Estimation of Linear Regression and Fuzzy Linear Regression with Fuzzy Coefficients on Financials Credentials of Agriculture Co-Operative Development Bank

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ABSTRACT:

In this paper, we proposed linear regression and fuzzy linear regression with fuzzy coefficients on the financials of Agriculture Co-operative Development Bank from year 2011-17.The data consists of that consists of credentials such as Reserves and Other Funds, Paid-up Share Capital, Total Own Funds, Loans
advanced during the year(SADB level, PADBs Level , Total Loans Outstanding, BorrowingsOutstanding, WorkingCapital(average)),Profits(SADB,PADB).First the linear regression was proposed and then fuzzy regression based on fuzzy coefficients is evaluated. The fluctuated parameters (slope) were evaluated with respect to basic values of slope of all data set. The merits of fuzzy regression over linear areobserved.

Keywords: *Regression equation, fuzzy regression, least square method, demand value and cost etc*

1. INTRODUCTION

Regression is a very important numerical tool. There are lots of uses of regression analysis in different areas. After having the confirmed that two variables are closely related in approximating or expecting the value of one variable with respect to another variable. For example, the yield of rice and the amount of rain are related closely with one another then we identify the amount of rain required for the production of definite quantity of rice. The relation between two variables is convey by regression analysis and with the help of this prediction is possible.

The vocabulary meaning of the term “Regression” is the act of returning or going back The term was first used by “sir Francis Galton in 1877 while studying the relationship between the heights of father and sons. The line describing the tendency to regress or going back was called by Galton a” Regression Line”. In order to explain the trend of a given group of points, we still used the regression line to draw a given line.The purpose of this paper to solve a single problem using different regression methods. In this paper we are using different kind of curves to solve the regression like linear, curvilinear regression, fuzzy regression. Regression analysis is used for prediction as mentioned above, just as on the basis of the current run rate of the team we predict the number of runs in the coming overs with the help of regression, these are regression applications.

Fuzzy regression is mainly used in statistics in which we represent the dependence of one variable on another the variable. We are using the empirical data to represent the fuzzy regression. In this paper we analysis the relationship between the Credentials of the financials of Agriculture Co-operative Development Bank from year 2011-17.

2. LITERATURE REVIEW

To solve the problem of linear regression analysis we use Fuzzy Regression. By different authors there are lots of methods to solve the fuzzy regression as mentioned below:[1] convenient for the fuzzy linear function to linear regression model and recognized methods of system demonstration for an indefinite phenomenon. The imprecision of the calculation system was symbolized by the fuzzy linear function. To evaluate the given data, the linear system used by[2-3] to find the fuzzy parameters this method is useful on the data. To enhance the precision,[4] planned a two-stage creation of a linear regression model. His determination had a major impact on the use of fuzzy regression and the practical use environment.When the data was not appropriate for statistical regression analysis,[5-7]found a practical alternative that is fuzzy regression. On the basis of contrast of observed membership function and the expected membership function, the fuzzy regression model is evaluated by[8]. Otherwise they use the indistinctness model as they use fuzzy linear regression and fuzzy linear least square regression[9]. To solve the problem of fuzzy regression, [10] considered a fuzzy linear regression model with non-fuzzy input and output data type. He presented a preassigned k-limiting value. These values are resolute to solve the current problem. To find out the abnormal values were affected by the k-limiting values [11-14] automatic change point detection method offered to resolve the piecewise fuzzy regression. They bring together possible and necessity regression models, and function worked in different ways in different portions of the range of crisp input variables. In[15] it was suggested that functional relationship between the independent and dependent variable were in fuzzy surroundings. In many fuzzy regression models the input is crisp and the output is fuzzy. In [16], the authors introduced that the distance fuzzy least square, is effective and an alternative model to estimate the fuzzy parameters by taking fuzzy input and fuzzy output. Ali Azadeh, *et al*.[17]appliedfuzzy regression model to gas consumption in Iran. They equated with conventional regression methods and fuzzy regression model to the crisp data. They detected that fuzzy algorithm has superior presentation than conventional regression analysis on the basis of fuzzy linear regression model. XuJialu& Lu Qiujun[18], established this for Predicting the GDP growth using outlier effect. They recommended that the performance of fuzzy linear regression is superior to the conventional linear regression model.

