

Trend Analysis Comparison of Forecasts For New Student

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Abstract— The number of new students who register annually less stable, increasing and decreasing. This has caused difficulties in the adjustment including adjustment of the number of classrooms and lecturers that will impact on the ratio of lecturers. Thus the need to do forecasting or prediction of the number of new students each year. To get the most precise predictions in this study used four methods on Trend Analysis namely methods of semi on average, the least squares method, the method of quadratic trend, exponential trend method, which will be compared to determine the method with the smallest error rate.

Keywords—Prediction; Forecast; Comparison; Trend Analysis

I. INTRODUCTION

Acceptance of new students is a very important thing for any college, both public universities and private colleges. Each college has the following criteria and their respective advantages offered to new students. For community college to get qualified students with the desired amount is straightforward. Every college wants to get a good quality students and the maximum quantity in accordance with the quota of the college. Public universities have a system that makes it easier to get new students. Unlike the private universities should strive more to get new students. Then the college should have a strategy to compete in attracting new students. Many different strategies employed by private universities, among others, with open enrollment for new students early [1]. Make estimates of future enrollment accurately is very important for a college because a lot of decisions that may be taken from the forecasting method [2]. Prediction accurately the number of new students is important to do because of the predicted outcome can be taken many decisions as necessary adjustments to classroom students, adjusting the number of lecturers, and the adjustment means of support other teaching and learning activities. Several studies have been conducted to estimate the number of new students [3]. The purpose of this study is to determine an accurate method for the prediction of new students each year. The benefits derived from this research is to produce an accurate method for the prediction of new students, adjustment of the classroom and the number of lecturers become easier, better planning can be done in accordance with the vision, mission, goals and objectives.

II. TREND ANALYSIS

Trend analysis is an analytical method that is intended to make an estimate or forecast the future. To do forecasting

with both the needs of various kinds of information (data) is quite a lot and observed in a period of relatively long, so that the results of the analysis can be known how many large fluctuations and the factors that influence those changes. In theoristis, in time series analysis of the most decisive is the quality or accuracy of the information or the data obtained and the time or period of the data collected. Time series analysis is important because we can use the sequential results of a variable for a time period, to forecast the future behavior or to discover the possible causes behind the results [1,4]. Trend is a tendency to move up or down in the long term is derived from the average change over time and the value is quite flat (smooth). An increasing trend called a positive trend and declining trend called the negative trend. Trend shows the changes in a relatively long and stable. To perform the analysis of trend forecasting, there are several ways: (a) Semi average method, (b) Least squares method, (c) Quadratic trend method, (d). Exponential trend method.

A. Semi Average Method

Semi average methods in principle is to divide the data into two parts: the first group and the second group. Furthermore, the two groups were used as the basis for the calculation of trends and forecasting. Steps in obtaining the trend line with this method are: (a) Grouping the data into two parts. If the amount of data is odd, then the middle one can be omitted or counted twice, one part menjad first group and the first part into the second group, (b) Calculating the arithmetic mean first group K_1 and K_2 the second group, K_1 is placed in the middle of the group 1 and K_2 is placed in the middle of the group 2. Values K_1 and K_2 is a constant value (a) and lies in the base year. Value K_1 and K_2 be the intercept in the equation trends, (c). Calculates the difference between (e) To determine the magnitude of the upcoming trend can just enter a value (X) in the equation.

B. Least Square Method

Trend by the least squares method is obtained by determining the trend line that has the smallest sum of the squares of the difference between the original data with the data on the trend line. If Y describes the original data and Y' is the trend data, the method formulated smallest. Trend with the smallest method can be described on the following pages.

C. Quadratic Trend Method

Trends that are short and medium term, it is likely the trend will follow a linear pattern. One that is not linear is quadratic method.

D. Exponential Trend Method

The exponential trend is a trend that has promoted or exponent of his time.

