Investigation and Evaluation of the Egg Price by Using Fuzzy and Neural Method in 2011

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ABSTRACT

By the aim of forecasting the price of protein genus at the Ardebil province level, an investigation was done by using Fuzzy-Neuron network model to use it in the plan of arranging bazaar. The data was gathered from records of 15 days and one month of these genus during time period from initial day of Apr (2005) to Jui (2008) from statistic resources of organizations. The final results showed that this model has good results in forecasting the price of egg and is capable of forecasting the coming procedure of the price of this material by low fault.

Key words: foresight-the price of protein genus- Fuzzy-Neuron network.

Introduction

Froe sighting has main role in using appropriate Policies in economy. Doing economical fore sighting lead to clearness of the way of future movement. In addition to allocating influence resources to aimed activities in operational level by acting foresight, it can lead to decrees the probable during compiling future ways. Because one of the main goals of Government is protecting low income population in the society and maintaining their purchase power and also their health, and because protein genus has main role in individuals health, planning on the direction of arranging the bazaar of these genus, is of main necessities in avoiding the frequencies of price and accessing to propounded goals.

The subject of planning in the best way isn’t ascertained unless we have exact fore sighting about general states and price. By doing exact price fore sighting, executing the policies of bazaar arranging of these genus by lows price will be imaginable for responsible of the province doing exact-fore sights about protein genus price in the protein, will give good opportunities to leaders that do the necessary actions in respect of avoiding over load increase or decrees in price and so it can lead to decreasing the negative influence of that phenomenon to low income population of the province. So, executing this plan is a considerable subject.

Many studies have been done about using artificial neural networks to forecasting the economical variables.

Kohzady and his collaborator s [1] not only use the forced neural networks to forecast the price of wheat and alive caw and the comparison of the Neural network model and ARIMA process, but use them in evaluating the extraction of the returned point.

In this study, it was used of monthly privet of the wheat and caw meal in time period of 1950-90. The result of the study showed that means of standard of neural network models MSE in forecasting the price of the caw and wheat is 27 and 56 percent less than ARIMA process respectively.

Also the neural network has high ability in extracting the return pints. [7] Tkacz [2] by using forced neural networks has for cast the internal alloyed production (GOP) of Canada.

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The results of the investigation showed that the artificial neural network has the least error amount less than the linear and one variable models in forecasting the annually progress rate of the internal alloyed production. He used MSE standard and absolute error mean standard (MAE) to compare the forecasting power of various methods. [2].

Olson and Mossman (2003), used neural network not only in forecasting but also in classification of financial bazaar. In this investigation, the artificial neural network was compared with logit model and normal square minimum method (OLS) after fault propagation. The used data in this investigation was the proportion output (2352) of Canadian organization from 1996 to 1993.

The results showed that the neural network has high ability in recognizing the non-linear relations between dependent and non dependent variables and indicate exact forecasts in production. Also, the neural network classified more exactly the organizations on the basis of outputs than other methods. [3]. Heravi and his collaborators [4], had compared the ability of the forced neural network with a (AR) process in forecasting industrial production of three European countries, French-England and German. For this aim, it was of (RMSE) fault square mean root, the result the investigation showed that the artificial neural in time periods less than 12 month has less forecasted fault than (AR) Process. [4].

In an investigation with the aim of forecasting the inflation rate in Iran, it was used from 3 models: Time series model, economical evaluation model and artificial neural network. The results showed that the neural networks can forecast the inflation rate in Iran as well as the current models but better than those in some cases. [5].

In an investigation, the forecasting the economical progress in Iran was studied by using forced neural network. In this investigation the efficiency of one neural network model with a AR model for forecasting the economical progress rate in Iran was compared. The results of the investigation has showed that the artificial neural network model in forecasting the economical progress rate in Iran has high efficiency [6]. In another investigation, it was paid to forecasting the transport amount of pistachio of Iran by using artificial neural networks. In this investigation that the customs data of Iran in 1304 to 1382 were used and the artificial neural networks models and ARIMA were investigated, the results showed that the artificial neural network has better efficiency in comparison with ARIMA and can forecast the amount of pistachio’s transportation exactly [7]. In an another investigation, the protein production demand’s integral in Iran was investigated. In this investigation, it was used of the data in time periods of 1350 to 1378 of protein production demand integral by segregation of rural and civil regions.

