

# Modeling for anxiety data toward students achievement in factorial design materials

Nely Indra Meifiani<sup>1</sup>, U Tisngati<sup>2</sup>, D C N Apriyani<sup>3</sup>, Martini<sup>4</sup>

<sup>1,3</sup> Study Program of Mathematics Education, STKIP PGRI Pacitan, Pacitan, 63511, East Java, Indonesia

<sup>2</sup> Study Program of Primary School Teacher Education, STKIP PGRI Pacitan, Pacitan, 63511, East Java, Indonesia

<sup>4</sup> Study Program of History Education, STKIP PGRI Pacitan, Pacitan, 63511, East Java, Indonesia

E-mail: [indrameifiani@yahoo.co.id](mailto:indrameifiani@yahoo.co.id)

**Abstract.** This study aims to determine various models that might occur in the relationship between anxiety and student achievement in factorial design material. At first glance, this data model is a linear regression with the correlation coefficient is negative. However, by using *Curveexpert 1.4*, some other models are mostly non-linear that might be better models than the linear model itself. This research method utilizes the Lavenberg-Marquardt method. The order of the models generated from the best models was as follows: 1) Fit Polynomial; 2) Sinusoidal fit; 3) Quadratic Fit; 4) Rational Function; 5) MMF Model; 6) User-Defined Model; 7) Linear Fit; and 8) Logistic Model.

## 1. Introduction

Successes of learning for a student's usually reflected in their achievement in a school. A good score of a test, of course, is a reflection of that the student success in learning. The student's conditions also affect whether the students will be a success or failure in the study. This regard, physiological conditions and psychological of the students also change. Mental conditions such as students anxiety too very influential in the process of learning. Most people experienced anxiety if they face something challenging, like learning mathematics. Especially when the material is quite complicated and complex, for instance teaching about 4 factors factorial design in the course design of experiments. Usually, the anxiety will show up when the tests will be taken. The dimensions of the concern are somatic anxiety, worry, and concentration disruption, and it showed that the three predictors could predict two out of three aspects of competitive anxiety [1]. Feelings of panic and fear of not being able to do the test become indicators that trigger student anxiety higher that will affect the test results. Hashempour & Mehrad also said that academic anxiety could have a negative impact on the success and activities of the school by themselves [2]. On the other hand, anxiety inhibits control of attention

High levels of anxiety when learning on someone has an adverse impact, usually the opposite effect on one's achievement. Moreover, it happens continuously so this will have an even worse impact. This is because high anxiety means the condition of a person is not good, resulting in an unfortunate possibility. According to Herrero (2006), students who permanently show a high level of anxiety usually show poor learning and memory skills, at this point, reducing stress related to responses or lowering levels of anxiety can increase students' cognitive performance and learning ability [3].

## 2. Research Methods

Calculate  $\chi^2(a)$

Take a certain value for  $\lambda$ . (CurveExpert used 0.001)

Get  $\delta a$  from equation (3)

Evaluate  $\chi^2(a + \delta a)$  (4)

If  $\chi^2(a + \delta a) \geq \chi^2(a)$ , multiple  $\lambda$  with a factor (CurveExpert used 10) and returns to (3). (5)

If  $\chi^2(a + \delta a) < \chi^2(a)$ , divide  $\lambda$  by a factor (CurveExpert used 10), correct the parameter vector with  $a = (a + \delta a)$  and return to (3). (6)

Iteration is stopped when  $\chi^2(a + \delta a) - \chi^2(a) < \varepsilon$ . The tolerance of  $\varepsilon$  taken by CurveExpert 1.4 is 10-6. [6]

The relationship between two variables, namely between anxiety and learning achievement is an unusual relationship. The relationship formed by these two variables is an inversely proportional relationship. That is, if anxiety is higher, then the achievement will be lower and vice versa if the anxiety is lower then the achievement will be higher. This is in line with the results obtained in this study, namely in Table 1 below.

achievement	Anxiety		
-.486*	1	<i>Pearson Correlation</i>	anxiety
.048		<i>Sig. (2-tailed)</i>	

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17	17 N	
1	-.486* <i>Pearson Correlation</i>	achievement
	.048 <i>Sig. (2-tailed)</i>	
17	17 N	

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\*. *Correlation is significant at the 0.05 level (2-tailed).*

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Based on the SPSS output, it shows that the correlation coefficient between anxiety variables and achievement variables is -0.486, which means that when the correlation coefficient minus shows an inverse relationship, the effect is a negative influence. When the negative impact of a variable increases will result in the decline of other variables, while a decrease in a variable can lead to a rise in the other variables that participated in this study. Based on Table 1 also obtained that the value of sig is 0.048. This significance value when compared with alpha 5%, the result is that Ho is rejected. It means the value of the correlation coefficient is significant. This is strengthened in Table 2, and the Anava results below.