3. Mathematical Preliminaries

3.1 Regression: The term which explains the relationship between two or more number of variables inthe form of original unit of data that mathematical term is stated as regression. There are two kinds of variables that are used in regression:

a) **Dependent variable or Regressed or explained variable**: whose value is predicted
b) **Independent variable or repressor or predictor or explanatory variable**: This explanatory variable is used for the approximation.

3.2 Crisp numbers: Crisp numbers are those numbers whose value is exact. When we deals with the membership function its value is either 0 or 1 as the membership function well-defined in [0,1].

3.3 Fuzzy Distances: Fuzzy Distance is well-defined as it is the space between two Fuzzy numbers. These distances perform a very important role in the literature.

3.4 Crisp Distances: Crisp Distances is well defined as it is the space between two Crisp numbers.

3.5Least square method: Least square process is used to reduce the error and to increase the accuracy of the solution. Least square means that the overall solution minimizes the sum of the squares of the residual made in the results of every single equation.

3.6Fuzzification: In this process of fuzzification we collect an input of crisp data and convert the data of crisp set into fuzzy set using fuzzy variables.

3.7 Defuzzification: It is a process in which we map a fuzzy set to a crisp set or convert the fuzzy set to crisp set. It is used in fuzzy control system.

4. Methodologies

Regression can be calculated by forming and equation of the form $Y = a + b$ or $X = a' + b'Y$ (depending upon whether we are considering Y on X, where Y depends on X or X on Y, where X depends upon Y). The value of the unknown parameters (a, b, a',b') can be calculated as follows:

Considering equation Y on X ($Y = a + bX$) (4.1)

Where b=$\frac{\sum XY - \sum X \sum Y}{\sum X^2 - (\sum X)^2}$ and$a = \bar{Y} - b\bar{X}$. (4.2)

Similarly,in the case of X on Y.

Linear Regression with Fuzzy Parameters

The initial problem of ruling the fuzzy parameters C_1, C_2, ... , $C_n$can be transformed to the problem of discovering the vectors c and s. For each data given(a_j, b_j) (h ∈ [0,1])

The designated fuzzy regression problem can be expressed in terms of the resulting classical linear programming problem:

$$\text{Min } \sum_{i=1}^{n} s_i$$

subject to $(1\text{-}h)\ s^T|a_j| - |b_j - a_j^t c| \geq 0 \quad j \in N_m s_i \geq 0, I \in N_n$ (4.3)

4.DATA COLLECTION AND RESULTS

This data is from "The Punjab State Cooperative Agricultural Development Bank".

Credentials	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Reserves and other funds	410.29	412.63	408.77	427.82	386.58	**361.74**
Paid up share capital	70.91	71.73	72.95	74.52	75.86	**77.16**
Total own funds	481.2	484.36	481.73	502.34	462.44	**449.71**
Loans Advanced during the year						
SADB Level	487.08	431.64	501.11	506.54	559.8	**490.22**
PADBs Level	513.11	465.54	628.07	646.69	663.59	**488.98**
Total Loan Outstanding	2187.95	2226.66	2309.87	2428.86	2617.95	**2704.03**
Borrowing Outstanding	2048.6	2123.06	2163.14	2277.79	2332.1	**2368.63**
Working Capital (Average)	2783.4	2962.53	3131.56	3234.98	3210.95	**3357**
Profits						
SADB	20.7	28.77	25.66	24.93	25.42	**10.81**
PADB	35.61	54.92	43.99	41.09	21.07	**1.9**
Total	**56.31**	**83.69**	**69.65**	**66.02**	**46.49**	**12.71**

Table:4.1 A look of financials from year 2011-17. (In Crores.)

Case-1

Here we are finding the relation between "Reserves and otherfunds" and "paid up and share capital". Reserves And Other Funds is taken as X. Paid Up and Share Capital as Y.

Hence equation Y on X is given by $Y = a + bX$

Where value of b = -0.0727 and value of a = 103.0298 $\Rightarrow Y = 103.0298 - (0.0727)$

Similarly, Equation X on Y is given by $X = a' + b'Y$
Where values of b'= -6.8021 and value of a'=903.6740 $\Rightarrow X = 903.6740 - (6.8021)$

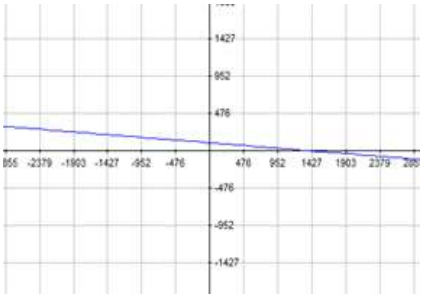

Figure4.1 shows the regression line Y on X and X on Y.