The results of the investigation showed that the income tractions of all carnal and dairy commodities in rural and civil regions were positive. The input tractions of the carnal commodity were higher than 1 and the income tractions of the dairy productions were less than one. It shows that the carnal commodity is among luxe commodity and the dairy productions are among necessary productions for civil and rural families.

Although the income traction of all commodity (except milk), in civil regions were higher than rural regions and the price traction of commodity in rural regions were higher than civil regions also the intersecting traction in civil regions were higher than rural regions It shows that in civil regions, the successor commodity are accessible easily. [8]

**The Method of the Investigation:**

The recent investigation was a library kind investigation. The Fuzzy Neuron network model was used in this investigation that estimates the necessary statistics of the egg. It is the best model for forecasting the prices on the basis of RMSE and MAE standards.

**Data Gathering Tools:**

The needed data in doing this investigation were gathered from statistic resources of commercial organization and begetting and consumers protective organization and also from agriculture jahad organization.

**Statistic Population:**

Because the needed data for the variables of this investigation were accessible from initial day of 2005, so the data bout the 15 days and monthly price and also offer and demand of this genus from years 2005 to 2008 were used, and instead of sampling, total data were used in training and estimations.

**Selecting the Explaining Parameters of the Egg Price in the Province:**

From the main explaining parameters of the egg price in the province, parameters such as the price of creating oviparous hens, the price indicator using of dairy products and egg in the province and the average of the price of the egg in the country were selected and investigated because of existence of statics and data. We can observe that the price of the egg in the province along with dairy product and egg using indicator, have highest correlation coefficient among other investigated factors.
So, only this variable can be selected as the main explaining factor because of high correlation between this reliable with other investigated variables. In above table, the correlation coefficient between current month price and the price of 12 month ago were presented.

We can see that the price of the egg in the current month in the country with the price of one month ago, have highest correlation coefficient (0.785). So the price of one month ago of the egg is selected of explaining factors of the price of current month of the egg, too.

Changing process of the egg price in the province and the indicator of the price of using egg and dairy product in comparison with each other.

Changing process of egg price in current montll in comparison with previous month in the province Egg price changing process in pounces:

Table 1: Correlation coefficient between various influence factors on egg price.

<table>
<thead>
<tr>
<th></th>
<th>The price of the egg</th>
<th>The price of the oviparous hen</th>
<th>The indicator of egg and dairy product using</th>
<th>The average of the price of the egg in all over the country</th>
</tr>
</thead>
<tbody>
<tr>
<td>The egg price</td>
<td>1</td>
<td>0.748</td>
<td>0.890</td>
<td>0.877</td>
</tr>
<tr>
<td>The price of the oviparous hen</td>
<td>0.748</td>
<td>1</td>
<td>0.955</td>
<td>0.826</td>
</tr>
<tr>
<td>The indicator of egg and dairy product using</td>
<td>0.890</td>
<td>0.955</td>
<td>1</td>
<td>0.899</td>
</tr>
<tr>
<td>The average of the price of the egg in all over the country</td>
<td>0.877</td>
<td>0.826</td>
<td>0.899</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2: The correlation coefficient between the price of egg of months ago and the price of the off in current month.

<table>
<thead>
<tr>
<th>Correlation coefficient</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.785</td>
<td>0.568</td>
<td>0.401</td>
<td>0.468</td>
<td>0.557</td>
<td>0.381</td>
<td>0.274</td>
<td>0.419</td>
<td>0.627</td>
<td>0.680</td>
<td>0.524</td>
<td>0.418</td>
</tr>
</tbody>
</table>

The investigation of egg price in the province during 2008.4.15 to 2010.6.15 shows that increasing the price of this material begins from the end of Mar every year and continues until 15 Apr of the next year. The price of egg has decreasing current from 15 Apr to 15 May and its price is fixing from 15 May to 15 Aug. The investigation of the time period about egg price in the province proves this subject that among a 1 month period, 15 Aug to 15 September, the price of the egg increase every year
and after 15 September until the end of Nov it’s price is fix.
From Nov until the end of Mar, the price of the egg has a fixed care that is inclined to decreasing a little so about the price of the egg in the province we can say that the end days of the Mar and 15 Aug are increasing periods of the egg price.

