Alfa Value Scalability on Single and Double Exponential Smoothing Comparatives

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Abstract

To find out sales forecasts in the future, it is not only based on estimates but must be calculated carefully based on the experience of previous sales transactions. This observation can be made based on sales data a few months ago to be used as actual data to get predictive value in the future period. Prediction or forecasting is done with two methods Single Exponential Smoothing (SES) and Double Exponential Smoothing (DES), from these two methods, will be sought the most suitable alpha value to get the percentage error value. There are two error values : Mean Absolute Deviation (MAD) and Mean Absolute Percentage Error (MAPE). By using sales data from February to December 2019, the predicted value of 430 orders was obtained in the SES method and resulted in a sales prediction of 402 orders in the DES method with the smallest error accuracy value of 26.88% in the SES method and an accuracy value of 22.71%. in the DES method with the acquisition of scalability of the right alpha value for both, namely 0.3 and the beta value of 0.3 in the DES method

Keywords: *Single Exponential Smoothing, Double Exponential Smoothing, MAPE, MAD, Prediction.*

1. Introduction

The pandemic has made the economy wheel erratic and has become a big problem for everyone, primarily entrepreneurs in the culinary field. Due to this condition, many have experienced a decrease in turnover and even went out of business; therefore, it is vital to reduce losses. Prediction or forecasting is the right step to find out sales forecasts in the future. This study will predict sales using sales transaction data for the month from February 2019 to December 2019 at the Kedaung corner shop. In this study, researchers took sales data at Kedai Pojok Kedaung, which is a restaurant. In fulfilling the demand for catering orders, business owners require careful preparation to support the sales process, but there are problems experienced in ensuring the number of orders that come. The unpreparedness of materials to support catering sales is very influential in processing order requests that are sometimes impromptu and uncertain in number. It will make it difficult for the shop to find materials and capital if orders coincide. This unpreparedness can be minimized by knowing the estimated demand for orders in the following month.

An estimate or prediction is a conjecture about the occurrence of an event in the future [1]. This estimate can be obtained based on testing past conditions to predict the situation [2]. There are many methods for predicting data, one of which is the Exponential Smoothing Method which is a method for forecasting time series data by performing continuous improvement procedures[2][3]. The Exponential Smoothing method is usually used for short-term forecasting[4]. Another method, namely the moving average, is a forecasting algorithm that uses a moving average model [5]. These problems can be
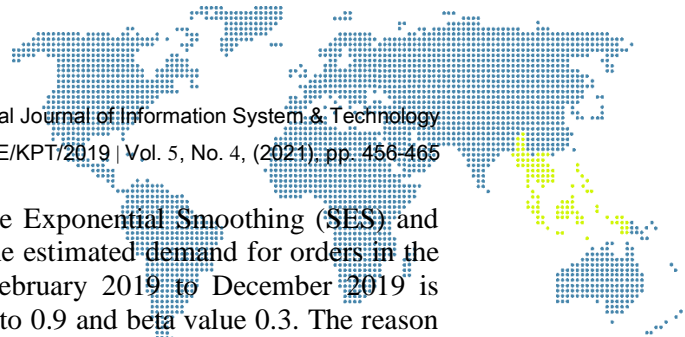
solved using predictions. The method used is Single Exponential Smoothing (SES) and Double Exponential Smoothing (DES) to find out the estimated demand for orders in the following month, with catering sales data from February 2019 to December 2019 is calculated based on value weights. (alpha) from 0.1 to 0.9 and beta value 0.3. The reason for using the SES method is that the sales transaction data for 11 months is quite stable. Still, from this data, several transactions have a declining trend in sales. They will be calculated using the DES method. A prediction accuracy value will be calculated to measure the minimum error value between the existing and the data. The value of the prediction uses MAD (Mean Absolute Deviation) and MAPE (Mean Absolute Percentage Error) to get prediction results with the lowest error value so that it can be used to control the number of sales and help business owners in managing sales with a minimal error rate. This study will be tested to compare the two methods using transaction test data from the Kedai Pojok Kedaung restaurant.

The purpose of this study is to find out which method is optimal with the case of transactions at catering and to test the alpha values one by one from 0.1 to 0.9 to find out the right alpha value so that the contribution of this research is to compare the results of the smallest error values from the SES and DES methods and get the weights. Best alpha value. Comparison of the single exponential smoothing and double exponential smoothing methods for accuracy in forecasting the number of the workforce in the coming period and the percentage of errors using MAP, MAD and MSD, from this study the results of the Double Exponential Smoothing method are more precise than the Single Exponential method with data that does not contain patterns sales trend and has a smaller error percentage from Double Exponential Smoothing, namely 389.20 than Single Exponential Smoothing with an error percentage of 419.360[1].

