive utility model for the evaluation of the performance of the Greek public enterprises. The expert analyst based on his knowledge and experience on the Greek public sector, he was asked to define a ranking of the 20 public enterprises that are included in the reference set from the best to the worst ones according to their financial performance over the examined period. Using this predefined ranking of the 20 public enterprises of the reference set as well as their evaluation over the six selected financial ratios as inputs to the FINEVA system, the UTASTAR method was applied. The objective was to develop an evaluation model in the form of an additive utility function that could provide a ranking of the public enterprises that would be consistent with the ranking defined by the expert analyst. Such a model could then be exploited to support the assessment of the financial performance of other Greek public enterprises in real time. The obtained additive utility model was the following:

$$u(\underline{g}) = 0.2459u_1(g_1) + 0.1630u_2(g_2) + 0.0400u_3(g_3) + 0.1334u_4(g_4) + 0.2038u_5(g_5) + 0.2139u_6(g_6)$$

According to this model the most significant financial ratios for the evaluation of the performance of the Greek public enterprises are the profitability ratio g_1 (Earnings before interest and taxes/Total assets), and the managerial performance ratios g_5 (Inventories·365/Cost of sales) and g_6 (Accounts receivable·365/Sales), with weights 24.59%, 20.38% and 21.39% respectively. It is important to note that the latter two financial ratios (Inventories·365/Cost of sales and Accounts receivable·365/Sales) that represent the circulation of inventories and account receivable respectively, were also considered significant by the expert analyst in the determination of the preordering of the public enterprises. This type of consistency between the developed additive utility model and the expert analyst's preferences is an encouraging result depicting the capability of the UTASTAR method in analyzing the decision maker's preferences and judgement policy. The marginal utility functions of the six financial ratios are illustrated in Figure 1.

