THE VERIFICATION OF APPLICABILITY OF ECONOMICAL-MATHEMATICS METHODS OF STRUCTURAL ANALYSES AS A TOOL FOR OPTIMISING ECONOMIC PROCEEDINGS OF METALLURGICAL ENTERPRISE

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Abstract

In enterprise routine making economic considerations and decision making of management, it’s possible to use structural (balance) models. These models are product of structural analysis and are able to analyse changes in factory-consumable relationships preserving conditions of economic balance. Main areas of its use in the economy of enterprise is the creation of distribution plans, supply and operativ specification of factory function.

Keywords Economical-mathematics Methods of Structural Analyses, Structural analysis, Balance Models, Optimising Economic Proceedings

1. INTRODUCTION

In the current business environment is constantly changing situation on the market, increasingly, individual customer requests, growing the requirement to produce or provide services according to individual customers need. The result is that business to prosper and be a long-term success in markets; they must produce increasingly different products, thus increasing variability in production. At the same time, increase the quality, reliability, speed and accuracy in supply. All of these on the market prices. Under these conditions, the effectiveness (costs) the production of industrial companies – business depends primarily on the quality of their proceedings, based on the provided ensuring compliance between economic and technical management.

2. STRUCTURAL ANALYSIS AND BALANCE MODELS

An industrial company, representing the factory-consumable system arrive on one side of the purchased inputs-the raw material, energy and services, on the other hand provides this system produced output-products and services to customers. Depending on the nature of the production processes (mechanical or physic-chemical nature of technology, mass factor, and the range of products, the complexity of the production chains) is the company as the factory-consumable system identified different complex of endogenous and exogenous factory-consumer relations, which have to be respected in all sequences of management decision-making process in order to guarantee the conditions of economic equilibrium and efficiency. Creation, evaluation and selection of possible variants of plans for different time horizons with reference to the (operatives) or forecast (strategy) market requirements of the customer, management of material flows and value the relationship in which rational cost controlling and pricing, system of changes reflection - all these would be based on the existing set of general theoretical knowledge of mathematical modelling and analysis of the manufactured-consuming links, usually known as structural analysis. Using the mathematically defined models balance of factory-consumer relations are prevalent and the historically oldest models in the economy and these had originally view relationships in the reproductive process at the macroeconomic level [1] gradually expanded to the level of business entities and has been the one of the
important tools of economic governance. Professional literature gives numerous examples dedicated to real applications, např.[2], [3],[4], [5].

Product of structural analysis are structural models (balance models), showing under different assumptions endogenous and exogenous manufactured-consumer relations of any factory-consumer system. These links allow relatively quickly and depending on the quality of input information accurately projected market demands – required to measure the volume of production of the various modes of company in material and energy of the supplier to the claims for the workforce and means for their remuneration in the total cost of production structures, in which gross or net income. The aim of structural models as structural analysis is to quantify the relations within the same site-end system (between its elements-scopes), as well as links to the surroundings, and on this basis, to create conditions for rational (using other methodological tools optimal) making economic decisions.

The model of structural analysis is made by two basic linear equations – distributions’ and costs’ equations. These could be for different balance- analytics purposes modified in many different ways. These relationships form the basis of structural analysis, which can be developed further in various ways and to different assumptions. On this basis we can modify analogous to the system of distribution equations, edit the system of cost equation. The linearity assumption of factory-consumer relationship, as expressed in general as - production usage is directly proportional to volume production – may not be accepted the same for each type of system. It may be accepted as a statement of long-term production experience. If we use in the manufacture of a product of the same production process, the same technology in production, consumption of raw material used depends the energy, materials and products on the size of the production of the product and only a small proportion is influenced by other factors. This simplistic assumption is not always met, but for a type and amount of production is acceptable. However, we can design the foundations and structural models where the relationship is made so that production usage is not proportional to the volume of production, but at the same time as the result of several factors influencing the progress of the production process. However, this does not alter the fact that the proper determination of the technical coefficients or standards of consumption depends on the effect of structural model of the information supplied by relevance for decision-making processes.

3. POSSIBLE WAYS OF USE OF STRUCTURAL ANALYSIS

Structural analysis as one of the tools of a rational economic decision making is primarily used to solve the following tasks:

- finding the proportions between the (total) and (final) sales
- finding proportions between the volume of production and raw material resources
- determine the proportions between the volume of production and the primary factors of production
- for optimization tasks