Forecasting the inflation rate using the double exponential smoothing method and looking for the slightest error value with MSE and alpha values of 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9. This study was able to predict the 2018 Inflation Figure Forecast in the city of Samarinda based on inflation data for 2013-2017 with the smallest error value at an alpha value of 0.3, which was measured using the mean square error[2].Predicting the number of train passengers in 2018 using the Single Exponential Smoothing and Double Exponential Smoothing methods than using checking the error values of SSE, MSE, and MAPE at alpha 1 and 0.5 values using train passenger training data from January 2006 - December 2015 and January 2016 - October 2017 as test data. The SSE accuracy value of 157444122 is found in the Double Exponential Smoothing method, and it can be concluded that train passengers in Indonesia will increase every month in 2018[3]. BI's data in real-time from January 27 to February 13, 2020, were analyzed using the Moving Average and Exponential Smoothing methods with alpha values of 0.1, 0.5, and 0.9 using MAD and MSE to find the smallest error value. The Exponential Smoothing method is considered the right method for forecasting the IDR exchange rate against the USD dollar with an alpha value of 0.9 on February 14 of IDR. 13,677.29 with an error value of MAD = 5.58 and MSE = 1,376.62[4].

The Double Moving Average method is used to predict the arrival of foreign tourists at the Ngurah Rai airport with the data used as training the order value, which is then used as multiple values in calculating the average. The process carried out is to find the Single Moving Average value as the moving average value, then do the same with the double moving average method but do not use the actual visit data but use the resulting value from the Single Moving Average, so that it becomes the value of the moving average calculation result. Double Moving Average. Then the calculation is carried out to find the constant value and trend coefficient. These values are then added together so that the result of the summed value is the forecast value. The DES method has better accuracy than DMA in forecasting the number of foreign tourist arrivals at Ngurah Rai Airport [5].

Comparing the production data using the Least Square and Double Exponential Smoothing methods with the smallest error percentage. In my research, I compared the
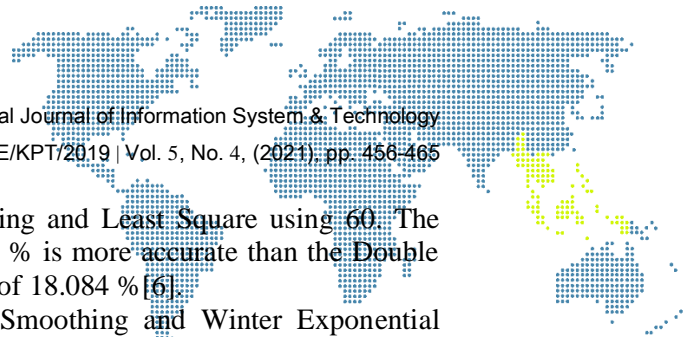
two methods between Double Exponential Smoothing and Least Square using 60. The Least Square method with a MAPE value of 17.008 % is more accurate than the Double Exponential Smoothing method with a MAPE value of 18.084 %[6].

This study uses the Holt Double Exponential Smoothing and Winter Exponential Smoothing (Triple Exponential Smoothing Multiplicative) methods which will be compared to get accurate results on sales predictions in the future period; accuracy is sought using MAPE to get accurate values. The data used is souvenir sales data at UD. Fajar Jaya in 2016-2017 and used glass souvenirs as a sample. The prediction results in July 2017 using the Holt Exponential Smoothing Method were 599 items with a MAPE forecasting error rate of 20.5%. While the results of Winter Exponential Smoothing are 549.6 items with a MAPE error rate of 12.6% [7]. The Double Moving Average method is used to determine the time, the number of periods and divide the results of the period calculation with the initial data. The Double Exponential Smoothing method will be carried out to determine the alpha and beta values and then look for the predicted values. Then the Box Jenkins method is used to preprocess the data, then estimate the model and diagnostic test; if the diagnostic test is met, then continue forecasting. If not, then return to data preprocessing. Then perform a forecasting test for each method and determine the error value using MES, RMSE, and MAPE. Forecasting garden production in 2019 with the best method, namely the Double Exponential Smoothing method in January of 949181.5 Kg, February of 963505.8 Kg, March of 977830.1 Kg, April of 992154.4 Kg, May of 1006478.6 Kg and June of 1020802.9 Kg with an MSE value of 47031163817, and RMSE of 216866.7 and parameter values (optimum weighting) for = 0.616667 and = 0.1548939[8].

