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A Study on Employment in Non-Life Insurance Companies: Fuzzy Regression Example

Hayat Dışı Sigorta Şirketlerinde İstihdam Üzerine Bir Çalışma: Bulanık Regresyon Örneği

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Özet

Amaç: *Bu çalışmada hayat dışı sigorta şirketlerinde istihdamı etkileyen faktörler incelenmiştir. Bu faktörler sigorta şirketlerinin mali değişkenleri olup, mali kar-zarar, net prim toplamı, toplam varlıklar ve teknik kar-zarar dır*
Yöntem: *Çözüm yöntemi olarak bulanık regresyon yöntemi kullanılmıştır.*
Bulgular: *Elde edilen sonuçlara göre bulanıklık seviyesi h=09 de mali değişkenlerin değişim aralığı anlamlı bulunmuştur. Sonuç olarak toplam varlıkların değişim aralığı %0,0906, mali kar-zarar %0,0002, prim toplamı % 0,6204ve teknik kar-zarar % 0,0392çıkmıştır. Ayrıca gerçek istihdam verileri üst regresyon sınırına yakın olduğu tespit edilmiştir.*
Sonuç ve Katkılar: *Bulanık regresyon yöntemiyle elde edilen sonuçlar, tahminlerin tutarlılığı açısından panel veri çözüm yönteminden oldukça iyidir. Sektördeki firmaların finansal değişkenleri ile istihdamı için tahmin modelleri oluşturulmak istendiğinde, bulanık regresyon yöntemi anlamlı modeller oluşturmada iyidir ve ilgili argümanların katsayıları hakkında daha tutarlı bilgi verir. Çalışmanın sonuçları ekonomik ve sosyal olarak yorumlanacak olursa; sigorta şirketlerinin istihdam*

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kapasitesini etkilediği düşünülen içsel değişkenlerin sigorta şirketlerinde istihdamı nasıl etkilediği gözlemlenmiştir. Sigorta şirketlerinde prim kazancı büyüklüğündeki artışın istihdamı olumlu etkilediği görülmektedir. Bu etki, sigortacılık sektöründe yeni istihdam yaratılmasına olumlu yansıyacaktır. İstihdamdaki bu artış ülke ekonomisine de olumlu yansıyacaktır.

Sınırlılıklar: *Ancak gelişen teknoloji ve birçok sigorta işleminin online olarak yapılması, prim kazanç büyüklükleri artsa bile şirketlerin istihdam kapasitelerinin azalmasına neden olacaktır. Örneğin ihtiyaç duyulan saha satış personeli ve acente sayısında azalma olacaktır. Bu durumda tam tersine sigorta sektöründe ve ülkede işsiz sayısı artacaktır. İstihdamın azalması ve işsizliğin artması hem insanları hem de ülke ekonomisini olumsuz etkileyecektir.*

Anahtar Kelimeler: *Sigortacılık, Bulanık Regresyon, İstihdam, Sigorta Şirketi*

Jel Kodu: *G22, J21, C61*

Abstract

Purpose: *In this study, factors affecting employment in non - life insurance companies were examined. These factors are the financial variables of insurance companies, including financial profit-loss, total net premiums, total assets and technical profit-loss.*

Methodology: *Fuzzy regression method was used as the solution method.*

Findings: *According to the results, the change interval of the financial variables was found significant at h = 09. As a result, the change interval in total assets was % 0.0906, the financial profit was nearly "0", technical profit/loss was % 0.0392 and the sum of premiums was % 62,04. Also, real employment data was found to be closer to the upper regression limit.*

Implications: *The results obtained by the fuzzy regression method are quite better from the panel data solution method in terms of the consistency of the estimates. When it is desired to generate prediction models for the employment with financial variables of the companies in the sector, the fuzzy regression method is good at creating meaningful models and gives more consistent information about the coefficient of the related arguments. If the results of the study will be interpreted economically and socially; it was observed how internal variables, which are thought to affect the employment capacity of insurance companies, affect employment in insurance companies. It is observed that the increase in the size of premium gain in insurance companies has a positive effect on its employment. This effect will have positive effects on creating new employment in the insurance sector. This increase in employment will also have positive effects for the country's economy.*