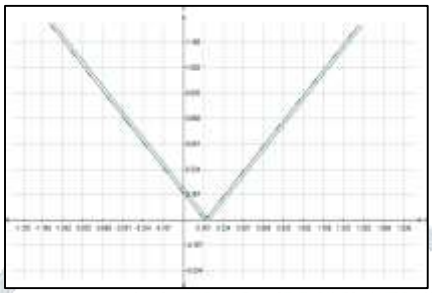

Figure 4.2 shows the optimized feasible region in upper half plane for the fuzzy regression

C	S	Cx	sx
0.19305	0.2145	79.20648	88.00721
0.19305	0.2145	79.65822	88.50914
0.19305	0.2145	78.91305	87.68117
0.19305	0.2145	82.59065	91.76739
0.19305	0.2145	74.62927	82.92141
0.19305	0.2145	69.83391	77.59323

Table4.2 Show the different value of cx and sx

The value of c from given Fig4.2 is 0.19305. Similarly we can find the value of *s* which is

$$s \geq \frac{1}{1-h} max\,(|0.1728 - c|, |0.1738 - c|, |0.1784 - c|, |0.1741 - c|, |0.1962 - c|, |0.2133 - c|)$$

Hence, the value of $s=\frac{0.19305}{1-h}$where h∈[0, 1].So, taking h=0.1 we get, s=0.2145. Then we will find the value of *cx* and *sx*. Then plot the figure 4.2 between them.

Case-2

Here we are finding relation between "Reserves and other funds" and "total own funds". Reserves and other funds is taken as X and Total own funds as Y.
Hence equation Y on X is given by $Y = a + bX$
Where value of b = 0.7717 and value of a = 167.2763, $\Rightarrow Y = 167.2763 + (0.7717)X$
Similarly, Equation X on Y is given by $X = a' + b'Y$
Where values of b'= 1.2536 and value of a'=-196.6161,$\Rightarrow X = -196.6161 + (1.2536)Y$

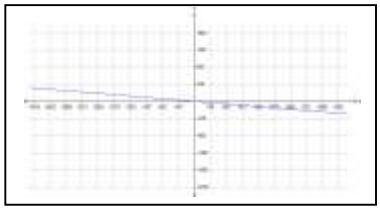

Figure4.3 shows the regression line Y on X and X on Y.

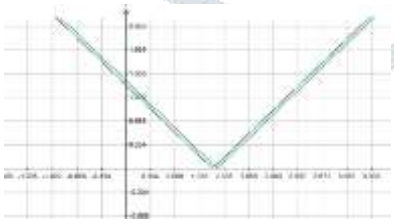

Figure 4.4 shows the optimized feasible region in upper half plane for the fuzzy regression

C	s	cx	sx
1.20795	1.34216	495.6098	550.6748
1.20795	1.34216	498.4364	553.8155
1.20795	1.34216	493.7737	548.6347
1.20795	1.34216	516.7852	574.2029
1.20795	1.34216	466.9693	518.8522
1.20795	1.34216	436.9638	485.513

Table4.3 Show the different value of cx and sx

The value of c from given Fig 4.4 is 1.20795. Similarly we can find the value of *s* which is

$$s \geq \frac{1}{1-h} max(|1.1728 - c|, |1.1738 - c|, |1.1784 - c|, |1.1741 - c|, |1.1962 - c|, |1.2431 - c|)$$

Hence, the value of $s=\frac{1.20795}{1-h}$where h∈[0, 1].So, taking h=0.1 we get, s=1.34216. Then we will find the value of *cx* and *sx*. Then plot the graph4.2 between them.

Case-3

Here we are finding the relation between "SADB Level" and" Total Loan Outstanding." SADB Level is taken as X and Total Loan Outstanding as Y.