**Selecting Appropriate Software for Mudding:**

Because the aim of this investigation is using Fuzzy method to assess the egg price, we use matlab software for modeling the Fuzzy – Neuron method.

Model assessment: to assess the models, there considered various indicators that we pay to them in the following chapters

RMSE- the square root of the average of the fault squares is defined as below:

\[
RMSE = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (y_{\text{actual}} - y_{\text{forecast}})^2}
\]

In above relation, factual is the amount of real data and forecast is the amount of fore sighting data and n is the number of data.

**The Average of Absolute Fault Percent:**

Absolute fault is defined as the differential of the real data from fore sighting data divided to real data. The average of absolute fault percent is obtained from averaging all the absolute faults, and is defined as below:

\[
MAPE = \frac{1}{n} \sum_{i=1}^{n} \left| \frac{y_{\text{actual}} - y_{\text{forecast}}}{y_{\text{actual}}} \right|
\]

**The Method of Modeling:**

As a whole, in all the models that will defined in the net sections, the major explaining parameters of the protein genus were used, and in all of them, the entrance data is divided to three parts, training data, proved data and test data.

<table>
<thead>
<tr>
<th>The related variable</th>
<th>The explaining factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>The price of the egg in the province</td>
<td>The one month ago price of the egg, the indicator of egg and dairy product consumption</td>
</tr>
</tbody>
</table>

**NF4 Model:**

Balcony of the model- the 15 days price of the egg in the province

Entrance of the model: the 15 days ago price of the egg in the province.

**NF5 Model:**

Balcony of the model: the 15 days price of the egg in the province

Entrance of the model: the 15 days and one month ago price of the egg in the province

In nor Fuzzy that needs to training, the training data is used to create the model. The confirmation data controls that the model fault don’t become more than normal.

So the behavior of the model is so that in some cases in spite of decreasing the percent of relative fault of the training data, the percent of the relative fault of the confirmation data is increase. So it is necessary to avoid the much training of the model and therefore the best pint of the training of the model is the minimum point of fault of the confirmation data.

**NF1 Model:**

Balcony of the model- the monthly price of the egg in the province Entrance of the model – The one month ago price of the egg in the province.

**NF2 Model:**

Balcony of the model – the monthly price of the egg in the province

Entrance of the model – the one month ago price of the egg in the province and the indicator of egg and dairy product consumption.

**NF3 Model:**

Balcony of the model- the monthly price of the egg in the province

Entrance of the model – the one month ago price of the egg in the province and the indicator of egg and dairy product consumption.

The various explaining factors of the egg price were investigated and the parameters were selected that had high compellation coefficient with the price of the protein. It was defined as below:

By considering the 15 day statistic of the egg, the planning Models for fore sighting the price of the egg in the province were considered in two situation: first, by using monthly data that in this state by considering the selection of two explaining factor for each of protein genus, three model were planned to fore sighting as below:

Egg in the province

Entrance of the model: the 15 days and one month and 45 days ago price of the egg in the province.

Normalization of the data: Before planning, the data must be normalized by Fuzzy-Neuron network so some changes must be done on the entrance data and data were seethed in \([L, H]\) distance. This action is done by using this relation

\[
X_{\text{scaled}} = mX_i + b
\]

\[
m = \frac{H-L}{X_{\text{max}}-X_{\text{min}}}, \quad b = \frac{X_{\text{max}}L-X_{\text{min}}H}{X_{\text{max}}-X_{\text{min}}}
\]

In this relation, \(L\) and \(H\) are the low and high normalization and they are usually considered 1 and -1. \(X_{\text{max}}\) and \(X_{\text{min}}\) are the maximum and minimum amounts of \(X_i\). So this relation can be written simply as below:

\[
X_i = \frac{2\left(X - X_{\text{min}}\right)}{X_{\text{max}} - X_{\text{min}}} - 1
\]

Selecting the \([L,H]\) distance is differing, by considering the kind of question and the selected changing integral. The distances that is used much more than others, are \([-1,1]\) and \([0,1]\), they are used for logistic and hyperbolic changing integrals.