Limitations: *However, developing technology and making many insurance transactions online will cause companies to decrease their employment capacity even if their premium gain size increases. For example, there will be a decrease in needed field sales staff and number of agencies. In this case, on the contrary, it will increase the number of unemployed people in insurance sector and in the country. The decrease in employment and increasing unemployment will affect both people* *and the country's economy negatively. Economically, a negative outlook will occur in the domestic and foreign markets.*

Keywords: *Insurance, Fuzzy Regression, Employment, İnsurance Company*

Jel Codes: *G22, J21, C61*

1. Introduction

The banking and insurance sector have a leading role in the financial sector in Turkey. New risks rise as the population increases from one side. Premium production amounts also increased over the years with the increase in economic development. Today, more than one hundred fifteen thousand people are employed in insurance companies, agencies, experts and brokers in the Turkish insurance sector. The effects of financial variables on employment cannot be measured directly. The financial variables of the insurance companies have an effect on the total financial performance and employment. Firm performance depends on micro and macro variables. Micro variables are internal variables of the firm. Micro variables are those that can be controlled by the firm management. Some of these variables are the asset volume, age, growth and leverage of the firm (Hunjra, Chani, et al., 2014:66). Many studies show there are internal factors that affect firm performance. These are the asset volume, age, debt ratio, quick ratio, inventory level, capital turnover, capital intensity, sales growth and sales growth physical capital intensity (Chandrapala and Knápková ,2013:2183). Profit is an important factor in the capital formation of enterprises that include banks. Capital can be increased by holding equity and gains (Rumler and Waschiczek, 2010:49).

The classical regression solution method is an effective solution method when variables considered to be dependent on each other. This method is simple to apply to the researcher and gives statistical results about the relationship between the variables on the short path to researcher. As a general definition, the classical regression is a method that shows the relation between dependent variable and independent variable in numerical way and helps researchers to create model accordingly. In constructed models, it is intended to show how unitary changes in independent variables affect the dependent variable.

Among the several regression methods, panel regression solution method is also frequently used. The panel regression method is a regression model that brings together the subjective structures that are generally observed, for example, cross-sectional data belonging to the companies, firms or companies operating in any selected field, in a specified time period. If the selected data belonging to the determined subjects are searched at the time of designation, such regression models are also called panel data. If we look at all the interpretations made about the panel data, panel data is two-dimensional because the data are cross-sectioned and monitored over time in the data solution method.

All the usual classical methods that are commonly used cause the problem of inadequacy in the existing classical regression assumptions methods due to the time-consuming and increasing needs of the existing systems and the fact that these systems become more complicated and the technological changes and developments progress rapidly and usable models cannot be produced. For this reason, researchers have sought different solutions to create useful models. One of the main reasons for this is that the results obtained from the solutions made by the classical method are insufficient to explain the relationship between the dependent variable and the independent variable. Another classical method is that many of the desired hypotheses are not realized.

Because of similar problems, classical regression methods are stretched and different solution techniques have been tried to estimate the coefficients of dependent variables and independent variables. One of these methods is fuzzy regression. Fuzzy regression solution method is a flexible solution method which can be used in cases where classical regression assumptions cannot be held. In cases where the information is insufficient or uncertain, tools obtained from the fuzzy set theory such as fuzzy regression are suitable solution alternatives. The estimates obtained after adding the coefficients are not random variables and it is difficult to use arithmetic operations. On the other hand, fuzzy numbers are easy to use in arithmetic operations. If fuzzy numbers are used, there is no loss of information due to arithmetic operations with fuzzy numbers. The classic regression assumptions are not required in the fuzzy regression method (de Andrés-Sánchez, 2007).

This study examines the effects of financial variables such as firm assets, financial profit / loss, net premiums and technical profit/loss, on their own employment level by using fuzzy regression method. This study consists of 4 parts. The first part of the study is the relevant literature. The second part of the study gives information about the general structure of the insurance sector product. The third part of the study gives information about the analysis used. The last part of the study includes the findings and the conclusion where the findings are discussed.

2. Literature

As Nasrabadi, Nasrabadi, et al., (2005) argues fuzzy regression is sometimes weak against extreme values. In order to solve the problems arising from this, multi-purpose programming solution method is used. (D'urso, Massari, et al., 2011) presents the least squares and weighted least squares estimates for the solution of the robust regression model of the fuzzy regression model introduced by Coppi et al.