Hence equation Y on X is given by $Y = a + bX$

Where value of b =2.9581 and value of a =945.1435, => $Y = 945.1435 + (2.9581)X$

Similarly, Equation X on Y is given by $X = a' + b'Y$

Where values of b'=0.1122 and value of a'=225.3766, => $X = 225.3766 + (0.1122)Y$

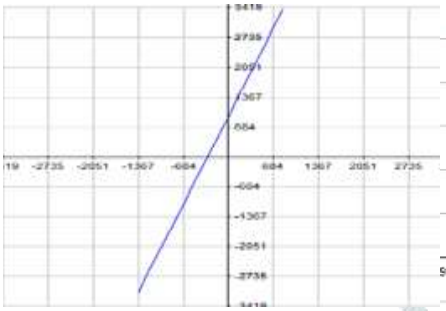

Figure4.5 shows the regression line Y on X and X on Y.

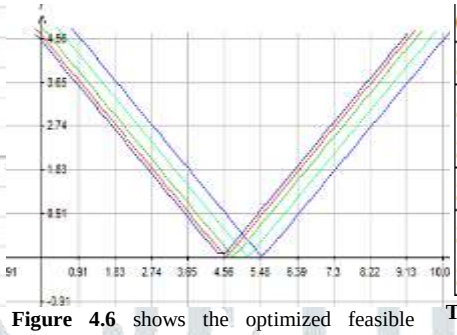

Figure 4.6 shows the optimized feasible region in upper half plane for the fuzzy regression

C	S	CX	SX
5.00395	5.55994	2437.324	2708.136
5.00395	5.55994	2159.905	2399.893
5.00395	5.55994	2507.529	2786.142
5.00395	5.55994	2534.701	2816.332
5.00395	5.55994	2801.211	3112.454
5.00395	5.55994	2453.036	2725.594

Table4.4 Show the different value of cx and sx

The value of c from given Fig 4.6 is 5.00395. Similarly we can find the value of *s* which is

$$s \geq \frac{1}{1-h} max(|4.4920 - c|, |5.1586 - c|, |5.5159 - c|, |4.6095 - c|, |4.7950 - c|, |4.6765 - c|)$$

Hence, the value of $s = \frac{5.00395}{1-h}$ where h∈[0, 1].So, taking h=0.1 we get, s=5.55994. Then we will find the value of *cx* and *sx*. Then plot the graph 4.6 between them.

Case-4 Here we are finding the relation between" SADB Level" and "Borrowing Outstanding". SADB Level is taken as X and Borrowing Outstanding as Y.

Hence equation Y on X is given by $Y = a + bX$

Where value of b =1.6991 and value of a =1376.0226, => $Y = 1376.0226 + (1.6991)X$

Similarly, Equation X on Y is given by $X = a' + b'Y$

Where values of b'= 0.1797 and value of a'=97.3311,=> $X = 97.3311 + (0.1797)Y$

Figure4.7 shows the regression line Y on X and X on Y.

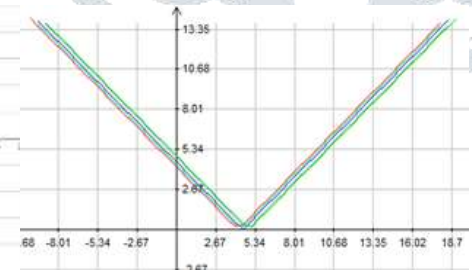

Figure 4.8 shows the optimized feasible region in upper half plane for the fuzzy regression

C	s	cx	sx
4.5521	5.0578	2217.237	2463.553
4.5521	5.0578	1964.868	2183.149
4.5521	5.0578	2281.103	2534.514
4.5521	5.0578	2305.821	2561.978
4.5521	5.0578	2548.266	2831.356
4.5521	5.0578	2231.53	2479.435

Table4.5 Show the different value of cx and sx

The value of c from given Fig 4.8 is 4.5521. Similarly we can find the value of *s* which is

$$s \geq \frac{1}{1-h} max(|4.2058 - c|, |4.9185 - c|, |4.3166 - c|, |4.4967 - c|, |4.1659 - c|, |4.8317 - c|)$$

Hence, the value of $s = \frac{4.5521}{1-h}$ where h∈[0, 1].So, taking h=0.1 we get, s=5.0578. Then we will find the value of *cx* and *sx*. Then plot the graph4.8 between them.

Case-5 Here we are finding the relation between" SADB Level" and "Working Capital." SADB Level taken as X and Working Capital as Y.