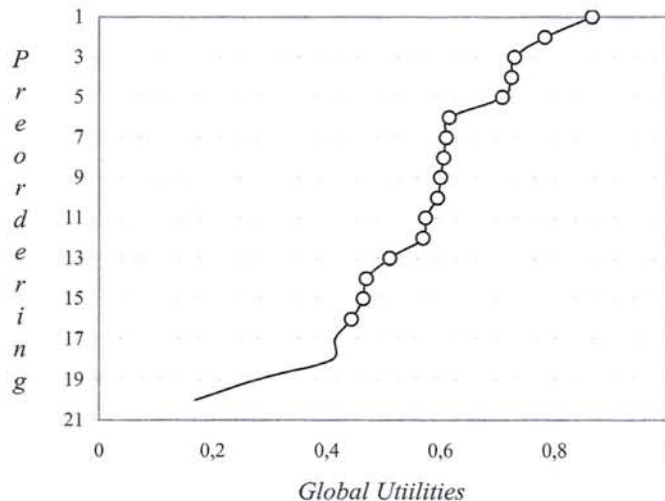**Figure 1.** Marginal utility functions of the financial ratios.
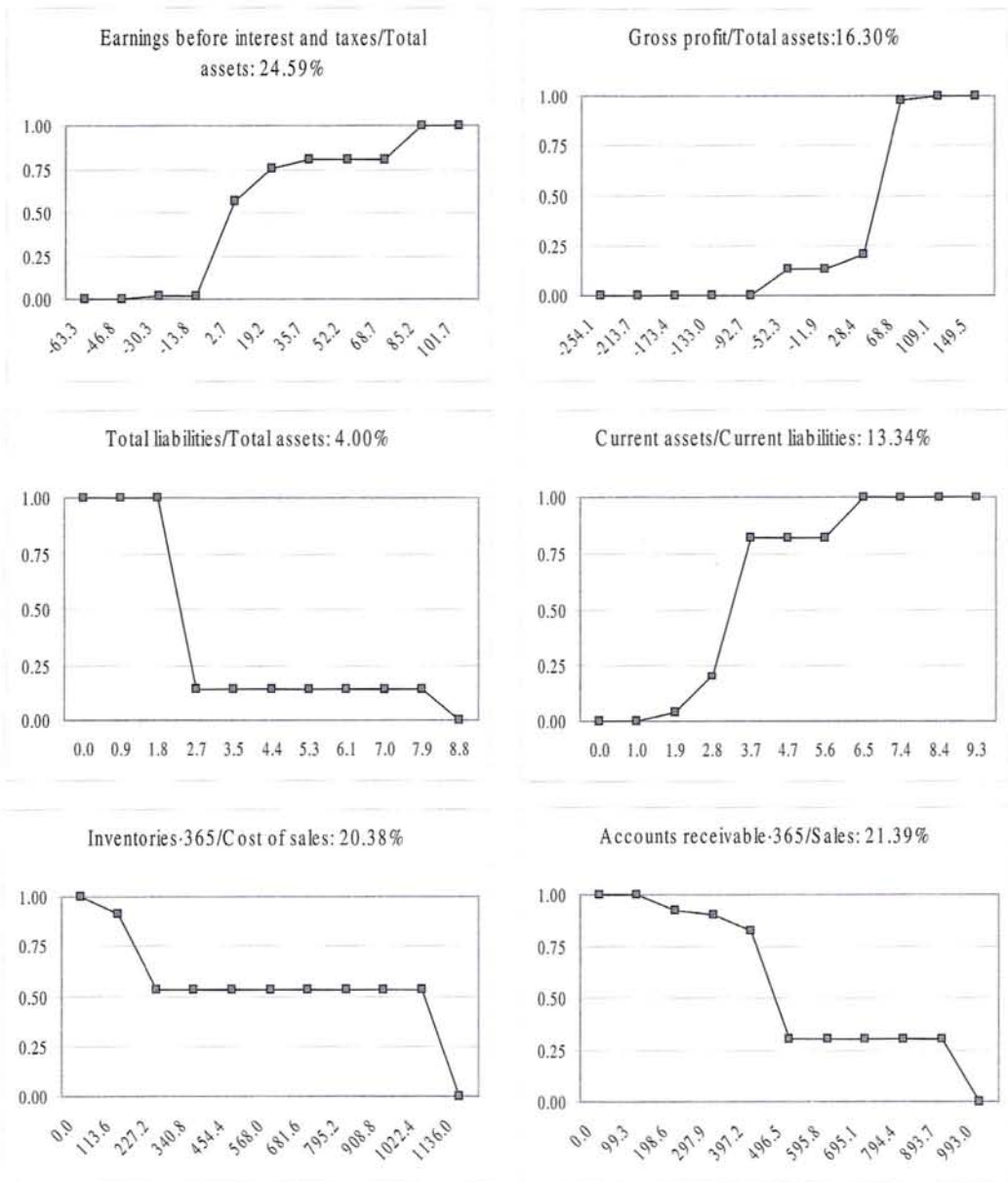
The developed additive utility model is fully consistent with the preordering of the Greek public enterprises included in the reference set as defined by the expert analyst. Thus, the ranking of the public enterprises according to their global utilities obtained through the developed additive utility function is the same with the ranking (preordering) defined by the expert analyst. Table 3 presents the evaluation results on the reference set, while Figure 2 illustrates the ordinal regression curve of the obtained additive utility model.

Table 3. Evaluation results (reference set).

	Expert analyst's ranking	Global utility
Duty Free Shops	1	0.8660
Olympic Catering	2	0.7832
Greek Sugar Corp.	3	0.7298
Greek Export Promotion Organization	4	0.7248
Greek Hospital Supplies Corp.	5	0.7087
Olympic Aviation	6	0.6148
Greek Railways Organization	7	0.6098
International Petroleum Trade Corp.	8	0.6048
Public Real Estate Corp.	9	0.5998
Greek Vehicles Corp.	10	0.5943
Water Supply and Sewerage System Corp. of Athens	11	0.5741
Public Corporation for Housing and Urban Development	12	0.5691
Helexpo S.A.	13	0.5105
Larko S.A.	14	0.4692
Privileged Corp. of General Warehouses of Greece	15	0.4642
Ipirus Metallurgic Corp.	16	0.4434
Athens-Pireaus Electric Buses	17	0.4148
Thermal Buses S.A.	18	0.4091
Pyrkal S.A.	19	0.2762
Greek Arms Corp.	20	0.1692

Figure 2. Ordinal regression curve.

Global Utiilities

Although the developed additive utility model is fully consistent with the preordering of the public enterprises that was included in the reference set it was decided to use it also for the assessment of the financial performance of the public enterprises of the extrapolation set. The use of the extratolation set enables us to evaluate the ability of the developed model to provide reliable estimations and efficient support regarding the assessment of the performance of Greek public enterprises.