Structural model is an appropriate instrument for analysis based on production structures, it allows fast and relatively accurately to count in the area of cost calculation [6], controlling operations and pricing [7] – to set up the impact synergies prices reflect the impact of changes in prices, costs, changes in value added processing, pricing, etc. The starting point is a set of cost equation. The relationship is the link between the prices of production, their components, i.e. depreciation, wage costs, profit and material-energy supply entry. It is clear that the change in prices of production of one scope evokes modification of the material costs, and
thus the price or any part in the subjects of production consumes. Price change in one discipline requires price adjustment or some of its components in many other sectors, since otherwise there would be a distortion of price relatives, which has given a rise to unexpected changes. In a corporate practice, we rarely see the way with task laid down at all prices for all products. When economic considerations and analysis is given, management frequently confront the task by estimated price changes (price up, price down) different modes of production in the factory-consumer system changes (increase, decrease) wages and salaries, or editing the profits and tax charges in specified fields, or the role of the estimated effects of changes in the production of certain disciplines on profits and tax charges in different modes. In this case, it is the assessment of sector price and indexes of wage costs and profit. System cost equation allows rapid response to changes in market prices, and the solution of tasks when you analyze the cost structure of production for the past year or when the cost calculations simulating various eligible in a given planning period in the future.

4. THE PROBLEM AREAS AND RESTRICTIONS ON THE BALANCE SHEET MODELS

As seen above, you can use simple means of linear algebra and disposable equipment provide economic decisions fast and relatively accurate information? All the operations required for the solution of balance, it can be efficiently implemented in a spreadsheet, for example: Excel. Thus the question of why these simple and effective methods are not more widely used in Czech enterprises. The main problem lies in the fact that the basic prerequisite is the linearity of the relations between the production-consumption and production of different modes. This hypothesis do not describe sufficiently precise the fact-the rate at which fact is on or off, is various for different scopes. The coverage and nonlinear dependences of production or consumption do not collide on mathematical problems, but mainly on the performance of the construction of nonlinear models, information on issues of implementation of such a model of sufficiently precise input data. The fundamental importance in the design, but especially, in the practical application of structural models, addressing questions of implementation of model base data-acquisition of appropriate and consistent data. Many models have not been used in contrast to the broader usage just due to underestimation of the information base. When the structural model of factory-consumer system is set the primary question how such basic information to technical coefficients are not affected (or been affected by the possible) way of collecting and processing data. All matrix are highly sensitive to changes in numbers, it is therefore important that technical coefficients of the model described the model reality with maximum precision as to invert matrix operations [8] can expand without control (according to resources [9] it was experimentally found that 5% deviation for matrix coefficients of direct consumption rise to 30% of deviations for some elements of the inverse matrix coefficients complex). In practice, we may also use arguments that we cannot show some balance models for modelling-enabled aspects of reality, which would be substantial in terms of the objective pursued. For example: that the use of this model cannot be determined the version of "optimal", it cannot be considered to use alternative technology (raw materials), not realistically existing restrictions on the raw material inputs, production capacity and cannot specify a range of final consumption. Variability, however, technologic restrictions through benchmarking series models with variant inputs, you can connect with methods of structural models, linear and nonlinear programming (dynamic), as a tool to search the optimal variant of the objective pursued. While each structural models need to be aware of the limitations and the simplification of the model is based on the results obtained with regard to interpret them.
5. CONCLUSION

The mathematical modelling of economic phenomena and processes gradually acquires permanent positions in all sectors and our national economy. The importance of this instrument for improving the management increases in connection with a wide use of computer technology and information technologies is unthinkable without which the effective management of economic systems operates under difficult economic conditions in the factory. Unfortunately, despite the indisputable importance of economic-mathematical methods and model techniques in quantitative support decision-making in the management is their practical use in Czech firms still lack. Often, the methods are called on a poorly and do not perform properly, which necessarily leads to dissatisfaction with their applications and subsequently to scepticism regarding its practical use. The main area of their usage is the planning process, which allows the expression of algorithms for creating predictions to suggest necessary balance business plans of distribution, production and supply and the operational schedule production tasks. Using models compiled for a description of the material flows in stepped productions led to the idea of using relatively simple procedures for description of the technological processes. S. Gros in the literature [10] suggests possible utilization of the structural analysis for the description of the technological processes-the main objective is to estimate the expected results for known input parameters, e.g. the quantity and characteristics of materials (content of active substance, physical properties), setting of technological parameters (pressure, temperature) that affect the progress of the various manufacturing operations and indicates the problems associated with its use. The steel manufacturing process produces in terms of both its technological-physical-chemical substance and its place in metallurgical production cycle of some specific requirements for operational planning procedures and methodology. Tight continuity of operations when processing technology of smelting, required immediate continuity produced the smelting for main production aggregates, frequent changes of program caused by both customer and relatively strong steel, an element of uncertainty in the production process and caused particularly inaccurate information about material inputs, results in a relatively short time horizon of operative planning production and planning procedures so as to allow them to carry out operational changes in plans. From the above mentioned the issues associated with the planning process of steel-works, has used the way of non-typical applications and allowable simplification, which could lead to wider use of structural analysis in the steel manufacturing process. Mathematical modelling of manufacturing and industrial processes is useful not only in terms of "normative" but also in terms of "gnoseological". Analysis of reality, necessary to construct a model, the analysis of the causes of "failure" of the model is themselves a source of knowledge for managerial decision-making.

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LITERATURE