Comparing Single Moving Average with Single Exponential Smoothing, the sample used is Aknil product; this product is a painkiller. The use of these two methods is to compare the two forecasting methods to compare the most accurate forecasting method and approach the actual value. The research method used starts from collecting historical data, determining forecasting methods, calculating forecasting, determining the best strategy, and drawing conclusions. From the test results, the method that can be used to analyze the data with the smallest error rate is the SMA method with forecasting results for July 2019 of 466 and the Single Exponential Smoothing method using alpha 0.8 yielding 408,488 caplets [9].

1.1 Prediction or Forecasting (Forecasting)

Forecasting is predicting some or many future events. As Niels Bohr, a Danish physicist quoted by Montgomery Jennings and Kulahci, makes, a reasonable prediction is not always easy. Forecasting is a vital issue covering many fields, including business and industry, government, economics, environmental science, medical, social science, politics, and finance[10]. There are two techniques of forecasting methods, namely subjective and objective methods. The unique forecasting method has a qualitative model that seeks to include factors.

2. Research Methodology
2.1. Research Framework

This study will compare the SES and DES methods with the sales dataset at Kedai Pojok Kedaung from February to December 2019. This dataset will be processed using the Single Exponential Smoothing and Double Exponential Smoothing forecasting methods using a beta value of 0.3 and the weight of the alpha value used. Between 0.1 to 0.9 and to find the error value using MAD and MAPE. After being calculated using an alpha value of 0.1 to 0.9, it will take the alpha that produces the smallest percentage and the slightest error value used.
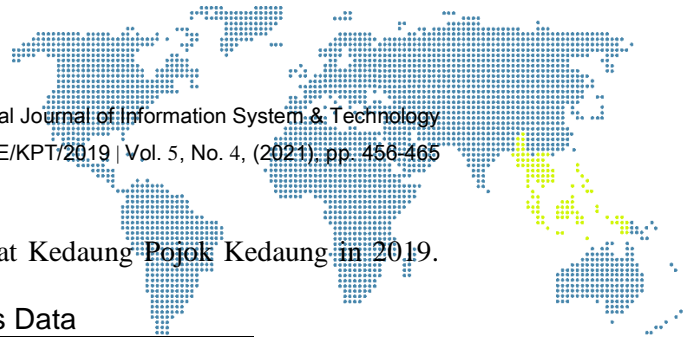
2.2. Research Data

The research material used is the Sales Dataset at Kedaung Pojok Kedaung in 2019. The data is shown in Table 1.

Table 1. 2019 Sales Data

No	Periode / Bulan	Jumlah / Data Aktual
2	Februari	329
3	Maret	431
4	April	294
5	Mei	294
6	Juni	267
7	Juli	416
8	Agustus	196
9	September	589
10	Oktober	379
11	November	466
12	Desember	482

2.3. Research Methodology

The stages of the forecasting process will explain in making predictions using two methods SES and DES. Before the prediction process is carried out, the data collection stage is first carried out. This stage is carried out to prepare the data that has been collected to analyze what data is needed in the prediction process. The data obtained are sales data for 11 periods, as shown in Table 1. The dataset is calculated using the SES method with an alpha value of 0.1 to 0.9. The error value is computed using MAD and MAPE. From the calculation results, it can be seen that the smallest percentage value is in alpha between 0.1 to 0.9. Then with the same dataset and the same alpha value will be calculated using the DES method, the DES method will add a beta value of 0.3. From the results of the DES calculation, it can also be seen that the smallest percentage value is in alpha between 0.1 to 0.9. The steps in carrying out the prediction process can be seen in Figure 1.
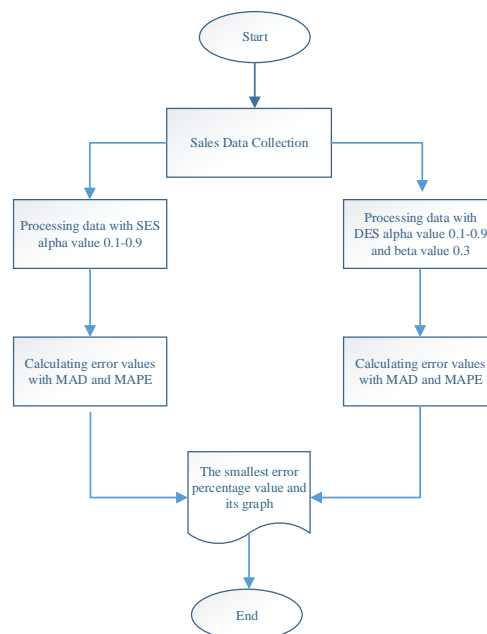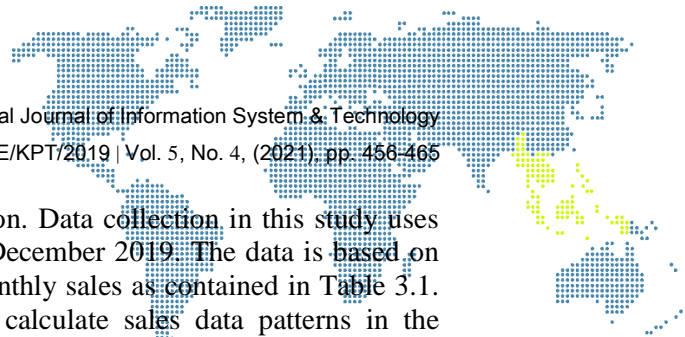