E. Choosing a Better Trends

To determine which one is better used measure of accuracy is how well a forecasting tool that suspect the actual incident. More precise tools will have a smaller degree of error. To measure the accuracy of the required value of the difference between the data with forecasting the smallest. If the value smallest, then these methods are felt most appropriate, or having a smaller error rate [5].

III. DATA PROCESSING

This study uses data of new students who register start the academic year 2006/2007 up to 2015/2016 for the study program Informatics Techniques and Information Systems.

Table 1. Data sets

Year	Number of New Students
2006	422
2007	345
2008	512
2009	398
2010	440
2011	439
2012	293
2013	298
2014	387
2015	289

Semi Average Method, of which year group divide to K1 and K2 group.

Table 2. Semi Average Method

	Year	Numbering of New Students	Average	Value of X	
				2008	2013
K1	2006	422		-2	-7
	2007	345		-1	-6
	2008	512	423,4	0	-5
	2009	398		1	-4
	2010	440		2	-3
K2	2011	439		3	-2
	2012	293		4	-1
	2013	298	341,2	5	0
	2014	387		6	1
	2015	289		7	2

Next, counting table with Least square method.

Table 3. Least Square Method

Year	Numbering of New Students	Kode X (Tahun)	Y.X	X ²
2006	422	-4,5	-1899	20,25
2007	345	-3,5	-1207,5	12,25
2008	512	-2,5	-1280	6,25
2009	398	-1,5	-597	2,25
2010	440	-0,5	-220	0,25
2011	439	0,5	219,5	0,25
2012	293	1,5	439,5	2,25
2013	298	2,5	745	6,25
2014	387	3,5	1354,5	12,25
2015	289	4,5	1300,5	20,25
Amount	3823		-1144,5	82,5

And then, counting with Quadratic method.

Table 4. Quadratic Method

Year	Y	X	XY	X ²	(X ²)Y	X ⁴
2006	422	-4,5	-1899	20,25	8545,5	410,0625
2007	345	-3,5	-1207,5	12,25	4226,25	150,0625
2008	512	-2,5	-1280	6,25	3200	39,0625
2009	398	-1,5	-597	2,25	895,5	5,0625
2010	440	-0,5	-220	0,25	110	0,0625
2011	439	0,5	219,5	0,25	109,75	0,0625
2012	293	1,5	439,5	2,25	659,25	5,0625
2013	298	2,5	745	6,25	1862,5	39,0625

2014	387	3,5	1354,5	12,25	4740,75	150,0625
2015	289	4,5	1300,5	20,25	5852,25	410,0625
Amount	3823		-1144,5	82,5	30201,75	1208,625

Next, counting table with Exponential method.

Table 5. Exponential Method

Year	Y	X	LN Y	X ²	X LN Y
2006	422	-4,5	6,045005314	20,25	-27,202524
2007	345	-3,5	5,843544417	12,25	-20,452405
2008	512	-2,5	6,238324625	6,25	-15,595812
2009	398	-1,5	5,986452005	2,25	-8,979678
2010	440	-0,5	6,086774727	0,25	-3,0433874
2011	439	0,5	6,084499413	0,25	3,0422497
2012	293	1,5	5,680172609	2,25	8,5202589
2013	298	2,5	5,697093487	6,25	14,242734
2014	387	3,5	5,958424693	12,25	20,854486
2015	289	4,5	5,666426688	20,25	25,49892
Amount	3823		59,28671798	82,5	-3,1151574

The table below describes the results of the calculation of the value of a, b, and c to establish equality of each method. The equation can be calculated from the predicted values for 2016 and 2020. In order to obtain different values. So by using this equation can predict the number of new students for a particular year who want predictable.

