The Effect of Cooperative Firms on Decreasing Poverty Comparison of artificial neural networks and regression(A Case Study: Fars Province, Iran)

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ABSTRACT

This study aims to estimate the effect of cooperatives on poverty level. The data were related to the period 1984-2012. A regression model was used. dependent variable is the number of people living below the poverty line . Independent variables included inflation rate, unemployment rate, income distribution, literacy, economic development, urban population percent, family dimension, bank facilities, population growth, and variables related to developing cooperatives such as the initial capital, the number of people, the number of employed people in the cooperative, and the current capital. To calculate the percent of people living below the poverty line, FGT index was used. The results revealed that cooperative developments decrease poverty in the society.

KEYWORDS: Cooperatives, Capital, Poverty Line, FGT Index

1. INTRODUCTION

To reach development and to improve life quality are among the most important aims most of the countries pursue. Although these developments have had a profound positive effect on life, the difference and the distance among countries have negatively increased. Using cooperative methods and promoting cooperation and participation among people can be considered as a solution alleviating this problem. Those countries facing lack of domestic and foreign capitals, low production, high levels of poverty and unemployment can work on cooperatives. Through collection of savings, cooperatives can evoke investment and can enter stagnant liquidity into investment cycle. In this way, production increases and finally economic growth and development are achieved. Despite the significant impacts of cooperatives, no specific study has been carried out and, to the best of our knowledge, the present study is the first one delving in to the effects of cooperatives on poverty level. our purposes of this study are: determining the relationship between growth of cooperatives and decrease in poverty. And determining the role of cooperatives on decreasing poverty.

2. MATERIALS AND METHODS

In the model used:

(1) $Y=AX1^{\beta1}X2^{\beta2}X3^{\beta3}\ldots..Xk^{\beta k}e^{u}$

Y is the ratio of people living below the poverty line,X1 is the inflation rate,X2 is the unemployment rate,X3 is income distribution,X4 is the literacy level,X5 is the economic growth rate,X6 is the urban population rcent,X7 is the family dimension,X8 is the bank facility level,X9 is the population growth X10 is the initial capital of the cooperative,X11 is the initial number of the people forming a cooperative,X12 is the number of employed people in the cooperative,X13 is the current capital of the cooperative,X14 is the current number of the people in the cooperative .The sample of the study includes all the active cooperatives in Fars Province. These 4680 cooperatives work in 12 fields (such as agriculture, services, industry, transportation, credit, hand-woven carpets, housing, mining, civil, meeting needs of customers and manufacturers, and multi-purpose). The data required for poverty- line studies were provided through the information gathered by Iran. Statistics Center. At first, the urban and rural poverty line of the years 2006 was selected as the base. The poverty line of this year was calculated linear expenditure system and demand function of Aseton-Gray. Then, the poverty line related to other years was also calculated and the number of people living below the poverty line was achieved by FGT index.

(2) $FGT=\frac{1}{N}\sum(\frac{(Z-XJ)}{Z})2$

Artificial neural networks

Artificial neural networks are simplified models of central nervous system and like the brain transmit the rules hidden behind the data to the network structure by processing and analyzing experimental data. An artificial neural network is composed of neurons that make up the basis of neural networks functions. Each neuron receives the inputs, processes them, and generates an output signal according to the following equation (Wow, 1995).

(3) a = f (wp + b)

The driving function ***f*** is chosen by the designer and then based on the choice of ***f*** and type of learning algorithm, ***w*** and ***b*** parameters are adjusted. Learning means ***w*** and *b* are changed so that the relationship between neurons' input and output are matched with the specific goal. Typically, a neuron has more than one input. In Figure (1), a neuron model with input **R** is shown.

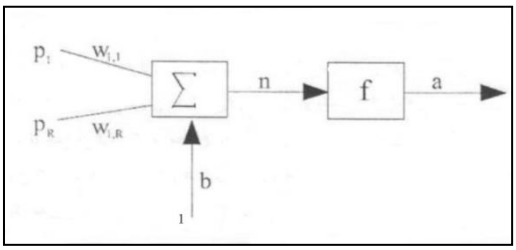

Figure 1: Multi-input model of a neuron

In Figure (1), *pi* is input vector element ($\overline{P}$) which make the net input as an equation, using the weight matrix *w* and the diagonal term *(b)* as follows:

$$n = \sum_{i=1}^{R} p_i W1,i + b = W\overline{P} + b0$$

$$\overline{\mathbf{P}} = [\mathbf{P_1}, \mathbf{P_2}, \ldots, \mathbf{P_R}]^{\mathbf{T}}$$

$$W = [w_{1},1, w_{2},2,\ldots,w_{1,R}]$$

And finally, the net output is applied on conversion function F and generates the outputs *a* as follows:

$$a = f(w\overline{p} + b)$$

A reduced multiple input neuron model can be also shown as Figure (2):

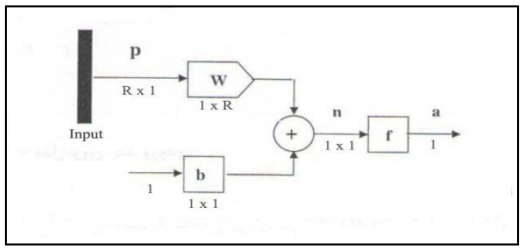

Figure 2: Simplified form of a neuron with Input R

As it can be seen in Figure (2), input vector $\overline{p}$ has an **R** element. This vector is multiplied by the matrix **w** containing **R** columns and a row and is added to the diagonal term ***b***, resulting in the total net input ***n*** The net input is applied to the conversion function ***f*** and generates the output ***a***. In this case, the output is a numeric value with a 1 × 1 matrix. Usually a neuron even with a large number of inputs is not sufficient by itself to solve problems (Menhaj, 1998). Therefore, in most cases, several neurons are used as a layer. Artificial neural networks can be organized in different ways like biological neural networks, indicating that neurons can be connected in different way s to produce different neural network structures. In the present study, Microfit and MATLAB software packages are used.