In order to evaluate the efficiency of the developed additive utility model, the expert analyst was asked once again to provide a ranking of the public enterprises of the extrapolation set according to their financial performance for the three-year period of the analysis. This ranking was compared to the ranking of the public enterprises obtained through the developed additive utility model. Table 3 illustrates the obtained results.

Table 3: Evaluation results (extrapolation set).

Public enterprises	Expert analyst's ranking	Estimated ranking	Global utilities
Corinth Canal Corp.	2	1	0.7055
Pireaus Port Organization	1	2	0.6821
Greek Fuel and Mineral Oil Corp.	3	3	0.6473
Greek Aspropirgus Refinery	5	4	0.6436
Greek Local Development Corp.	4	4	0.6436
Greek Telecommunications Organization	8	5	0.6434
Madeconian Refineries and Chemicals	7	6	0.6211
Elefsis Shipyards S.A.	15	7	0.6207
Public Petroleum Corp.	10	8	0.6145
Public Gas Corp.	6	9	0.5919
Olympic Airways	14	10	0.5861
Greek Electricity Organization	9	11	0.5774
Athens Urban Transport Organization	11	12	0.5703
Greek Radio-Television	13	13	0.5384
Athens-Pireaus Electric Railways Corp.	20	14	0.5065
Public Petroleum Corp. – Exploration and Exploitation of Hydrocarbons	12	15	0.4899
Greek Aerospace Corp.	17	16	0.4898
Greek Industrial Reconstruction Organization	16	17	0.4721
Greek Post	18	18	0.4623
Olympic Marin S.A.	19	19	0.4326

As it can be observed the ranking defined by the expert analyst differs from the one obtained through the additive utility model. To evaluate and measure the consistency between the two rankings the Kendall's • rank correlation coefficient is used, which in this case is 0.744. This relatively low value of the Kendall's rank correlation coefficient is mainly caused by two major differences between the two rankings. The first one involves Elefsis Shipyards, while the second one involves Athens-Pireaus Electric Railways. In the former case, according to the evaluation of the expert analyst, Elefsis Shipyards is ranked 15th among the 20 public enterprises of the extrapolation set, while according to the developed model Elefsis Shipyards is ranked 7th. In the latter case, Athens-Pireaus Electric Railways is ranked 20th by the expert analyst and 14th by the model. The rest of the differences can be considered to be minor.

Nevertheless, the value of Kendall's • (0.744) can be considered satisfactory bearing in mind the major diversity of the public enterprises considered, as far as their role and operating model are concerned. It should also be noted that due to the special features of some of the Greek public enterprises that have a significant social role, the two samples that were used in this application had several outliers. Such outliers are often met in financial management problems and they pose significant problems in the development of evaluation models especially in the case of multivariate statistical analysis. Consequently, since the proposed multicriteria methodology is not based on any statistical assumption regarding the data employed, it is ex-

pected to provide better results compared to multivariate statistical analysis techniques. Finally, the expert analyst himself recognized that the developed evaluation model provided satisfactory results concerning the assessment of the financial performance of Greek public enterprises although some differences between his evaluation and the model occur.

CONCLUSIONS

Unlike previous studies, the aim of this paper was not to provide a theoretical description of the methodological framework for the evaluation of the financial performance of public enterprises. Instead, the paper focused on the development of a specific evaluation model that can support the evaluation process. The development of the model was accomplished using a multicriteria decision aid methodology, and it was based on a representative sample consisting of the major Greek public enterprises. The results of the application are considered satisfactory as opposed to the evaluation of an expert analyst with experience on the Greek public sector, considering also the diversity of the public enterprises that were examined as regards their role and operating model.

The presentation of a methodology for developing a performance evaluation model for public enterprises is the distinctive feature of this research as opposed to previous ones. The proposed multicriteria approach provides the methodological basis for aggregating the major findings of previous studies regarding the determining performance characteristics of public enterprises, into a single performance evaluation index that can be used by governmental officers and managers of public enterprises to derive estimations on the performance of public enterprises in real-time.

Nevertheless, this research direction could be extended to consider in the analysis more detailed information on the overall performance of each public enterprise, including qualitative variables such as their organization, the quality of their management, their market position, etc. Such an extended analysis of the performance of public enterprises could also include the analysis and examination of their special social and strategic role and of course their operating model (i.e. non-profit organizations or corporate model).

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