Hence equation Y on X is given by $Y = a + bX$

Where value of b =2.2266 and value of a =2008.865,=> Y= $2008.865 + (2.2266)X$

Similarly, Equation X on Y is given by $X = a' + b'Y$

Where values of b'=0.0873 and value of a'=224.2649,=>X= $224.2649 + (0.0873)\,Y$

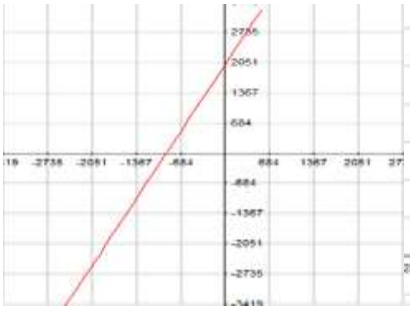

Figure4.9 shows the regression line Y on X and X on Y.

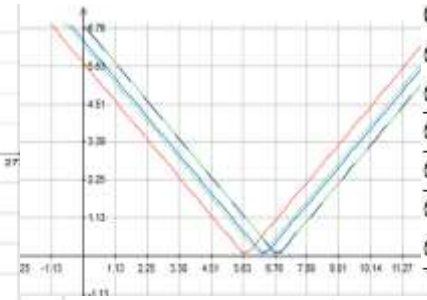

Figure 4.10 shows the optimized feasible region in upper half plane for the fuzzy regression

C	s	cx	sx
6.2889	6.9876	3063.197	3403.52
6.2889	6.9876	2714.541	3016.128
6.2889	6.9876	3151.431	3501.556
6.2889	6.9876	3185.579	3539.499
6.2889	6.9876	3520.526	3911.658
6.2889	6.9876	3082.945	3425.461

Table4.6 Show the different value of cx and sx

The value of c from given Fig 4.10 is 6.2889. Similarly we can find the value of *s* which is

$$s \geq \frac{1}{1-h} max(|6.8479 - c|, |5.7358 - c|, |6.3864 - c|, |6.2492 - c|, |6.8634 - c|, |5.7144 - c|)$$

Hence, the value of s=$\frac{6.2889}{1-h}$where h∈[0, 1].So, taking h=0.1 we get, s=6.9876. Then we will find the value of *cx* and *sx*. Then plot the graph4.10 between them.

Case-6 Here we are finding the relation between "PADBs Level" and "SADB Level." Here is PADBs Level taken as X and SADB Level as Y.

Hence equation Y on X is given by $Y = a + bX$

Where value of b =0.3818 and value of a =279.3312,=> Y= $279.3312 + (0.3818)X$

Similarly, Equation X on Y is given by $X = a' + b'Y$

Where values of b'= 1.7459 and value of a'=-298.4165, =>X= $-298.4165 + 1.7459)Y$

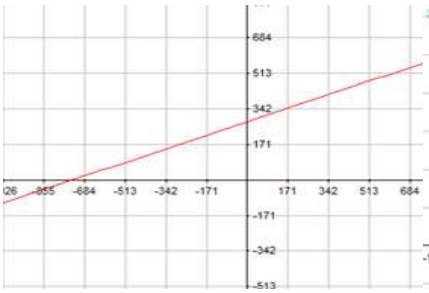

Figure4.11 shows the regression line Y on X and X on Y.

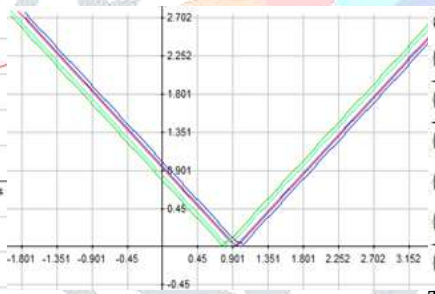

Figure 4.12 shows the optimized feasible region in upper half plane for the fuzzy regression

c	s	cx	sx
0.89285	0.99205	458.1303	509.0308
0.89285	0.99205	415.6574	461.839
0.89285	0.99205	560.7723	623.0768
0.89285	0.99205	577.3972	641.5488
0.89285	0.99205	592.4863	658.3145
0.89285	0.99205	436.5858	485.0926

Table4.7 Show the different value of cx and sx

The value of c from given Fig 4.12 is 0.89285. Similarly we can find the value of *s* which is

$s \geq \frac{1}{1-h} max(|0.9492 - c|, |0.9271 - c|, |0.7978 - c|, |0.7832 - c|, |0.8435 - c|, |1.0025 - c|)$Hence, the value of s=$\frac{0.89285}{1-h}$where h∈[0, 1].So, taking h=0.1 we get, s=0.99205. Then we will find the value of *cx* and *sx*. Then plot the graph 4.12 between them.