Tran and Duckstein, (2002) In the study, the multivariate fuzzy regression model was used together with the probability features of the regression and fuzzy regression and the central tendency measures. The branch and boundary technique were used to make variable selection of the fuzzy regression model in the study of Wang & Tsaur (2000).

Ramli, Watada, et al., (2011) pointed that fuzzy regression analysis has been developed that relate to real-time processing direction. Privilege in real-time data analysis is provided by using the convex method which reduces the calculation time to a minimum.

Azadeh, Saberi, et al., (2011) use non-stationary data of developing countries such as China and Iran, fuzzy regression was applied by using the time series estimating electricity consumption and electricity demand of the same countries. A probabilistic fuzzy regression model was developed by Xue et al (2005), to control the bed width of the robotic electric welding machine in the study.

Nasrabadi, Nasrabadi, et al., (2005) use a multi-purpose programming solution with the purpose of eliminating the weakness of the fuzzy regression against the overvalues. Chang & Ayyup (2001), conducted to investigate the differences between classical regression and fuzzy regression.

Chen, Hsueh, et al., (2013) develop a fuzzy regression model based on the distance concept with a two-stage approach. Precise numbers showing fuzzy observations are obtained by using fuzzy reduction and the exact regression coefficients in the fuzzy regression model are obtained by the traditional least squares method and fuzzy variables are added to the model.

de Andrés-Sánchez, (2006) use the expansion of the combination of Ishibuchi and Tanakan's classical regression method and Sherman's claim reserve scheme. In actuarial literature, numerous methods of claim reserves based on statistical concepts have been proposed. The volatile and ambiguous behavior of the insurance market does not make available databases when calculating compensation claims. On the other hand, it is lost in the reliability of these statistical methods, but it makes use of fuzzy solution very attractive.

de Andrés-Sánchez, (2012) define firstly the fuzzy least squares used in the background then define the method of claim reserving that combines the classic statistical schema based on two-way ANOVA with the fuzzy regression. Finally, numerical application is developed to demonstrate in detail how to use developed method to comply with anticipated claim costs and variability and compare the results with traditional two ways ANOVA. Because of The changing and undefined behavior of the insurance industry is insufficient to make available data base for the calculation of claims reserves, from the measurement techniques, fuzzy regression offers a more appropriate solution.

Berry-Stölzle, Koissi, et al., (2010) develop a test for the fuzziness of regression coefficients according to a study on the Tanaka et al. (1982) and He et al. (2007) possibilistic fuzzy regression models. The spread of the regression coefficients was explained as a statistic measuring the fuzziness of the relationship between the independent variable and the dependent variable. Then, test distributions are used based on the null hypothesis that such spreads are obtained by estimating a possibilistic regression with data generated by a classical regression model with random errors. Finally, it is shown how test defines a fuzzy regression coefficient in a solvency prediction model for German property liability insurance companies.

Shapiro, (2004) show an assessment of some studies such as, underwriting, classification, projected liabilities, present and future values of fuzziness, pricing, cash flows, asset allocations and investment. Because of fuzziness, some of fuzzy logic studies have done on applications in the insurance sector. The main idea of study based on two steps, first is reviewing Fuzzy logic applications in insurance to demonstrate the unique characteristics of insurance as an application area and second, to demonstrate the extent to which Fuzzy Logic technologies have been employed.

Cummins and Derrig, (1997) use fuzzy set theory to solve a problem in actuarial science which is the financial pricing of property-liability insurance contracts. On the basis of the fuzzy set theory, membership is expressed as a set containing the rank of membership power. Fuzzy set theory enables appropriate mathematical regulations for uncertain, subjective and judgmental knowledge into complex decision processes. Variables of insurance sector, such as future economic conditions, cash flows, risk premiums and other factors affect insurance pricing. These variables also contain subjective judgment, so it is difficult to quantify them by conventional calculations such as statistical methods. By using fuzzy set theory, a well-known insurance pricing model can be fuzzified. As a result, fuzzy set theory can lead explicit decisions than the conventional methods.