In this investigation, the data were normalized in distances \([-1,1]\). In follow up we pay to assess each of these models. In each of these models , by considering the various kind of integrals, the membership and sensitiveness of the model against each of the membership integrals and lack of a rule in selecting the kind and number of these integrals the various states were studied in the recent investigation. One of the investigated integrals in this research , we can refer to membership integral of the kind trimf, trapmf, gbellmf, gaussmf, gass 2mf, pimf and disgmf. Also, the numbers of membership integral from 2 to 5 were analized. The reason of selecting 5 integral is that there wasn’t seen basic changes in training fault and testing networks with more than 5 integral. So with seven kind of the membership integral and four various kinds in the number of integrals, each of the models were trained 28 times and the fouls of the training and test were registered.

**NF1 Model:**

The fault results of the test and training data of this model were presented in this table. The most appropriate network to foresight the egg price, in the state that the entrance of the model is the price of the egg in previous month, is a network with 5 membership integral from kind gbellmf. So in this model this network is selected as the most appropriate network.

**NF2 Model:**

We can see that in this model the lowest test fault is related to a network with two membership integral of the kind of disgmf with test fault equal to 0.395

**NF3 Model:**

We can see that to foresight the price of the egg, the most appropriate state is when that the number of the membership integrals of the model is two and the membership integral is of kind pimf, when the entrance of the model, is one month ago price of the egg and the indicator of the consumption is egg and dairy products. We can see from the comparison of these three models, NF- NF2- NF3, that the lowest foresighted fault in fore sighting the monthly prose of the egg is when the entrance of the model is equal with the price of one month ago. This model has lowest foresighted fault among fore mentioned models.

**NF4 Model:**

This model pay to foresight the 15 days price of the egg in province by using 15 days ago price of the egg.

In this model, a network with 4 membership integral of the kind gauss2mf has better quality in comparison with other networks. So, it is selected as the most appropriate network.

**NF5 Model:**

In this model the one month ago price of the egg is presented as an entrance in fore sighting the price of 15 days after that. In this model the most appropriate model is related to a network with two membership integral of kind trapmf. Although in comparison with previous model, in this model, the increase of one month ago price cannot decrease the test fault as a new entrance.

**NF6 Model:**

In this model, in addition to 15 days and one month ago price, the 45 days price of the egg is added to this model as a new entrance. In this model, the most appropriate network in network foresighting with three membership integrals of kind gaussmf with test fault is 0.239. We can conclude that NF4 model has better function in comparison with other models in foresighting the 15 days price of the egg. Selecting the appropriate Model for foresighting the price of the egg:

Among different estimated models for fore
sighting the price of the egg in the province, NF4 model has lowest test fault. So this model is selected as the appropriate model in fore sighting the price of the egg in the province.

This model pay to freight the 15day price of the egg by using the price of 15 days ago of egg. This model could the process of changing price of the egg.

Table 3: The results of test fault of NF1 model.

<table>
<thead>
<tr>
<th>The kind of membership integral</th>
<th>The number of membership integral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Tramf</td>
<td>22.27</td>
</tr>
<tr>
<td>Trapmf</td>
<td>0.887</td>
</tr>
<tr>
<td>gbe11mf</td>
<td>5.525</td>
</tr>
<tr>
<td>gauss2mf</td>
<td>0.5545</td>
</tr>
<tr>
<td>Pmf</td>
<td>4.111</td>
</tr>
<tr>
<td>Dsi8mf</td>
<td>1.9741</td>
</tr>
<tr>
<td></td>
<td>0.8822</td>
</tr>
</tbody>
</table>

Table 4: The results of test fault of NF2 model.