Case-7 Here we are finding the relation between "PADBs Level" and " Total Loan Outstanding." Here is PADBs Level taken as X and Total Loan Outstanding as Y

Hence equation Y on X is given by $Y = a + bX$

Where value of b =0.5967 and value of a =2073.8287,=> Y= $2073.8287 + (0.5967)X$

Similarly, Equation X on Y is given by $X = a' + b'Y$

Where values of b'= 0.1035 and value of a'=317.9641,=>X= $317.9641 + (0.1035)\,Y.$

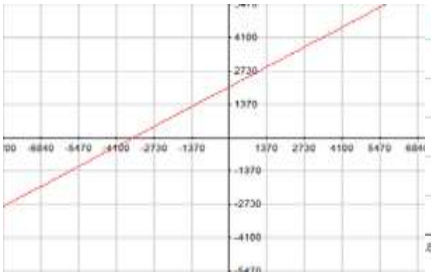

Figure4.13 shows the regression line Y on X and X on Y.

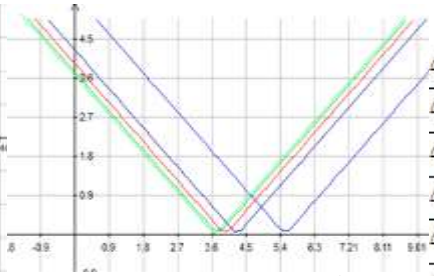

Figure 4.14 shows the optimized feasible region in upper half plane for the fuzzy regression

c	s	cx	sx
4.6038	5.1153	2362.256	2624.712
4.6038	5.1153	2143.253	2381.377
4.6038	5.1153	2891.509	3212.766
4.6038	5.1153	2977.231	3308.013
4.6038	5.1153	3055.036	3394.462
4.6038	5.1153	2251.166	2501.279

Table4.8 Show the different value of cx and sx

The value of c from given Fig 4.14 is 4.6038. Similarly we can find the value of *s* which is

$$s \geq \frac{1}{1-h} max(|4.2640 - c|, |4.7829 - c|, |5.5299 - c|, |3.6777 - c|, |3.7558 - c|, |3.9451 - c|)$$

Hence, the value of $s=\frac{4.6038}{1-h}$ where h∈[0, 1].So, taking h=0.1 we get, s=5.1153. Then we will find the value of *cx* and *sx*. Then plot the graph4.14 between them.

Case-8 Here we are finding the relation between "PADBs Level" and "Working Capital." PADBs Level taken as X and Working Capital as Y.

Hence equation Y on X is given by $Y = a + bX$

Where value of b =0.8866 and value of a =2610.1131,=> $Y = 2610.1131 + (0.8866)\ X$

Similarly, Equation X on Y is given by $X = a' + b'Y$

Where values of b'=0.1590 and value of a'=72.6322,=>X= $72.6322 + (0.1590)\ Y$

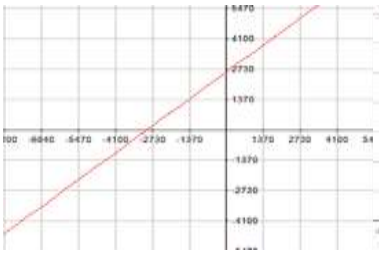

Figure4.15 shows the regression line Y on X and X on Y.