Figure 1. Forecasting Process Stages

a) The initial stage carried out is data collection. Data collection in this study uses catering sales data from February 2019 to December 2019. The data is based on invoices or invoices, then compiled into monthly sales as contained in Table 3.1. The sales data will be used to view and calculate sales data patterns in the following month.

b) The next step is to calculate predictions using the Single Exponential Smoothing method with equation 2.1. The weight of the value of (alpha) used is from 0.1 to 0.9.

c) After getting the predicted value, the MAD (Mean Absolute Deviation) calculation is carried out using equation 2.5 to see the lowest Error Value and the MAPE (Mean Absolute Percentage Error) calculation using equation 2.6 to see the percentage of error accuracy on the weighted value.

d) Percentage of Accuracy Errors can be seen at the smallest percentage.

e) Then calculate the prediction using the Double Exponential Smoothing method, which first calculates the level with equation 2.2, then proceeds to calculate the trend using equation 2.3 and continues to calculate predictions with equation 2.4. The weight of the (alpha) value used is the same as the SES method, which is from 0.1 to 0.9, but this DES method adds a beta value; the beta value used is 0.3.

f) Then calculate MAD and MAPE according to the formula as in equations 2.5 and 2.6

g) From the results of MAD and MAPE, both methods are then graphed. From the two graphs, it can be seen that the percentage results that have the lowest error value are at alpha 0.3 in both methods.

2.4. Time Series Analysis

One of the essential elements that must first be known if we want to make predictions or forecasts with the help of statistical analysis is the time series. Time series analysis is statistical data arranged in time order. According to Thomas Herbert Wonnacott, the time series analysis itself is "a tool that can be used to determine the tendency of a value from time to time, as well as an analytical tool that can be applied to predict the value of a variable at a certain time." In this case, the period in question can be from years, months, quarters, weeks, quarterly, and so on [11]. The purpose of time series analysis, in general, is to find the form or pattern of variations of the data in the past and use statistical knowledge to forecast the properties of the data in the future [12].

2.5. Single Exponential Smoothing (SES)

Single Exponential Smoothing is a continuous smoothing procedure for forecasting the latest observation object. Which focuses on decreasing priority in stages on older observational data. In other words, recent observations will be given higher priority for forecasting than older observations [13]. This forecasting method takes estimates for the previous period and adjusts them using forecast errors, and is used for the next period [14]. With the Single Exponential Smoothing method, the data is smoothed by removing noise in the data and using the weighted average of the past data. The model assumes that the data fluctuates around a fixed mean, with no consistent growth trend or pattern. The formula for Single Exponential Smoothing is found in equation 1 [14].

