UNEMPLOYED USING GENETIC ALGORITHMS

Balan Ionut
"Stefan cel Mare" University of Suceava, Faculty of Economic Science and Public Administration, Str. Universitatii nr. 13, ionutb@seap.usv.ro, 0743066521
Gradinaru Dorin
"Stefan cel Mare" University of Suceava, Faculty of Mechanical Engineering, Str. Universitatii nr. 13, gradinaru@fim.usv.ro

In a market economy we can have difficulties in real income measuring, due to changes in prices and wages that may be in short intervals of time. When we want to compare real income obtained in different periods of time it is used, most often, a "trash day", element that helps in purchasing power calculating for a population. In this paper we study the evolution of real incomes of two important social categories: the unemployed and pensioners, taking into account the evolution of some categories of prices and the evolution of peoples income.

Keywords: genetic algorithm, cross-over, mutation, unemployed, pensioners

JEL:C82

1. Introduction

A model is, simply, a simplified representation of a process or a system. Although it is not necessarily to be composed by equations (there is a ricardian model), is no less true that, at present, construction of models made frequent recourse to mathematical formalization: one model appears as a set of equations, being a simplified construction of an economic system which is used mainly to show the reciprocal action, chaining, the interdependence of certain phenomena [1].
The realization of experiments with computer, which involves the construction of mathematical models describing the behaviour of a real system, in this case economic, in a given period is called simulation. Most times it does not provide exact solutions, being close to optimal, but is considered an effective research technique for complex economic problems (which are impossible to study using mathematical-economic models for optimisation). The essence of modelling method consists of replacing the real system, perceived by human senses, through a model more accessible to study.
Processed data in this study are average net revenue from pension and unemployment pay and six categories of annual average prices. Prices have been chosen for the basic categories of products. These products are fuels, electricity, gas, vegetables-fruits, breading products, and milk. They occupy a significant percentage in the private consumption of people with incomes close to the average net revenue studied.
This paper is structured over four chapters: Introduction, Method used, Results obtained and Conclusions. The second chapter provides a description of genetic algorithms, the structure of such an algorithm, operators used. We also describe the operation executed by the proposed system to solve the problem. Here are presented the technical characteristics of the system, the input data necessary to obtain a corresponding result, as well as which of the individuals is the final result.
In third chapter are presented results obtained and interpretations necessary, this chapter being followed by conclusions of this study. All values obtained are compared with those of 1991. If this year has unitary value, then if the prices taken into account will increase regard to this year with a higher percentage than the growing of the revenue from pension and unemployment revenue then, for those years we have subunitary values and if the prices increase is less than the increase of the revenue we have values greater then 1. From the results of this study we observe in which period the studied category of population had higher real incomes than in the base year and in which period these revenues were much lower than in 1991. We will highlight the minimum and maximum values obtained for the revenues obtained in this period for the categories studied.

2. Method used

Artificial Intelligence (AI) may be considered the informatic domain which has the main goal to design certain systems whose features are assigned commonly to human intelligence: human language understanding, learning, reasoning, problem solving, theorem demonstrating, etc [2].
Genetic algorithms represent an important class of search and optimization method. A genetic algorithm represents a transposition in programming of biological's principles. This thing requires the processing of a significant set of data, which requires many resources.
The developed system requires some data on input and provide on output some coefficients used in the simulation of the relationship between revenue of certain category of people and the prices of certain categories of products and services with high significance level for those categories of people.

The first stage of the genetic algorithm consists in population initialization. This boot is made for a population consists of 120 chromosomes, each chromosome having 7 genes. The first 6 genes of each chromosome are generated randomly, while the seventh gene is obtained by calculation. The values used for calculation of the seventh gene of each chromosome are those 6 genes generated randomly, as well as the revenue and prices taken into account in a given period of time.
The following steps of the algorithm will be repeated for a number of times, until the results are considered satisfactory for the simulated problem. In our case there are used 500 generations, a value considered sufficient for this problem. After different tests has been noted that if it exceeds this number of generations, the differences between the fitness function for the two generations are very small.
Because we have a small number of genes in the composition of an individual I felt that we could renounce to crossover operator, the convergence of the algorithm being possible by application of mutations to the original chromosomes. Considering the population of a generation, 50% of its chromosomes will be taken into account for any genetic mutations. The mutations are applied only for first 6 components in each individual, the seventh being calculated according to the 6 obtained.
To ensure a rapid convergence of this algorithm and efficient individuals for genetic operations is recommended to order the population depending on the values of the seventh gene in each generation.
At each step the most effective chromosomes of the old population will be kept for regeneration, and the less efficient chromosomes will be replaced with efficient chromosomes derived from genetic processing.
The input data will be stored in a file with 12 lines and 7 columns. Those 12 lines represent the corresponding value for the months from a year, while the first 6 columns represent the prices taken into account, and the seventh column the considered revenue from pension or dole.
The best chromosome, in terms of the fitness function, will be considered final result, this value representing the absolute value obtained from the difference between the actual income and the amount estimated by the model developed.