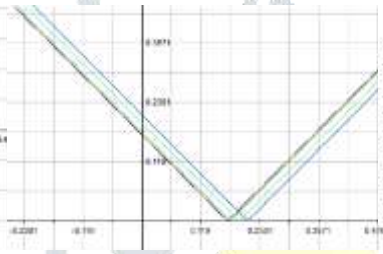

Figure 4.16 shows the optimized feasible region in upper half plane for the fuzzy regression

c	s	cx	sx
5.92565	6.584	3040.51	3378.316
5.92565	6.584	2758.627	3065.115
5.92565	6.584	3721.723	4135.213
5.92565	6.584	3832.059	4257.807
5.92565	6.584	3932.202	4369.077
5.92565	6.584	2897.524	3219.444

Table4.9 Show the different value of cx and sx

The value of c from given Fig 4.16 is 5.92565. Similarly we can find the value of *s* which is

$$s \geq \frac{1}{1-h} max(|5.4245 - c|, |6.3636 - c|, |4.9860 - c|, |5.0023 - c|, |4.8387 - c|, |6.8653 - c|)$$

Hence, the value of $s=\frac{5.92565}{1-h}$ where h∈[0, 1].So, taking h=0.1 we get, s=6.5840. Then we will find the value of *cx* and *sx*. Then plot the graph4.16 between them.

Case-9 Here we are finding the relation between "PADBs Level" and "Borrowing Outstanding." Here is PADBs Level taken as X and Borrowing Outstanding as Y.

Hence equation Y on X is given by $Y = a + bX$

Where value of b =0.5024 and value of a =1933.6926,=>$Y = 1933.6926 + (0.5024)\ X$

Similarly, Equation X on Y is given by $X = a' + b'Y$

Where values of b'= 0.2430 and value ofa'=28.4739,=>X= $28.4739 + (0.2430)\ Y$

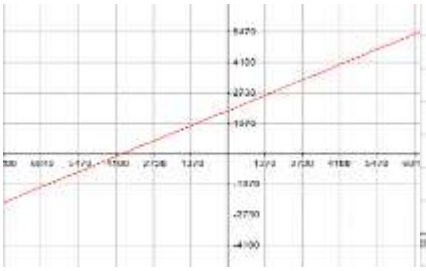

Figure4.17 shows the regression line Y on X and X on Y.

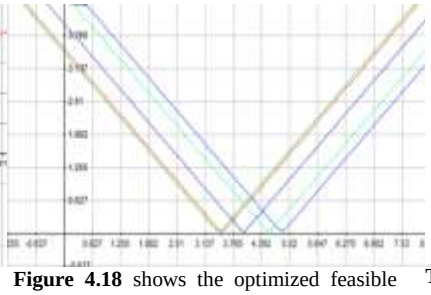

Figure 4.18 shows the optimized feasible region in upper half plane for the fuzzy regression

c	s	cx	sx
4.14405	4.6045	2126.353	2362.615
4.14405	4.6045	1929.221	2143.579
4.14405	4.6045	2602.753	2891.948
4.14405	4.6045	2679.916	2977.684
4.14405	4.6045	2749.95	3055.5
4.14405	4.6045	2026.358	2251.508

Table4.10 Show the different value of cx and sx

The value of c from given Fig 4.18 is 4.14405. Similarly we can find the value of *s* which is

$$s \geq \frac{1}{1-h} max(|3.9925 - c|, |4.5604 - c|, |3.4441 - c|, |3.5222 - c|, |3.5143 - c|, |4.8440 - c|)$$

Hence, the value of $s=\frac{4.14405}{1-h}$ where h∈[0, 1].So, taking h=0.1 we get, s=4.6045. Then we will find the value of *cx* and *sx*. Then plot the graph4.18 between them.

Case-10 Here weare finding the relation between "SADB Level " and "SADB (Profits)." SADB Level taken as X and SADB (Profits) as Y.

Hence equation Y on X is given by $Y = a + bX$

Where value of b =-0.0108 and value of a =28.0725,=> $Y = 28.0725 - (0.0108)X$

Similarly, Equation X on Y is given by $X = a' + b'Y$

Where values of b'=-0.4521 and value of a'=506.3344,=>$X= 506.3344 - (0.4521)\,Y$

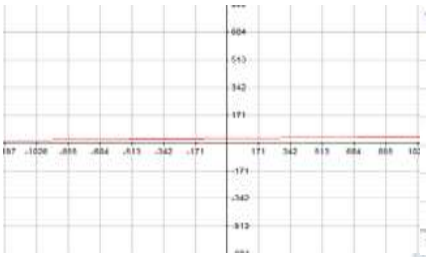

Figure4.19 shows the regression line Y on X and X on Y.

