

APPLICATION OF NEURAL NETWORKS FOR PRIOR APPRAISAL OF STRUCTURAL FUNDS PROJECT PROPOSALS

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Abstract: The subject of present paper is to discuss the layout of conception referred to the use of artificial intelligence methods (neural networks) for prior appraisal of project proposals to be submitted by Polish enterprises to European Union in order to get financial assistance for investments from the EU structural funds and the state budget. The experiments are limited to prior appraisal of the projects submitted only, as their practical execution may begin not earlier than on the 1st May 2004 (enlargement of European Union). Author of the present paper discusses the method referred to appraisal of project proposals submitted by enterprises. The method is related to review and acceptance of expenditures for investments co-financed by European Regional Development Fund. The author formulates conception for implementation of appraisal principles which could be considered as element of review and acceptance of expenditures according to Commission Regulation 1685/2000.

1 INTRODUCTION

Advanced process of transformation which takes place in Poland is intended to enable accession to European Union in near future. It offers exceptional unique chance for the enterprises to make use of European funds which are to be granted in still wider and wider extent. For the time being, so-called pre-accession funds such as PHARE, ISPA, SAPARD and some others may be mentioned in this connection. On acquiring membership and full access of Poland into European Union, much higher European funds will be potentially available, among the others, the structural funds.

However, effective use of potentially available funds will require well-prepared, qualified staff for Polish enterprises. It is necessary as well to supply the enterprises with relatively simple (for easy application) methods of appraisal, referred to investment projects submitted by them. In particular, the small and middle-size enterprises will have appraisal problems because of rather limited funds for expert advice. In this connection, author of the present paper has worked out and submits herein, the conception referred to application of neural networks for prior appraisal of project proposals while contending for European funds.

The main task of the present research project is to explore the basic methods of appraisal related to

feasibility and effectiveness of development programmes which are to be financed by EU structural funds. Up to now artificial intelligence methods have not been applied for such purpose. Author of the present paper is going to compare the hitherto prevailing methods to the methods based on neural networks. The experiments will be held to prove possibility as well as need for application of neural networks within the process of project appraisal. The experiments are limited to ex-ante evaluation (prior appraisal) of the projects submitted, as their practical execution may begin not earlier than on the 1st May 2004. As the subject for experiments, descriptions of potential projects (selected by survey) and intended for financing by ERDF means (European Regional Development Fund) will be considered.

Up to now, there have not been notable experiences with management of development projects financed by EU funds in Poland. Some attempts to apply artificial intelligence i.e. neural networks for the above purpose, are considered as something new. However, neural networks should increase set of useful tools used for appraisal of projects to be financed with EU funds and seem to be a good supplementation of the methods used so far.

2 APPRAISAL OF STRUCTURAL FUNDS PROJECT

In the procedure of appraisal referred to applications for financial support of investment projects from European funds, evaluation of documents (subjected before to unification) and operation programmes should be carried out in three implementation stages as follows:

- operation programme is prepared and supplemented (if required) together with preliminary evaluation, prior to the beginning of its implementation; so-called: *ex-ante* evaluation,
- evaluation is carried out in the middle of implementation period: so-called *mid-term* evaluation,
- evaluation is carried out after the end of implementation period: so-called *ex-post* evaluation.

Prior appraisal of the project proposals can be based on the analysis of strengths - weaknesses - opportunities - threats (so-called SWOT). Preliminary analysis of appraisal referred to effectiveness of the project, should be done with taking into consideration such elements as socio-economical situation in general, situation on the market, competitiveness and innovativeness. The variables applied for appraisal of the project should meet the following criteria:

- pertinence - the variables should be harmonized with character of the project and with anticipated effects of its implementation;
- measurability - the variables should be expressed by means of numerical values;
- credibility - definition of any variable should enable possibility of its verification;
- accessibility - the data should be easy to obtain.

The above mentioned properties of variables are taken into account in the process of preparation and implementation of appraisal models based on the methods of artificial intelligence.