3. Results obtained

To solve the problem proposed we considered a base to comparing the results obtained later. In our case, the base is the revenues recorded in 1991. With the proposed system it was made a model for this year with an error of about 6%. The values of real income, as well as the estimated values for the average revenue for population, calculated on the basis of prices are represented graphically in Figure 1.

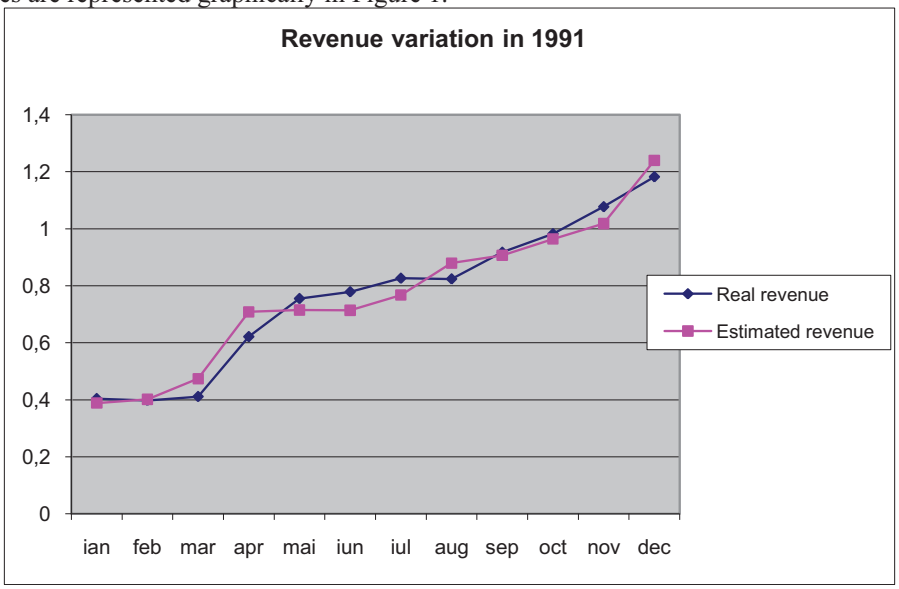

Fig.1. Real and estimated revenue variation in 1991

Because the error of the estimation of the revenue is quite small we used this model for the revenue estimation throughout the period considered (1992-2007).
In the present study, both prices and revenues use the same currency (RON). Figure 1 note that the average of the wages on the Romanian national economy was 0.4 RON in January, reaching a level of 1.2 RON in December of that year (1991). Also, the average of prices for the years studied were expressed in the same currency, prices calculated by using the price indices for the period.
Having on disposition the achieved model, considering 1991 like a base-year, the revenues calculated using the prices between 1991 and 2007 are presented in Table 1.

Table 1. The real, calculated and estimated revenue variation for pensioners and unemployed

Real pension	Calculated pension	Estimated pension (based on 1991)	Real pension	Calculated pension	Estimated pension (based on 1991)	Year
0,8759	5,931833	0,4666	0,596	5,931833	0,32108	1992
2,7079	20,72754	0,404742	1,673	20,72754	0,252387	1993
6,137	35,40379	0,564771	5,0834	35,40379	0,481936	1994
8,8108	43,4619	0,684841	6,375	43,4619	0,494116	1995
12,6842	67,39764	0,624397	9,5	67,39764	0,471664	1996
25,9947	170,4965	0,484511	24,8685	170,4965	0,490879	1997
40,0489	243,7258	0,529591	33,7228	243,7258	0,461602	1998
68,8789	390,0971	0,577534	49,5237	390,0971	0,417996	1999
93,717	601,6287	0,496961	68,0484	601,6287	0,366596	2000
104	803,3396	0,400532	97	803,3396	0,394755	2001
134	955,4174	0,439372	131	955,4174	0,456766	2002
156	1123,38	0,434329	171	1123,38	0,516125	2003
204	1358,13	0,476066	205	1358,13	0,511029	2004
246	1451,865	0,54945	236	1451,865	0,557951	2005
298	1522,41	0,655513	259	1522,41	0,589285	2006
395	1645,788	0,850561	321	1645,788	0,696512	2007