$$F_{t+1} = {}_\alpha X_t + (1 - \alpha)F_t \qquad (1)$$

Where :
Ft+1   : Predicted value for period t+1
A   : Smoothing Constant $(0 < \alpha < 1)$
Xt   : The actual value of the t-th period
Ft   : Predicted value of t period
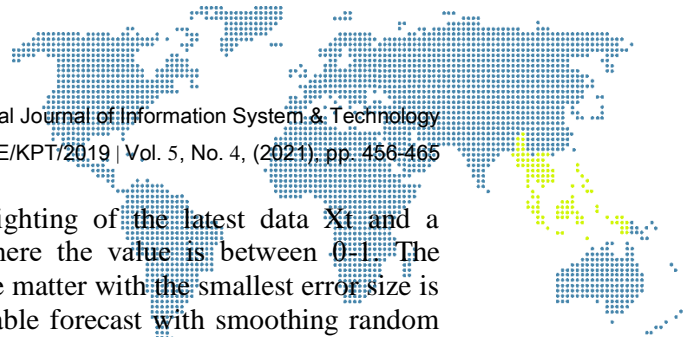
Forecasting Ft+1 is a forecast based on a weighting of the latest data Xt and a weighting of 1-α on the predicted data of Ft, where the value is between 0-1. The selection of the importance is made subjectively. The matter with the smallest error size is chosen to do the next forecasting. If you want a stable forecast with smoothing random components, then use a small value of. If you wish to fast forecast results for changes in data, then use a significant deal of.

2.6. Double Exponential Smoothing (DES)

This method extends single exponential smoothing to linear, exponential smoothing to allow forecasting of trending data using two constants and (with values between 0 and 1). With three equations, namely the first formula to calculate the level and the second to calculate, the third trend is calculated for predictions; these equations can be found in equation 2 for levels, 3 for trends, and 4 for forecasts [7][14].

$$L_t = \alpha Y_t + (1 - \alpha)(L_{t-1} + b_{t-1}) \tag{2}$$
$$b_t = \beta(L_t - L_{t-1}) + (1 - \beta) b_{t-1} \tag{3}$$
$$F_{t+m} = L_t + b_t m \tag{4}$$

Where :
Lt   : Indicates the level of the time series t or the smoothing value to t
A   : Smoothing parameter for data (0 < □ < 1) or aplha . value
B   : Smoothing parameter for trend estimation (0 < □ < 1) or beta . value
Yt   : Actual Data to – t
bt   : Estimated trend to – t
m   : Number of periods to be forecast
F_{t+m} : Value of forecast data
In this study, the prediction accuracy values used to determine the accuracy of the forecasting results carried out on the actual data are MAD (Mean Absolute Deviation) and MAPE Mean Absolute Percentage Error.

2.7. Mean Absolute Deviation (MAD)

MAD is a method for evaluating forecasting results in determining prediction errors. Of course, the expected minimum error results. In other words, the smaller the error value obtained, the more accurate the prediction results. This method performs calculations by finding the value of the difference between the actual and predicted data, then searches for the average value of the difference. The formula for calculating MAD is in equation 5.

$$MAD = \sum |t - t| \tag{5}$$

Where :
Σ   : Quantity
At   : Observation data for period t
Ft   : Forecast Period t
MAD is used to measure the variability (state of variation) in prediction error. Using MAD is more interpretable and easier to explain to non-specialists or people who are not experts in the method [10].

2.7. Mean Absolute Percentage Error (MAPE)

This method calculates the difference between the original data and the forecasted data. The difference is absolute, then calculated as a percentage of the original data. The result of the ratio is then obtained its mean value. A model has an excellent performance if the MAPE value is below 10% and if the MAPE value is between 10% and 20%. The formula for calculating MAPE is found in equation 6[6].
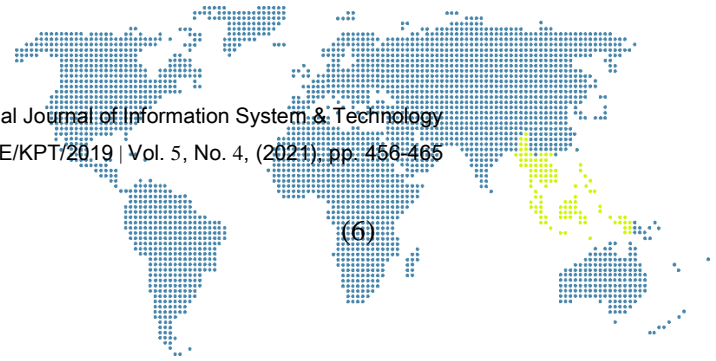
$$MAPE = \frac{1}{n}\sum_{t=1}^{n}\frac{|X_t - F_t|}{X_t} \; 100 \qquad (6)$$

Where :
Xt : Actual data in period t
Ft : Forecast value in period t
n : Number of time periods

3. Results And Discussion
3.1. Single Exponential Smoothing (SES)

At this stage, perform prediction calculations using the Single Exponential Smoothing method by performing calculations using equation (2.1) using the weighted value of (alpha) from 0.1 to 0.9. The following is the result of the analysis using the alpha value weight of 0.1. The calculation of the importance of the alpha value of 0.2 to 0.9 is done in the same way as calculating the weight of the alpha value of 0.1.