3. General Structure of Turkish Insurance Firms and Their Employment

Insurance companies operating in Turkey and are available in 2 different ways, Non-life and including in the life and pension branches. According to the Turkish Commercial Code No. 6102, insurance companies may operate in the form of Joint Stock Company or Cooperative. (Turkish Trade Law, 2011).

When we look at the table: 1, it is seen that there has not been a significant increase in the number of insurance companies operating both in the branch of life and in the branch of life and pension by years.

Table 1. Number of Insurance Companies Between 2012-2016

Years	Non-Life	Life and Pension	Total
2016	41	23	64
2017	42	23	65
2018	38	22	60
2019	38	22	60
2020	39	21	60

Source: Compiled from www.tsb.org.tr(https://www.tsb.org.tr/resmi-istatistikler.aspx?pageıd=909).

According to Table 2, premium production has increased over the years and the highest premium production rate is seen in 2019 with production an increase of 31 % in the previous year. It is observed that the number of employees in the general directorate and regional directorate of companies (Company + Direct Sales Personnel) increased nearly by 5 % in 2020 compared to the previous year. When the table is examined, it can be seen that the total premium production increases while the employment does not increase at the same rate. In recent years, it seems that the work force in the sector does not increase in the same way as the premium because insurance companies begin to make digital insurance, insurers become more conscious, and insurance companies are more cautious in risk selection and analysis.

Also, total assets also increase over the years while the employment does not increase at the same rate. The other variables such as fiscal profit/loss and technical profit/loss are not stable over the years. They sometimes increase or decrease while employment doesn’t still increase or decrease.

Table 2. *Values of Variables Over 2012-2016*

Year	Employment	% Change	Total Technical Profit and Loss	% Change	Financial Profit	% Change
2016	10.527	0.0	1.747.154.691	0.0	-339.920.257	0.0
2017	10.672	0,014	4.179.693.513	1,392	175.037.707	1,515
2018	11.108	0,041	3.034.644.575	-0,274	508.173.717	1,903
2019	11.137	0,003	9.546.461.599	2,146	655.013.328	0,289
2020	11.684	0,049	6.802.373.609	-0,287	580.103.797	-0,114

	Total Assets	% Change	Premium Total	% Change
2016	42.729.251.232	0.0	33.192.873.075	0.0
2017	50.587.678.406	0,184	39.404.307.182	0,187
2018	60.784.014.035	0,202	45.977.665.922	0,167
2019	77.242.086.258	0,271	60.386.781.192	0,313
2020	95.537.577.778	0,237	56.465.579.459	-0,065

Source: Compiled from www.tsb.org.tr (Https://www.tsb.org.tr/resmi-istatistikler.aspx?pageıd=909).

4. Analysis Method

4.1. Fuzzy Regression Method

The important factor in choosing the fuzzy regression model for the solution is that it provides flexible solutions in cases where results are not obtained with classical methods. With fuzzy regression, some models available for estimation can be created.

Fuzzy regression method offers flexible solution method in cases where the decision maker wants to reach or the situation, he wants to reach is uncertain. Instead of predicting the point obtained by regression, fuzzy regression produces prediction models by determining right-left or lower-upper limits for dependent variable and independent variable. The main advantage of this method is it makes it possible to estimate the maximum or minimum values that the variable can take. In this way, the decision maker observes the limit values that the variable can take. How the internal variables in the insurance companies will affect the employment in the insurance companies or the estimation of the future employment with the help of these variables is difficult for the decision maker and includes uncertainty. For this reason, the capacity or number of employments needed in the future is uncertain and includes fuzzy situation.

Nasrabadi, Nasrabadi, et al., (2005) use fuzzy linear regression is based on the assumption that the relationship between the variables in the regression model is fuzzy. In fuzzy regression, the relation between dependent and independent variables is expressed by fuzzy function and solution is achieved. The distribution of dependent and independent variables used in the fuzzy regression model is probable

The coefficients of the variables are estimated as the classical regression in the fuzzy regression. The objective of the fuzzy regression method is to find coefficients that give the most appropriate spread. The most known method from fuzzy regression methods is the minimum fuzziness method developed by Tanaka. The classical regression model is;

$$Y=B_1 x_1+B_2 x_2+\cdots\ldots B_n x_n+\varepsilon \quad i= 1,2,3,\ldots\ldots n \tag{1}$$