Source:[3]-[6]

The evolution of the estimated revenue may be highlighted graphically by Figure 2.

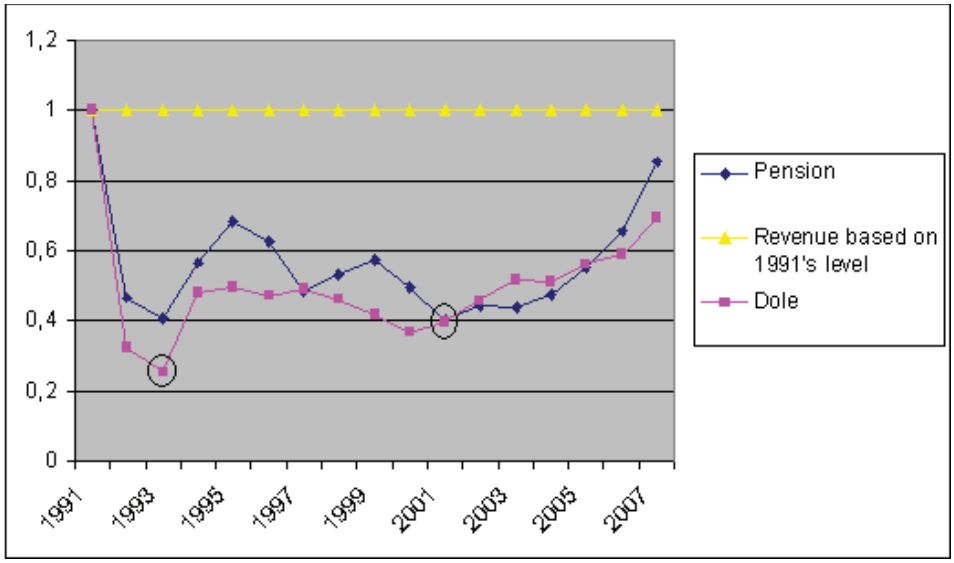

Fig.2. The estimated revenue evolution between 1991-2007

You can see that in the period between 1992 and 2006 the average of net revenue per resident was lower than the amount taken by him in 1991. Moreover, on this graphical representation we can see the crisis moments encountered at this indicator. Thus in 1993, we are dealing with a global minimum for the unemployed and in 2001 for the pensioners.

Unacceptable development during 1991-1993 is, primarily, due to low correlation between average level of income and the prices for categories studied. Thus, if revenues have increased approximately 8 times during this period, prices have a accelerated variation, with increases ranging between 24 and 68 times. All these crises were due, firstly, to the incompetence of political governance in the country and, secondly, political changes in that time. It notes that since 2000, the average of net incomes have begun to rise relative to prices, reaching in 2007 the highest levels from 1992.

4. Conclusions

The analysis of certain phenomena evolution is not doable, or even impossible using classical methods. That would be one of the reasons for the appeal to the artificial intelligence techniques to solve such problems. In addition to genetic algorithms, used in this study, other mechanisms of artificial intelligence are often used: neural networks,

intelligent agents, etc. These technologies do not always offer the best solutions, but a lot of them approximate this solution, being considered ideal in the simulation of certain phenomena whose evolution is too complex. In addition to describing the behaviour of certain indicators, these intelligent instruments can be used to forecast phenomena, based on the information from the past of that phenomenon and other phenomena that are related to the phenomenon studied.

In next work, using these artificial instruments, we will try to simulate the relationship between the different social categories incomes and market prices, in same time, trying to forecast the evolution of this relationship, taking into account the information available, the periods were achieved growth, recession and stagnation of this relation.

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