F2	$= \alpha X_1 + (1-\alpha) F_1$		F3	$= \alpha X_2 + (1-\alpha) F_2$
	$= (0,1 \times 329) + (0,9 \times 329)$			$= (0,1 \times 431) + (0,9 \times 329)$
	$= 32,9 + 296,1$			$= 43,1 + 296,1$
	$= 329$			$= 339,2$
F4	$= \alpha X_3 + (1-\alpha) F_3$		F5	$= \alpha X_4 + (1-\alpha) F_4$
	$= (0,1 \times 294) + (0,9 \times 339,2)$			$= (0,1 \times 294) + (0,9 \times 334,68)$
	$= 29,4 + 305,28$			$= 29,4 + 301,212$
	$= 334,68$			$= 330,612$
F6	$= \alpha X_5 + (1-\alpha) F_5$		F7	$= \alpha X_6 + (1-\alpha) F_6$
	$= (0,1 \times 267) + (0,9 \times 330,612)$			$= (0,1 \times 416) + (0,9 \times 324,2508)$
	$= 26,7 + 297,5508$			$= 41,6 + 291,82572$
	$= 324,2508$			$= 333,42572$
F8	$= \alpha X_7 + (1-\alpha) F_7$		F9	$= \alpha X_8 + (1-\alpha) F_8$
	$= (0,1 \times 196)+(0,9 \times 333,42572)$			$= (0,1 \times 589)+(0,9 \times 319,683148)$
	$= 19,6 + 300,083148$			$= 58,9 + 287,7148332$
	$= 319,683148$			$= 346,6148332$
F10	$= \alpha X_9 + (1-\alpha) F_9$		F11	$= \alpha X_{10} + (1-\alpha) F_{10}$
	$= (0,1 \times 379) + (0,9 \times 346,61483)$			$= (0,1 \times 466) + (0,9 \times 349,85334)$
	$= 37,9 + 311,9533499$			$= 46,6 + 314,8680149$
	$= 349,8533499$			$= 361,4680149$
F12	$= \alpha X_{11} + (1-\alpha) F_{11}$			
	$= (0,1 \times 482) + (0,9 \times 361,4680149)$			
	$= 48,2 + 325,3212134$			
	$= 373,5212134$			

After calculating the prediction using the value of (alpha) 0.1 to 0.9, then calculating MAD (Mean Absolute Deviation) using equation (2.5) to see the error value and calculating MAPE (Mean Absolute Percentage Error) using the equation (2.6) to see the percentage of error accuracy on the weighted value. The following are the results of the MAD and MAPE calculations with an alpha value of 0.1.

$$MAD = \frac{1}{n}\sum_{t=1}^{n}|et| \qquad\qquad MAPE = \frac{1}{n}\sum_{t=1}^{n}|PEt|$$
$$= \frac{1019,05}{10} = 101,9047574 \qquad\qquad = \frac{273,07\%}{10} = 27,31\%$$

The calculation of the SES method with a weighted alpha value of 0.1 and the estimate of the error value is in Table 2. The same equation is also used to calculate the weighted alpha value of 0.2 to 0.9, as shown in Table 2.
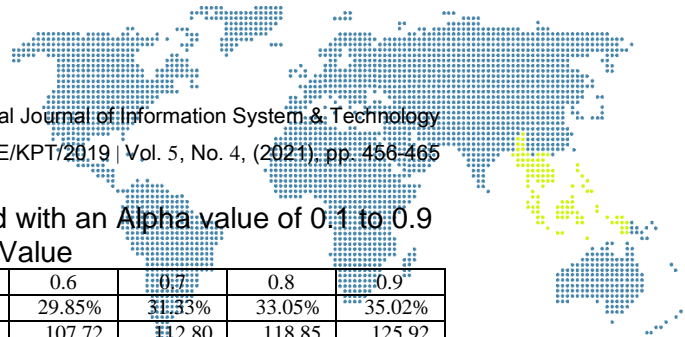
Table 2. Calculation Results of the SES Method with an Alpha value of 0.1 to 0.9 along with an Error Value

Alpha	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
MAPE	27.31%	26.88%	26.77%	27.58%	28.60%	29.85%	31.33%	33.05%	35.02%
MAD	101.90	99.19	97.95	100.34	103.58	107.72	112.80	118.85	125.92
RMSE	121.26	121.02	122.61	125.73	130.28	136.20	143.51	152.31	162.77
MSE	14705.05	14645.19	15032.52	15809.29	16972.95	18550.29	20596.02	23199.17	26495.16

From the calculations that have been carried out, the percentage of error accuracy is obtained by calculating the MAPE (Mean Absolute Percentage Error) using equation (1), where the overall results of the calculations can be seen in Table 3. The results of the percentage error values are shown in Table 4.