(Modarres, Ponnambalam, et al., 2005), The dependent variable Y is associated with the independent variable x. x and B are independent variable and parameter, ε is error variable. But in real life, all these variables represent fuzziness in large quantities. The fuzzy regression model is expressed as;

Y ̃=A ̃_1 x_1+ A ̃_1 x_1+ ………A ̃_n x_n+ ε i= 1,2,3,…….n (2)

Y ̃ fuzzy dependent variable related with A ̃_i fuzzy coefficient and x independent variable vector x=(x_1,x_2 ,……….x_n)^T i=1,2,3…..n and ε error variable. In fuzzy regression, parameter A ̃_i is the fuzzy number and Y ̃ is the fuzzy dependent variable. In the fuzzy regression model, the only input independent variables are x=(x_1,x_2 ,……….x_n)^T the definite number. Fuzzy number A ̃_i =(ai , ci) and ai is the center value and ci is the spread value.

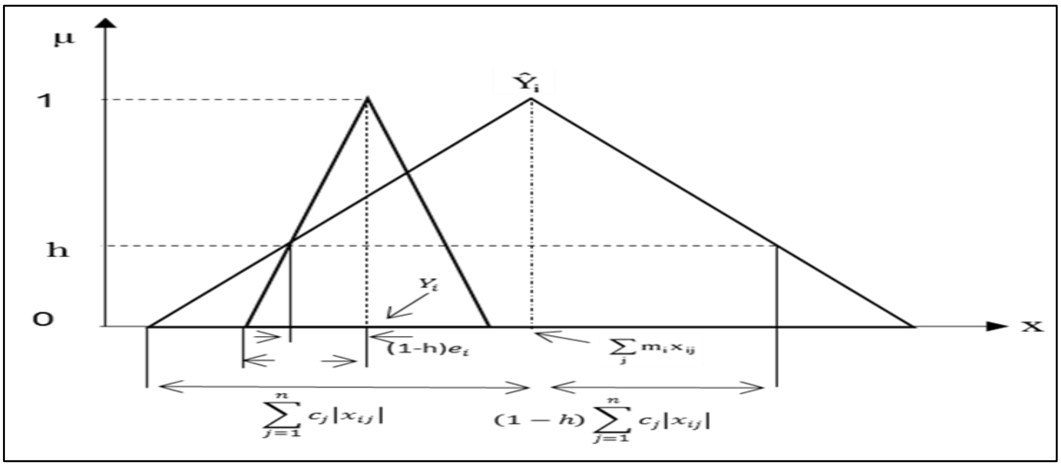
The membership function of the Fuzzy Regression model according to the dependent variable;

$$\mu_{\tilde{Y}}(y) = \begin{cases} 1 - \frac{|y-ax|}{c|x|}, & x \neq 0 \\ 1, & x = 0, y = 0 \\ 0, & x = 0, y \neq 0 \end{cases} \qquad (3)$$

Where |x|≤|y-ax| , the deviation between the calculated y value and the actual value is greater than the fuzzy width and μ_Y ̃ (y)=0. An important element in the fuzzy regression model is the degree of fuzziness. The fuzziness level ĥ measures the degree of fuzziness between the observed variable and the estimated variable by choosing any threshold value h by the decision maker. The threshold value h is shaped according to the experience of the expert. h threshold value affects the fuzzy width "c" (Khashei, Hejazi, et al., 2008: 774).

The center value ai and spread value are ci. The fuzzy regression model established between the predicted and the observed variable can be summarized as shown (Mousavi, Ponnambalam, et al., 2007);

Figure 1. Representation of Membership Function



According to this method, the fuzzy coefficients are determined to estimate the fuzzy Y spread with the minimum fuzzy width of the specified value of the degree of belief. The h value (fuzzy level) measures the compatibility between the regression model and the data. All observed data in the model should fall within the predicted range at the specified level.