Table 6. Predicted value with Semi Average Method

Semi Average Method	
Value of a	
Value of b	-16,44
Value of c	
Equation	
2008	$Y'=423,4 - 16,44 X$
2013	$Y =341,2 - 16,44 X$
Predicted value for 2016	
2008	291,88
2013	291,88
Predicted value for 2020	
2008	226,12
2013	226,12

Table 7. Predicted value with Least Square Method

Least Square Method	
Value of a	382,3

Value of b	-13,87272727
Value of c	
Equation	$Y' = 382,3 - 13,87 X$
Predicted value for 2016	306
Predicted value for 2020	250,5090909

Table 8. Predicted value with Quadratic Method

Quadratic method	
Value of a	403,20625
Value of b	-13,87272727
Value of c	-2,534090909
Equation	$Y' = 403,21 - 13,87 X - 2,53 X^2$
Predicted value for 2016	250,25
Predicted value for 2020	42,71363636

Table 9. Predicted value with Exponential Method

Exponential method	
Value of a	375,6552362
Value of b	-0,037055484
Value of c	
Equation	$Y = 375,66 (1 - 0,037) ^ x$
Predicted value for 2016	305,3089484
Predicted value for 2020	262,5697447

IV. METHOD COMPARISON

Analysis of calculation with some of these methods. The calculations for the prediction of the academic year 2016/2017 and 2020/2021 determine the best method of trend analysis that has the smallest error rate with equation below.

Table 10. Error rate of Semi Average Method

Semi Average Method				
Y	X	Y'	Y - Y'	(Y-Y') ²
422	-4,5	497,38	-75,38	5682,144
345	-3,5	480,94	-135,94	18479,68
512	-2,5	464,5	47,5	2256,25
398	-1,5	448,06	-50,06	2506,004
440	-0,5	431,62	8,38	70,2244
439	0,5	415,18	23,82	567,3924
293	1,5	398,74	-105,74	11180,95
298	2,5	382,3	-84,3	7106,49
387	3,5	365,86	21,14	446,8996
289	4,5	349,42	-60,42	3650,576
				51946,61

Table 11. Error rate of Least Square Method

Least Square Method				
Y	X	Y'	Y - Y'	(Y-Y') ²
422	-4,5	444,7272727	-22,7273	516,5289
345	-3,5	430,8545455	-85,8545	7371,003
512	-2,5	416,9818182	95,01818	9028,455
398	-1,5	403,1090909	-5,10909	26,10281
440	-0,5	389,2363636	50,76364	2576,947
439	0,5	375,3636364	63,63636	4049,587
293	1,5	361,4909091	-68,4909	4691,005
298	2,5	347,6181818	-49,6182	2461,964
387	3,5	333,7454545	53,25455	2836,047
289	4,5	319,8727273	-30,8727	953,1253
				34510,76

Table 12. Error rate of Quadratic Method

Quadratic Method				
Y	X	Y'	Y - Y'	(Y-Y') ²
422	-4,5	414,3181818	7,681818	59,01033
345	-3,5	420,7181818	-75,7182	5733,243
512	-2,5	422,05	89,95	8091,003
398	-1,5	418,3136364	-20,3136	412,6438
440	-0,5	409,5090909	30,49091	929,6955
439	0,5	395,6363636	43,36364	1880,405
293	1,5	376,6954545	-83,6955	7004,929
298	2,5	352,6863636	-54,6864	2990,598
387	3,5	323,6090909	63,39091	4018,407
289	4,5	289,4636364	-0,46364	0,214959
				31120,15

Table 13. Error rate of Exponential Method

Exponential Method				
Y	X	Y'	Y - Y'	(Y-Y') ²
422	-4,5	445,1195427	-23,1195	534,5133
345	-3,5	428,6501196	-83,6501	6997,343
512	-2,5	412,7900652	99,20993	9842,611
398	-1,5	397,5168328	0,483167	0,233451
440	-0,5	382,8087099	57,19129	3270,844
439	0,5	368,6447877	70,35521	4949,856
293	1,5	355,0049305	-62,0049	3844,611
298	2,5	341,8697481	-43,8697	1924,555
387	3,5	329,2205674	57,77943	3338,463

289	4,5	317,0394064	-28,0394	786,2083
				35489,24

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From the calculation results can be seen that the smallest error value is 31120.15 with Quadratic methods. With this method the predicted number of new students will be closer to the truth.

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