3 NEURAL MODELS

Principal properties of neural models are important to determine their effectiveness. Application of dependences appearing in neural networks, does not involve formulation of assumptions which are very difficult for checking. They are characteristic because of their ability for approximation of optional nonlinear dependences. They make possible generalization of learning, from training (historical) data towards the new data. Formation of neural

model is based on analysis of available historical data. In result, the main dependences in phenomenon being investigated, can be esteemed (with the use of model). These models are useful in case, the research worker does not know the rules characteristic for arising of dependences analyzed. They are particularly useful for description of variable, complex socio-economical phenomena.

Application of neural networks requires adequate preparation related to significant number of historical data, according to the character of variables and type of network to be used. However, this is connected with work and expenditure necessary to estimate neural model. In this case, it is most often assumed that number of samples for learning should be minimum 10 to 20 times higher than number of weights in the network. Direct and substitutable dependence between number of samples from the learning set and precision of results was not stated empirically. It should be noted, however, that in extreme cases, at small number of data (i. e. comparable to the number of weights), the network is unable to generate proper results.

Effectiveness of neural networks in appraisal procedure is expressed as description and analysis of optional dependences and their generalization. Due to the above, the neural network is able to give correct answer to a formulated problem, on the basis of already transformed input data. In this way information about regular events from the past is available. Functioning of the model is based on the assumption that the information collected is typically representative for any other data which might appear. Highly desired property of neural network is its ability for formulation of proper answer, even for those input data which are not included within the set of already collected information. Applicability of one-way neural networks for appraisal of investment projects, results from the fact that socio-economical phenomena have nonlinear character. These networks are able to perform approximation of optional nonlinear dependences and their generalization. They are adaptable and can help for description of dependences changing in time. Therefore, during the input of new information, further network learning process takes place. Sometimes, the learning process is limited to small amendments only or to taking into account transformations of the real system. One-way neural networks can be particularly useful for solving the problems of different types of markets (e.g. capital market, labour market, markets of goods and services). One-way neuron networks can serve as well for analysis of problems related to functioning of enterprise, also while applying for financial assistance from European funds intended

for investment projects and for estimation of anticipated profits.

4 METHODOLOGY AND EXPECTED RESULTS

The main task of the scientific-research project is to analyse the methods of appraisal referred to feasibility and effectiveness of development programmes to be financed by EU structural funds, as well as checking possibility and real purpose for application of new methods based on artificial intelligence. Satisfactory training of beneficiaries and public administration for absorption of EU funds are considered as essential for economy of Poland. Significant socio-economical losses can be involved if they are unable to fully profit of EU structural funds potentially available beginning with May 2004.

Research works undertaken by the author are going to be limited to so-called ex-ante (prior to) methods of project appraisal to be carried out before the beginning of development projects. Directives and recommendations of European Commission pay particular attention to a role of a.m. ex-ante evaluation in order to improve quality of the projects submitted. The potential beneficiaries are required to prepare (among the others): feasibility study, ex-ante project appraisal and to indicate some alternative solutions. The preliminary ex-ante evaluation (appraisal) will give some arguments for discussion (between the persons or institutions submitting the projects and the experts) to get more precisely defined development programmes. The other advantage of ex-ante project appraisal is that it makes the authors of development programmes to think them over again then introduce some necessary improvements as to their effectiveness and conformity with directives of European Commission. The quality and quantity factors formulated during ex-ante project appraisal, can be also useful for evaluation and monitoring at further stages of project execution and monitoring.

The research will consist in experiments with methods (according to directives of European Commission) which have been applied so far in Europe, as well as with methods of project appraisal based on artificial intelligence - neural networks. Among the others, the software „Statistica Neural Networks” by Statsoft will be used. This is relatively simple programme which serves for simulation of neural networks and for construction of system including different types of networks. Easy access to graphics and statistical tools as well as interface

being very convenient for the user, make possible quick and efficient interactive analysis of the data.