Linear programming, developed by Tanaka is used to obtain a solution. Fuzzy linear regression model;

$$\tilde{Y} = \tilde{A}_0 + \tilde{A}_1 x_1 + \ldots\ldots\ldots \tilde{A}_n X_k \tag{4}$$

i = 1, 2, ...n (n, the number of observations)

j = 0, 1, ...k (k, number of explanatory variables)

Fuzzy Linear Programming model of Tanaka's is written to find fuzzy regression coefficients center and spread values (Pehlivan, Paksoy, et al., 2010:4).

$$Minimize\ z = \sum_{i=1}^{n}\sum_{j=0}^{m} c_j X_{ij}$$

St- $\sum_{j=0}^{m}(a_j + (1-h)c_j)X_{ij} \geq Y_i + (1-h)e_i$ (5)

$$\sum_{j=0}^{m}(a_j - (1-h)c_j)X_{ij} \leq Y_i - (1-h)e_i$$

$$a_j\ free\quad c_j \geq 0, c_j * |X_{ij}| \geq 0$$

i=1,2,.........n ve j=0,1,..........m.

After solution of model, center values A=(a_0, a_1, a_2,........a_m) and spread values C=(c_0, c_1, c_2,......c_m) are obtained. After that, sub and upper regression equations are constructed. These equations also represent the upper and lower limits.

Sub regression equation:

$$Y^A = A_0(a_0 - c_0) + \textstyle\sum_{j=1}^{0} A_j(a_j - c_j) \tag{6}$$

Upper regression equation:

$$Y^U = A_0(a_0 + c_0) + \textstyle\sum_{j=1}^{0} A_j(a_j + c_j) \tag{7}$$

Calculated in the form of.

The numbers used in the method developed by Tanaka's are fuzzy symmetric triangular numbers and are estimated at the upper and lower limits.

4.2. Data Set

In this study, total assets, employment, technical profit / loss, financial profit / loss and premium basic variables of insurance companies operating in the non-life field are used. These data consist of a total of 168 observations covering the years of frequency of 2016 to 2020. The sampling period is based on the data from 39 insurance companies actively operating in the non-life area. Insurance data were compiled from the official website of Turkey Insurers Association.

5. Findings and Results

5.1.Statistical Results

Panel data analysis was applied to the variables. First of all, unit root studies were done on the variables. The test results are given in the following unit root in Table 3.

According to the Table 3, it is seen that there is a unit root in the total assets and technical profit / loss variables, and there is no unit root in the financial profit / loss, employment and premium variables. In order to make consistent estimates in panel data analysis, logarithmic values of total assets and technical profit / loss variables were taken, and the most suitable model was searched. The statistical values of the model that can be considered as generated are given in the
Table 4.

Table 3. Unit Root Table

Variables	Unit root (I) I=0 there is not unit root I=1 there is unit root
Total Assets (TOPV)	I=1
Employment (İSTH)	I=0
Technical profit / loss (TTKZ)	I=1
Financial profit / loss (MK)	I=0
Premium (TOPRU)	I=0

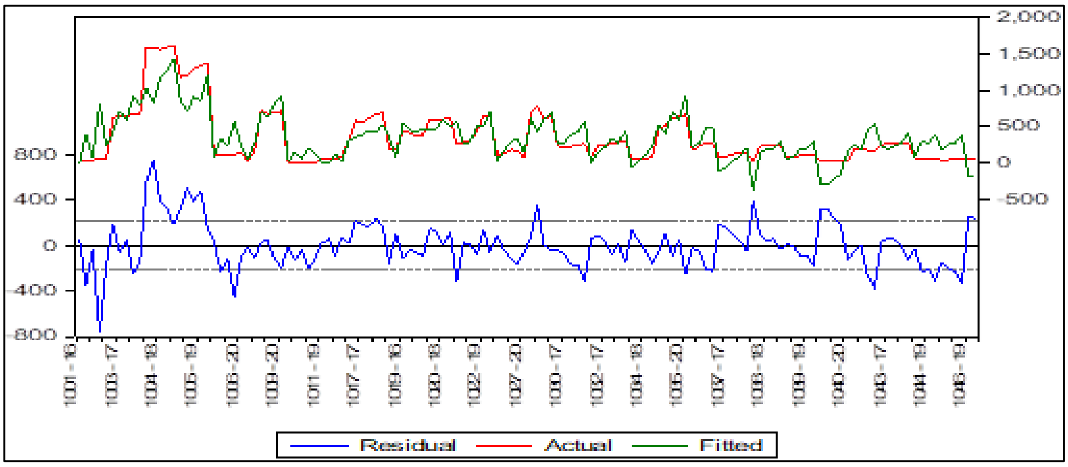
The statistical values of the model that can be considered as generated are given in Table 4. It is seen that the probability values of all variables are statistically significant.