Table 3. Accuracy percentage value

Periode	Tahun	Bulan	Data Aktual	Data Prediksi	αXt	(1 − α)Ft	Error	MAD |Error|	% Error	MAPE |% Error|	RMSE Error ^	
t			X(t)	F(t)								
1	2019	Februari	329	329	32.9	296.1	0.00	0.00	0.00%	0.00%	0.00	
2		Maret	431	329	43.1	296.1	102.00	102.00	23.67%	23.67%	10404.00	
3		April	294	339.20	29.4	305.28	-45.20	45.20	-15.37%	15.37%	2043.04	
4		Mei	294	334.68	29.4	301.21	-40.68	40.68	-13.84%	13.84%	1654.86	
5		Juni	267	330.61	26.7	297.55	-63.61	63.61	-23.82%	23.82%	4046.49	
6		Juli	416	324.25	41.6	291.83	91.75	91.75	22.06%	22.06%	8417.92	
7		Agustus	196	333.43	19.6	300.08	-137.43	137.43	-70.12%	70.12%	18885.83	
8		September	589	319.68	58.9	287.71	269.32	269.32	45.72%	45.72%	72531.57	
9		Oktober	379	346.61	37.9	311.95	32.39	32.39	8.54%	8.54%	1048.80	
10		November	466	349.85	46.6	314.87	116.15	116.15	24.92%	24.92%	13490.04	
11		Desember	482	361.47	48.2	325.32	120.53	120.53	25.01%	25.01%	14527.96	
12	2020	Januari		373.52121								
		Σ					445.21	1019.05	26.77%	273.07%	147050.50	MSE

Table 4. Percentage of Errors Based on Weighted Value (alpha)

|	Alpha	Beta	Nilai Kesalahan	Persentase Kesalahan
Januari 2020	0.1	0.1	201.4	47.37%
	0.2	0.2	119.91	27.64%
	0.3	0.3	91.84	22.71%
	0.4	0.4	95.62	25.27%
	0.5	0.5	107.47	29.45%
	0.6	0.6	124.69	34.77%
	0.7	0.7	149.62	41.92%
	0.8	0.8	182.95	51.12%
	0.9	0.9	218.96	61.17%

After the calculation using the SES method is complete. The analysis using the DES method is carried out with the same sales data in Table 1.

3.2. Double Exponential Smoothing (DES)

In this DES method, the calculation is done twice to calculate the level and the trend. Still using the same sales data, the following is the DES calculation for the level using equation (2). In contrast, the movement uses equation (3). For prediction using equation (4) with an alpha value of 0.1 and beta 0.1, the results of these calculations are shown in Table 5.

Table 5. Calculation Results of DES Method with alpha and batch 0.1 and Error

Periode	Tahun	Bulan	Data Aktual	L(t)	b(t)	Data Prediksi	Error	MAD |Error|	% Error	MAPE |% Error|	RMSE Error ^	
t			X(t)			F(t+1)						
1	2019	Februari	329	329	102							
2		Maret	431	247.40	83.64	431	0	0	0.00%	0.00%	0	
3		April	294	176.78	68.21	331.04	-37.04	37.04	-12.60%	12.60%	1371.96	
4		Mei	294	127.11	56.43	245.00	49.00	49.00	16.67%	16.67%	2401.16	
5		Juni	267	90.32	47.10	183.54	83.46	83.46	31.26%	31.26%	6965.83	
6		Juli	416	80.49	41.41	137.42	278.58	278.58	66.97%	66.97%	77605.74	
7		Agustus	196	54.77	34.70	121.90	74.10	74.10	37.80%	37.80%	5490.25	
8		September	589	76.97	33.45	89.47	499.53	499.53	84.81%	84.81%	249528.51	
9		Oktober	379	77.07	30.11	110.42	268.58	268.58	70.87%	70.87%	72137.43	
10		November	466	88.86	28.28	107.18	358.82	358.82	77.00%	77.00%	128750.69	
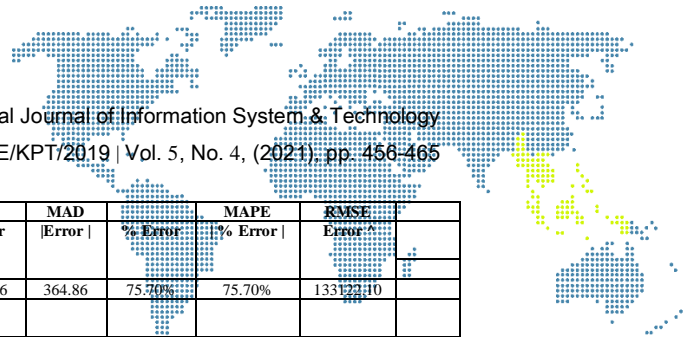
Periode	Tahun	Bulan	Data Aktual	L(t)	b(t)	Data Prediksi	Error	MAD |Error|	% Error	MAPE % Error	RMSE Error ^	
t			X(t)			F(t+1)						
11		Desember	482	102.72	26.84	117.14	364.86	364.86	75.70%	75.70%	133122.10	
12	2020	Januari				129.5603 854						
Σ							1939.89	2013.97	448.47%	473.67%	677373.66	MSE