3. RESULTS AND DISCUSSION

Data related to dependent variables was collected directly from the above results. For the independent variable, a given poverty line was selected and the data were categorized according to it. For this purpose.Urban and rural poverty line of the year 1998 was used. Then, the poverty line for the period 1362 to 1387 was estimated by inflation equations and CPI index. CPI's for different years were multiplied by the poverty line estimated by Samadi(1998) and poverty level for each year was calculated. The general approach to calculate FGT index is as follows:

To calculate FGT index, the number of poor families is determined annually and is included in the model. For example,37 rural families and 41 urban families out of 100 families in the year 1386 had income lower than the poverty line. Thus in FGT index, Q for rural household is 37 and for urban household is 41 and q is different for each year. So, the number of families living below the poverty line is signified as Q,Z is considered as current poverty, N is the number of participants in the sample and $x\ i$ is the income of ith poor family. Since this study was conducted for both rural and urban areas, the mean of FGT indices for urban and rural areas was estimated to determine the percent of people living below the poverty line. The results show that inflation, unemployment, unequal distribution of income, family size, banking facilities, and urban population affect poverty growth. In addition, the coefficients of variables representing cooperative development (i.e., initial capital, the number of employed people in the cooperative, the current capital, the number of people at the beginning and the number of people participating in the cooperative currently) have a negative influence in poverty growth. This means that developing cooperatives through increasing the number of partners or the amount of capital can decrease poverty in the society. Also R^2 was 92%, showing that 92 percent of changes in the number of people living below the poverty line each year was explained by the independent variables.

Table1 represents the results of The Model Estimate(equation 2)

Equation 1 – The Model Estimate

$$Y=7.02X_1^{.079}X_2^{.18}X_3^{1}X_4^{.42}X_5^{..15}X_6^{2.1}X_7^{.32}X_8^{-.12}X_9^{.17}X_{10}^{.25}X_{11}^{-3.2}X_{12}^{-.014}X_{13}^{-.019}X_{14}^{-.023}$$

White TEST	F Statistics=1.12	Prob=. 0347
Granger Causality Test (Granger causality arithmetic)		F= -5.23 1
Granger causality	F = -4.18	

Finally over-generalized Granger causality Test was carried out on regression residuals to test their constancy. Regression can be trusted if constancy of residuals is approved . Based on over–generalized Granger causality Test, residuals are also constant.

Results of data analysis by the regression model

Table 1: Results predicted by the regression model, , (Source: Research findings)

Correct predictions (%)	Samples
81	GROP 1
89	GROP 2
80	GROP 3
83	GROP 4

Results of data analysis by ANN

To train and test the networks in the artificial neural network as in the conventional prediction techniques, the data are divided into two parts. Then after network training and the stoppage of the learning process, the experimental sample will be used to evaluate network performance. In this study, about 89% of the data were used as the educational samples and the remaining 11% were used as the experimental data. The number of neurons selected in the hidden layer of this network varied from 1 to4. The results are shown in Table 2:

Table 2: Results predicted by the ANN model, (Source: Research findings)

Correct predictions (%)	Number Of optimal neurons	Samples
86	3	GROP 1
90	4	GROP 2
91	3	GROP 3
100	5	GROP 4

The findings of the study indicated the artificial neural network with an average error of 9% is preferred over the regression model with an average error of 15% as the former is more efficient in terms of prediction precision. In addition, the fourth order torque in the artificial neural network with five neurons in the hidden layer was chosen as superior network with 100% correct predictions. On the other hand, the signs of the estimated coefficients by both models indicated the correspondence of the models to the. As expected, increasing the number Of firms reduce the poor and. In addition.

Suggestions

Since cooperatives have a role in decreasing on poverty, they can be developed to decrease poverty

REFERENCES

1. Atiya, A. et al., 1999. A comparison between neural network forecasting techniques: Case study: River flow forecasting, IEEE Transactions on Neural Network, 10 (2):145-154.
2. Boyd, J. 2007. Nonmarket benefits of nature: what should be counted in green GDP? Ecological Economics, 61 (4), 716- 723.
3. Hasanshahi,M. Farazmand,F.Rahimi,M.2012. Estimate the protective value of Qalat Park Shiraz, Journal of Basic and Applied Scientific Research. 2(4)4149-4152.
4. Malik C, moshtagh s. 1990. Relationship between rural poverty and credit discrimination in Pakistan.Journal of cooperative studies. 79:48-59.
5. Mukherjee s, Benson T. 2003. the Determinants of Poverty in Malawi1998 .World Development. 31(2): 339-358.
6. Samadi, M.1998.Poverty reduction . Efficiency and equality in iran.Economy thesis.Faculty of Economics of
7. Tehran University.