But, when we look at the other statistic values, such as, it is seen that the Durbin-Watson value is insignificant, but R^2 value is significant. Due to these statistical values, the estimates to be made with the established panel regression model will not be consistent.

Table 4. Statistical Results of Panel Regression

Variable	Coefficient	Standard error	t-statistics	Prob.
MK	7.85E-07	3.26E-07	2.405115	0.0176
TOPRU	8.85E-08	1.27E-08	6.971146	0.0000
LNTOPV	196.3170	28.32539	6.930777	0.0000
LNTTKZ	-57.56409	24.54418	-2.345325	0.0205
C	-2833.540	332.5709	-8.520108	0.0000
R-squared	**0.707557**	**Durbin-Watson Stat**		**0.776311**
Adjusted R-squared	**0.698489**			

Figure 2. Graph of Panel Regression Estimation



5.2. Fuzzy Regression Results

Variables used in the panel regression model are used to find the coefficients of the variables in the fuzzy regression model. The Tanaka method uses linear programming which minimizes the fuzzy range at a certain fuzzy "h" level. A represents the fuzzy number A = (a0, c0), the center value a_0, and the c_0 spread value. A fuzzy number is a symmetric triangular fuzzy number. The spreading intervals are symmetrical in symmetrical triangular numbers. In the study, at all "h" levels of fuzzy, the data were solved by linear programming, which showed the best solution range.

In the Fuzzy Regression method, the upper and lower prediction intervals are obtained by adding and subtracting the spread values from the central values of the fuzzy numbers.

The upper and lower regression spreads are found with coefficients obtained from linear programming, So as Y^A lower regression estimation and Y^U upper regression estimation, obtained center and spread $(ai,\ ci)$ values are given by the following equations $Y^A = A_0(a_0 - c_0) + \sum_{j=1}^{0} A_j(a_j - c_j)$ and $Y^U = A_0(a_0 + c_0) + \sum_{j=1}^{0} A_j(a_j + c_j)$. In this way, it is checked whether the original observation values fall into the estimated lower and upper prediction ranges.

So that spread values will not be negative, the important point here is that the absolute values of spread coefficients are taken. Logarithmic values of the variables were taken to ensure consistency of the fuzzy solution. The coefficients of the variables obtained by the Tanaka method and the level of fuzzy are given in the table below.

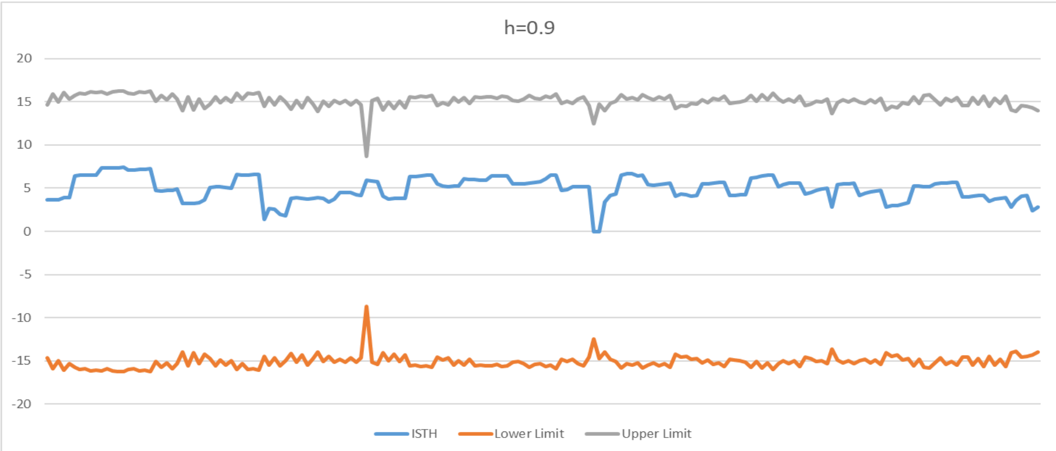
When the Table 5 is examined, the center values are all "0". The spread values, or alternatively named the lower and upper regression limits, are obtained when the spread values are added to and subtracted from the central values. A graph is created to show the solution for better understanding of spread values. Using these spread values, it is better understood that the actual values of dependent variable fall to the predicted ranges when the graph is created.