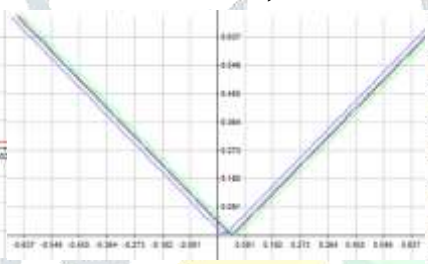

Figure 4.20 shows the optimized feasible region in upper half plane for the fuzzy regression

C	s	cx	sx
0.0443	0.0492	21.57764	23.96434
0.0443	0.0492	19.12165	21.23669
0.0443	0.0492	22.19917	24.65461
0.0443	0.0492	22.43972	24.92177
0.0443	0.0492	24.79914	27.54216
0.0443	0.0492	21.71675	24.11882

Table4.11 Show the different value of cx and sx

The value of c from given Fig 4.20 is 0.0443. Similarly we can find the value of *s* which is

$$s \geq \frac{1}{1-h} max(|0.0425 - c|, |0.0666 - c|, |0.0512 - c|, |0.0492 - c|, |0.0454 - c|, |0.0220 - c|)$$

Hence, the value of $s=\frac{0.0443}{1-h}$ where h∈[0, 1].So, taking h=0.1 we get, s=0.0492. Then we will find the value of *cx* and *sx*. Then plot the graph 4.20 between them.

Case-11 Here we are finding the relation between "PADBs Level" and "PADB (Profit)." PADBs Level taken as X and PADB (Profits) as Y.

Hence equation Y on X is given by $Y = a + bX$

Where value of b =0.0058 and value of a =29.8042,=> $Y= 29.8042 + (0.0058)X$

Similarly, Equation X on Y is given by $X= a'+b'Y$

Where values of b'=0.1261 and value ofa'=563.4899,=>$X= 563.4899 + (0.1261)\,Y$

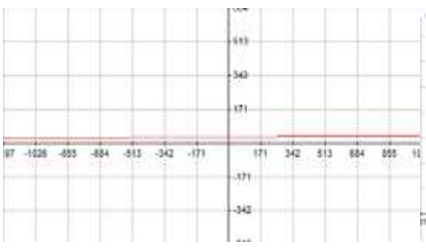

Figure4.21 shows the regression line Y on X and X on Y.

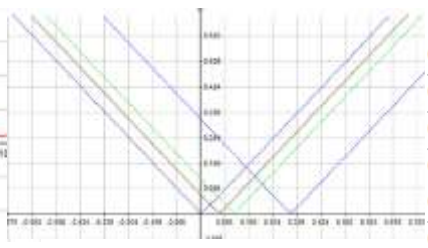

Figure 4.22 shows the optimized feasible region in upper half plane for the fuzzy

C	s	cx	Sx
0.06089	0.06765	31.24327	34.71189
0.06089	0.06765	28.34673	31.49378
0.06089	0.06765	38.24318	42.48894
0.06089	0.06765	39.37695	43.74858
0.06089	0.06765	40.406	44.89186
0.06089	0.06765	29.77399	33.0795

Table4.3 Show the different value of cx and

regression sx

The value of c from given Fig 4.22 is 0.06089. Similarly we can find the value of *s* which is

$s \geq \frac{1}{1-h} max(|0.0694 - c|, |0.1179 - c|, |0.0700 - c|, |0.0635 - c|, |0.03175 - c|, |0.00388 - c|)$

Hence, the value of $s=\frac{0.06089}{1-h}$where h∈[0, 1].So, taking h=0.1 we get, s=0.06765. Then we will find the value of *cx* and *sx*. Then plot the graph4.22 between them.

CONCLUSION

In this paper, we investigated linear regression and fuzzy linear regression with fuzzy coefficients on the financials of Agriculture Co-operative Development Bank from year 2011-17.The data consists of that consists of credentials such as Reserves and Other Funds, Paid-up Share Capital, Total Own Funds, Loans advanced during the year(SADB Level, PADBs Level,TotalLoansOutstanding,BorrowingsOutstanding,WorkingCapital(average)),Profits(SA DB, PADB).First the linear regression line have formed to all data set and then fuzzy regression based on fuzzy coefficients was evaluated. The fluctuated parameters (slope) were evaluated with respect to basic values of slope of all data set. Which shows that more degree of reliability than linear regression in each case (shown in table-4.1 to table-4.12 and figures 4.1 to figures 4.22.

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