As a starting point, identification of project appraisal methods applied nowadays (in the countries being members of European Union) for appraisal of projects to be financed by EU funds, is considered in accordance with directives of European Commission. Then, the neural networks will be subjected to research as a tool convenient for analysis of socio-economical data (as described in corresponding literature). Then, possibility of potential application of neural networks for management of development projects to be financed by EU structural funds will be analysed. Next, the comparison of project appraisal methods applied so far with the project appraisal methods based on neural models is to be done. Faults and features of all a.m. solutions will be examined. Within the next stage of research, the author will focus on making experiments with different types of neural networks which could be used for project appraisal. The experiments will be limited to ex-ante appraisal of the projects submitted, as they may be put into practical execution after 1st May 2004, not earlier. The experiments will be performed on the projects potentially predicted for financing by European Regional Development Fund (ERDF), selected by means of survey. These projects are prepared (among the others) on the basis of charts „Internet System of Evidence for Charts for Projects Intended for ERDF” (<http://isekp.mg.gov.pl>). Data base for these projects can be found in Ministry of Economy, Labour and Social Policy of Poland. It is registered as confidential. However, the author hopes to receive all the necessary data for scientific elaboration from the persons directly connected with preparations of the projects. Such are preliminary conceptions. Up to the beginning of June 2003, about 4300 potential projects have been submitted.

Methodological tasks of research do not require representative samples (as for survey); only typology and differentiation of subjects and areas can be important. The research and analysis of about 200 projects is predicted.

5 CONCLUSIONS

This is advisable to make research for alternative methods of appraisal in relation to currently applied ones. The methods having connection with artificial intelligence should be investigated and applied first. Author of the present paper recommends application of neural networks. Neural networks are, for the time being, decisively most often used tools (within the range of artificial intelligence) for analysis of

socio-economical data. The operation of neural networks is based on their self-learning ability or their supervised education; in result models of events to be discussed are originated with the use of algorithms of stochastic type.

Neural networks are recommendable for their following desired qualities:

- They are non-linear and non-parametric, no form of function allows for shaping the model of input-output relations.
- Any assumptions referred to forms and parameters of random variables distribution are not required.
- They are resistant to disturbances which appear in real systems.
- Application of neural networks makes possible acquiring of sufficient additional knowledge necessary for appraisal as well as in selection of information essential for appraisal purposes and elimination of unimportant factors.
- In case of the classical statistic methods being applied, it is necessary to determine dependence between the active (explaining) and passive (being explained) variables; reasons for such configuration should be given further on. All the above steps are not required while applying neural networks.
- The characteristics formulated above should be considered also as some limitation for applying neural networks, as the process of achieving results cannot be supported by any system of variables.

The aforementioned qualities of the systems based on artificial intelligence methods, may be used in appraisal systems competitive in relation to these which have been applied up to now. The new appraisal system should, if possible, make use of neural networks.

New developments in data processing techniques involve intensive research for new methods referred to support of appraisal process based on artificial intelligence. However, the following limitations in application of instruments discussed herein, should be taken into account:

- Significant computation expenditure required.
- In view of the above, application of traditional regressive equations should be reasonable for appraisal, if small numbers of historical data are concerned.
- Relatively simple application of neural networks sometimes results in wrong suggestion that the user does not need to analyse quality of the model prepared - what is usually done if traditional statistical methods are applied.
- The only method of verification referred to results of analysis can be their comparison to the real existing data.

Thorough analysis of the above characteristics referred to the methods classified as artificial intelligence (rights and wrongs) leads to the conclusion that their application may result in reduction of appraisal errors - in relation to the other traditional statistical methods.

The conception outlined herein (including tools) can be applied in enterprises which are going to apply for financial assistance from EU pre-accessive funds now and structural funds after becoming a member country of European Union. The research carried out by author of the present paper, referred to application of neural networks for preliminary appraisal of structural funds project proposals, can find also wider application involved by some other problems e.g. implementation of the other EU funds included in Polish National Development Plan - within the range of Community Support Framework.

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