<table>
<thead>
<tr>
<th>The kind of membership integral</th>
<th>The number of membership integral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Tramf</td>
<td>9.05</td>
</tr>
<tr>
<td>Trapmf</td>
<td>0.564</td>
</tr>
<tr>
<td>gbe11mf</td>
<td>17.57</td>
</tr>
<tr>
<td>gauss2mf</td>
<td>1.678</td>
</tr>
<tr>
<td>Pmf</td>
<td>0.435</td>
</tr>
<tr>
<td>Dsi8mf</td>
<td>0.615</td>
</tr>
<tr>
<td></td>
<td>0.395</td>
</tr>
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Table 5: The results of test fault of NF3 model.

<table>
<thead>
<tr>
<th>The kind of membership integral</th>
<th>The number of membership integral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Tramf</td>
<td>9.837</td>
</tr>
<tr>
<td>Trapmf</td>
<td>1.475</td>
</tr>
<tr>
<td>gbe11mf</td>
<td>3.145</td>
</tr>
<tr>
<td>gauss2mf</td>
<td>5.702</td>
</tr>
<tr>
<td>Pmf</td>
<td>11.637</td>
</tr>
<tr>
<td>Dsi8mf</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>1.848</td>
</tr>
</tbody>
</table>

Table 6: The results of test fault of the NF4 model.

<table>
<thead>
<tr>
<th>The kind of membership integral</th>
<th>The number of membership integral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Tramf</td>
<td>0.452</td>
</tr>
<tr>
<td>Trapmf</td>
<td>0.248</td>
</tr>
<tr>
<td>gbe11mf</td>
<td>0.25</td>
</tr>
<tr>
<td>gauss2mf</td>
<td>0.786</td>
</tr>
<tr>
<td>Pmf</td>
<td>0.597</td>
</tr>
<tr>
<td>Dsi8mf</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>0.285</td>
</tr>
</tbody>
</table>

Table 7: The result of test fault of NF5 Model.

<table>
<thead>
<tr>
<th>The kind of membership integral</th>
<th>The number of membership integral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Tramf</td>
<td>3.014</td>
</tr>
<tr>
<td>Trapmf</td>
<td>0.209</td>
</tr>
<tr>
<td>gbe11mf</td>
<td>2.54</td>
</tr>
<tr>
<td>gauss2mf</td>
<td>1.012</td>
</tr>
<tr>
<td>Pmf</td>
<td>0.204</td>
</tr>
<tr>
<td>Dsi8mf</td>
<td>0.256</td>
</tr>
<tr>
<td></td>
<td>0.228</td>
</tr>
</tbody>
</table>
Table 8: The results of test fault of NF6 model.

<table>
<thead>
<tr>
<th>The kind of membership integral</th>
<th>The number of membership integral</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Tramf</td>
<td>6.162</td>
</tr>
<tr>
<td>Trapmf</td>
<td>2.45</td>
</tr>
<tr>
<td>gbe11mf</td>
<td>2.079</td>
</tr>
<tr>
<td>gavssmf</td>
<td>1.415</td>
</tr>
<tr>
<td>gauss2mf</td>
<td>0.875</td>
</tr>
<tr>
<td>Pimf</td>
<td>0.736</td>
</tr>
<tr>
<td>Dui8mf</td>
<td>0.793</td>
</tr>
</tbody>
</table>

Results:

Among different estimated models for forecasting the price of the egg in the province, NF4 model has lowest test fault. So this model is selected as an appropriate model in forecasting the price of the egg in the province. This model used to forecasting the 15 day price of the egg by using the price of 15 days ago of the egg. It could recognize the process of changing price of the egg.

1. Jenus, it is better to use Fuzzy-Neuron model to obtain an ideal and real result in using the bazaar controlling instruments.

2. In relation with the price of the egg in province, the time of increasing the price is the and days of Mar to 15 of the Apr, and the responsible must do the necessary actions to avoid the price increasing.

3. In second half Jui, and first half of Aug, the price of the egg in province decrease, so using the offer arranging instrument of this genus for decreasing its influence is necessary.

References


5. Moshiri, S., 1380. forecasting the inflation rate of Iran by using the structural, time series and neural networks models, economical investigation journal, 58: 147-187.