Table 5. Upper and Lower Estimation of Values of Fuzzy Regression

h=09	a	c	Y_{lower}	Y_{upper}
LNMK	0,0000	0,0001	-0,0001	0,0001
LNTOPRU	0,0000	0,3102	-0,3102	0,3102
LNTOPV	0,0000	0,0453	-0,0196	0,0196
LNTTKZ	0,0000	0,0196	-0,0453	0,0453
c	0,0001	7,7279	-7,7278	7,7280

When the Figure 3 is examined, it can be seen that the employment variable falls to the lower and upper limit ranges. According to the result obtained from the solution, the results are consistent with the solutions made with the related independent variables. In other words, depending on the independent "h" value of the model, it can explain the dependent variable by 90%. The actual values approach the middle of the lower and upper estimate values. Another important point is real employment values are closer to the upper limit.

Figure 3. Upper and Lower Limits For h=0.9 Value



6. Conclusion

Different models with varying levels of fuzzy levels have been obtained that yield upper and lower regression boundaries. In all of these models, the original observational data fall into the upper and lower ranges. In the fuzzy level h = 09 which is most appropriate within these ranges, the variation range of the total assets is 0,0906 %, financial profit-loss 0,0002 %, premium gain 0,6204 % and technical profit-loss 0,0392 %. In fuzzy regression method, minimum and maximum limits of variables related to the minimum fuzzy range method were found and a usable model was established with an accuracy of 90 %.

Consequently, using the fuzzy regression method, how intra-company variables affect employment in insurance companies is estimated as a range. It has been observed that the premium gain of companies is the first factor affecting the employment of companies. It may be thought that the increase in the premium gain of companies may affect employment positively. However, due to the current technological developments and making many insurance transactions online, it may negatively affect employment in insurance companies. By determining the interval with fuzzy regression, it is shown in which percentage interval the asset size affects employment.

According to the results obtained, it is seen that at the fuzzy level of 90 % is the premium of the companies which is the variable affecting the employment in the created model. In turn, this change is followed by total assets and others. The alternative fuzzy regression solution gives more meaningful results to the variables concerned.

The results obtained by the fuzzy regression method are quite better from the panel data solution method in terms of the consistency of the estimates. When it is desired to generate prediction models for the employment with financial variables of the companies in the sector, the fuzzy regression method is good at creating meaningful models and gives more consistent information about the coefficient of the related arguments. According to the results of the fuzzy regression, the estimation power shows a high estimated power of 90 %, and at the same time the actual values fall into the forecast intervals.

If the results of the study will be interpreted economically and socially; it was observed how internal variables, which are thought to affect the employment capacity of insurance companies, affect employment in insurance companies.

It has been observed that the most effective variable on employment in insurance companies is the premium gain. Increasing premium gain increases the operating capacity of insurance companies economically and especially financially. This also causes it to increase its competitiveness and return on future investments. It is observed that the increase in the size of premium gain in insurance companies has a positive effect on its employment. This effect will have positive effects on creating new employment in the insurance sector. This increase in employment will also have positive effects for the country's economy.

However, developing technology and making many insurance transactions online will cause companies to decrease their employment capacity even if their premium gain size increases. For example, there will be a decrease in needed field sales staff and number of agencies. In this case, on the contrary, it will increase the number of unemployed people in insurance sector and in the country. The decrease in employment and increasing unemployment will affect both people and the country's economy negatively. Economically, a negative outlook will occur in the domestic and foreign markets.

Research and Publication Ethics Statement

The authors declare that ethical rules are followed in all preparation processes of this study. In case of detection of a contrary situation, Journal of Commercial Sciences has no responsibility and all responsibility belongs to the authors of the study. This study does not require ethics committee approval.

Author Contributions

Yusuf AKGÜL & Ahmet ŞENGÖNÜL and Fuat ÇAMLIBEL contributed equally to the introduction, literature summary, data collection in the empirical part, analysis and conclusion parts of the study. 1st author's contribution rate: 33,3%, 2nd author's contribution rate: 33,3%, 3rd author's contribution rate: 33,3%.

Conflict of Interest

There is no conflict of interest between the authors.

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