**Table 2. ANOVA<sup>b</sup>**

<i>Sig.</i>	<i>F</i>	<i>Mean Square</i>	<i>Df</i>	<i>Sum of Squares</i>	<i>Model</i>
.048 <sup>a</sup>	4.644	1229.174	1	1229.174	<i>Regression</i>
		264.659	15	3969.885	<i>Residual</i>
			16	5199.059	<i>Total</i>

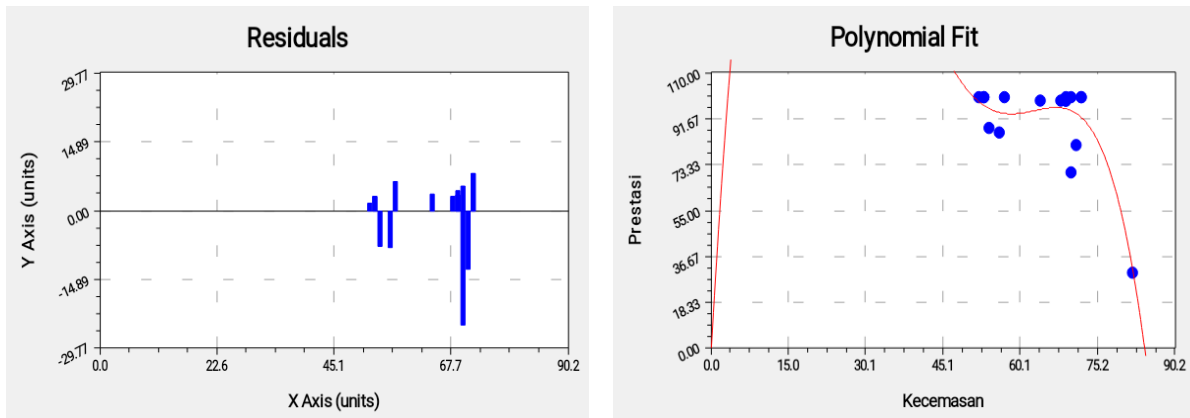
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*a. Predictors: (Constant), kecemasan*

*b. Dependent Variable: prestasi*

The significant correlation coefficient can be interpreted that there is a linear relationship between anxiety variables and learning achievement variables even though the correlation is a negative correlation. When there is a direct relationship between the two variables means a linear model is a model that may be formed from the relationship between the two variables but does not rule out the possibility that there are still other models that might be created from the relationship between the two variables. By using CurveExpert 1.4, the software that utilizes the Lavenberg-Marquardt method, the other non-linear models that represent the relation to the two variables can be easily generated. The best model is to fulfill 3 criteria, namely (1) Viewing from Standard Error (S) which is getting closer to zero, (2) Looking at the value of the correlation coefficient that is getting closer to 1, and (3) The residual value is as small as possible where the total remaining value is positive and must be balanced. Here are the 8 best models according to the best ranking generated from CurveExpert 1.4.

### 3.1. Polynomial fit



**Figure 1.** Regression curves and residual curves of a polynomial fit

4<sup>th</sup> Degree Polynomial Fit:  $y = a + bx + cx^2 + dx^3 + ex^4$

Coefficient Data:

a = 2.24284977457E-003

b = 3.61070429500E+001

c = -1.60032168924E+000

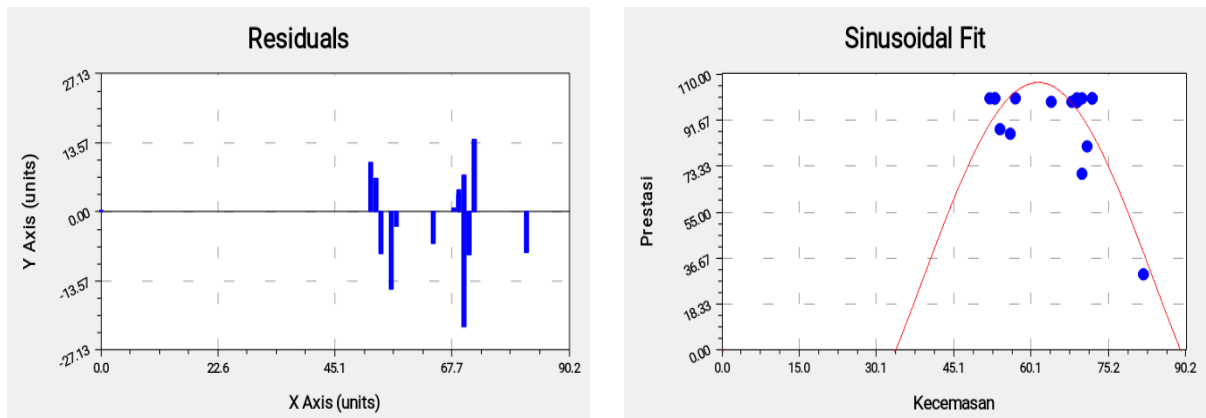
d = 2.49192051663E-002

e = -1.30712108642E-004

Standard Error S = 9.53836379

Correlation coefficient r = 0.95364619

### 3.2. Sinusoidal fit



**Figure 2.** Regression curves and residual curves of sinusoidal fit

Sinusoidal Fit:  $y = a + b\cos(cx + d)$

Coefficient Data:

a = 2.89070240738E+001

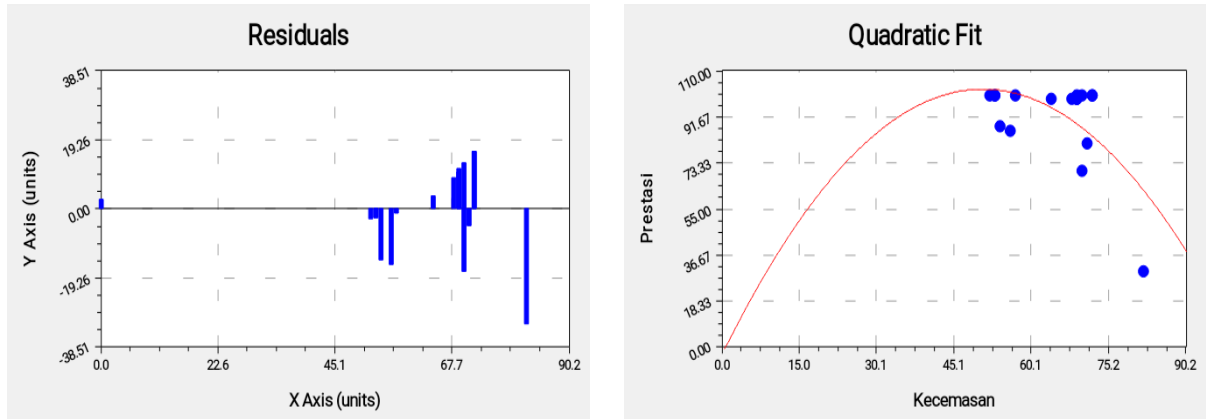
b = 7.76231659411E+001

c = 7.05016851671E-002

d = -4.32694912555E+000

Standard Error S=10.93110141  
Correlation coefficient r=0.93376424

### 3.3. Quadratic fit



**Figure 3.** Regression curves and residual curves of quadratic fit

Quadratic Fit:  $y = a + bx + cx^2$

Coefficient Data:

a = -2.73674898601E+000

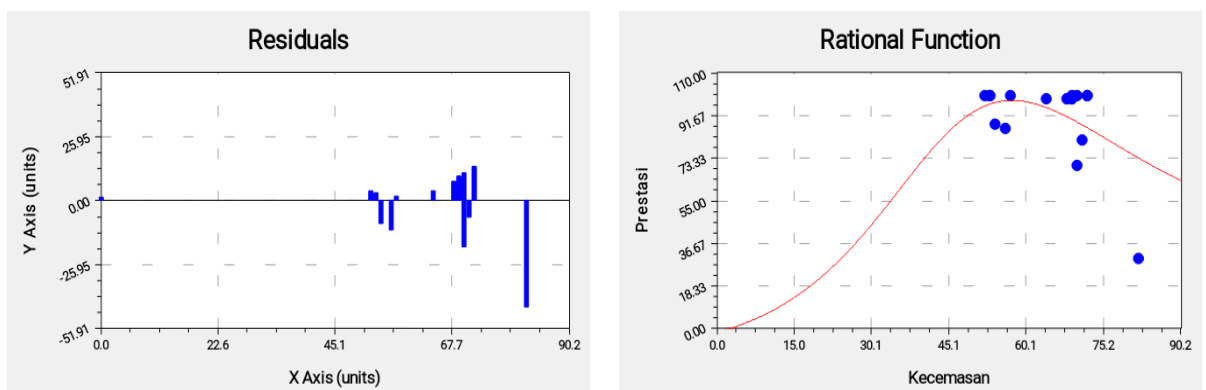
b = 4.16727392731E+000

c = -4.11790007060E-002

Standard Error S=13.97558683

Correlation coefficient r=0.88072593

### 3.4. Rational function



**Figure 4.** Regression curves and residual curves of rational fit

Rational Function:

$$y = \frac{a + bx}{1 + cx + dx^2}$$

Coefficient Data:

a = -1.65908100045E+000

b = 6.88858371201E-001

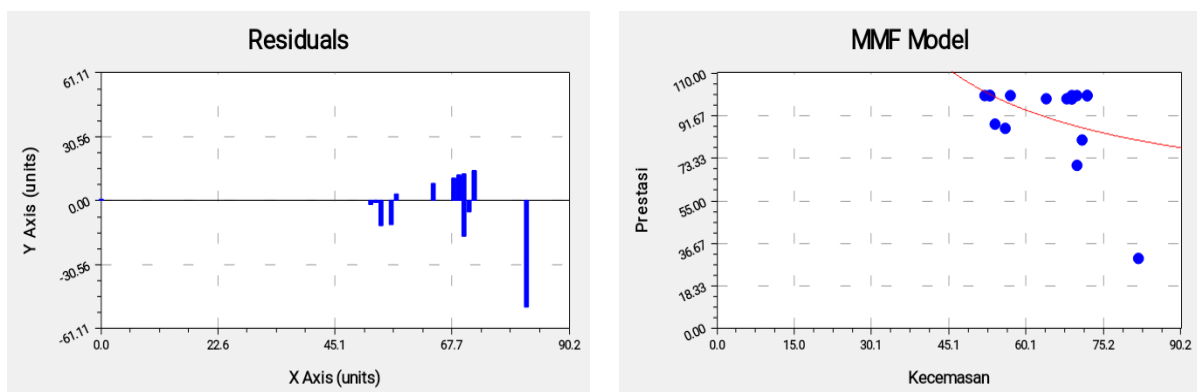
c = -2.84931198969E-002

d = 3.10063523962E-004

Standard Error S=15.56553982

Correlation coefficient r=0.86039831

### 3.5. MMF model



**Figure 5.** Regression curves and residual curves of MMF fit

MMF Model:

$$y = \frac{ab + cx^d}{b + x^d}$$

Coefficient Data:

a = -6.31390749278E-001

b = -1.65556837152E+000

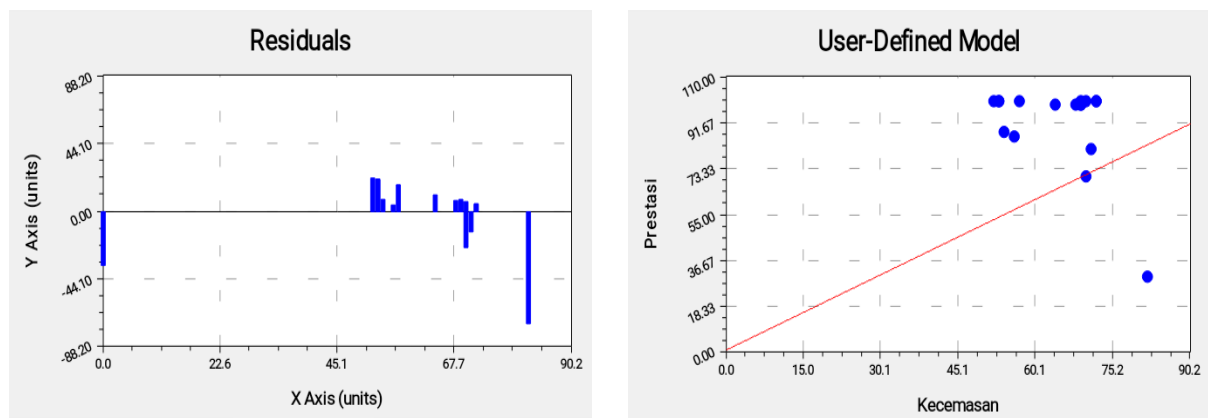
c = 2.55507299055E+001

d = 2.02261323524E-001

Standard Error S=17.66514538

Correlation coefficient r=0.81577875

### 3.6. User-defined model



**Figure 6.** Regression curves and residual curves of user-defined model fit

User-Defined Model:

$$y = a + bx$$

Coefficient Data:

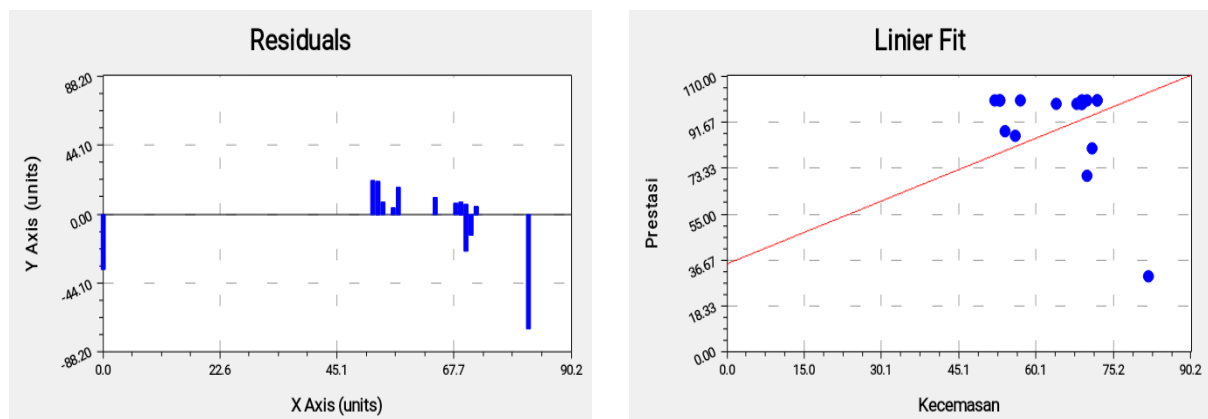
$$a = 3.52638471757E+001$$

$$b = 8.32198683519E-001$$

Standard Error S=24.30171527

Correlation coefficient r=0.52583980

### 3.7. Linier fit



**Figure 6.** Regression curves and residual curves of linear fit

Linear Fit:

$$y = a + bx$$

Coefficient Data:

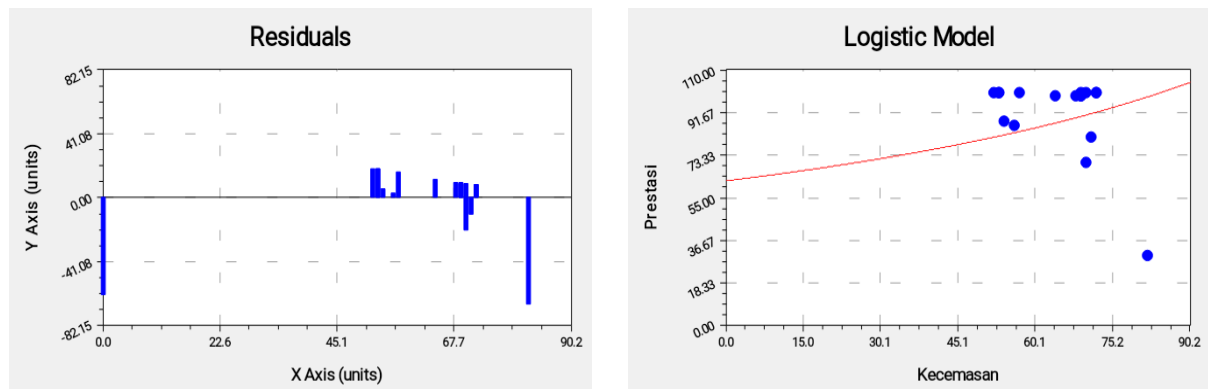
$$a = 3.52638476044E+001$$

$$b = 8.32198676767E-001$$

Standard Error S=24.30171527

Correlation coefficient r=0.5258398

### 3.8. Logistik model



**Figure 7.** Regression curves and residual curves of logistic model fit

Logistic Model:

$$y = \frac{a}{1 + be^{-cx}}$$

Coefficient Data:

a = 6.19810883828E+000

b = -9.00529567482E-001

c = -4.84809998552E-004

Standard Error S=27.29018799

Correlation coefficient r=0.38032712

Based on the results of the Curve Expert 1.4, it showed that the Linear Fit or linear model can still be used because it always appears even though it is in the 7th position. So it can be said that the linear model is not yet the best model. The best model produced is Polynomial Fit.

## 4. Conclusion

Linear or Linear Regression Models Fit is not the best model for the relationship between Student Anxiety and Achievement. Based on the results of Curve Expert 1.4, 8 best regression models have been obtained, namely Polynomial Fit, Sinusoidal Fit, Quadratic Fit, Rational Function, MMF Model, User-Defined Model, Linear Fit, and Logistics Model consecutively.

## References

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