With the same calculation process and equation, then the calculation for the alpha and beta value weights is 0.2 to 0.9 with the results in Table 6. And the results of the percentage accuracy of errors in the DES method are in Table 7.

Table 6. Calculation Results of the DES Method with alpha and beta values of 0.1 to 0.9 along with the Error Value

Beta	0.1	0.2	**0.3**	0.4	0.5	0.6	0.7	0.8	0.9
Alpha	0.1	0.2	**0.3**	0.4	0.5	0.6	0.7	0.8	0.9
MAPE	47.37%	27.64%	**22.71%**	25.27%	29.45%	34.77%	41.92%	51.12%	61.17%
MAD	201.40	119.91	**91.84**	95.62	107.47	124.69	149.62	182.95	218.96
RMSE	260.26	164.37	**136.40**	136.20	149.53	172.03	202.65	240.55	283.58
MSE	67737.37	27015.88	**18603.66**	18550.18	22358.98	29594.97	41068.24	57866.13	80415.06

Table 7. Percentage of Errors Based on Weighted Values of (alpha) and Beta

	Alpha	Nilai Kesalahan	Persentase Kesalahan
	0.1	101.90	27.31%
	0.2	99.19	26.88%
Januari 2020	0.3	97.95	26.77%
	0.4	100.34	27.58%
	0.5	103.58	28.60%
	0.6	107.72	29.85%
	0.7	112.80	31.33%
	0.8	118.85	33.05%
	0.9	125.92	35.02%

Based on the values in Tables 4 and 7, the result of the percentage of prediction errors in January, which is calculated based on the weighted value of (alpha) from 0.1 to 0.9 and determined using the lowest error value, is found in the weighted value of (alpha) 0.3 with a percentage of error in the SES method of 26.77% and the DES method of 22.71%. To make it easier to read the data, the author changes it to a graphic form like Figure 2
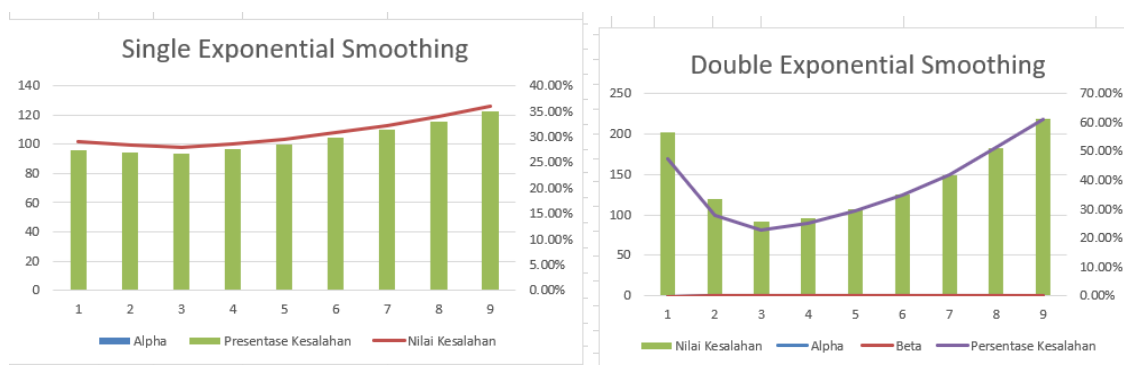

Figure 2. Graph of SES and DES Metode Methods

4. Conclusion

Based on sales data from February to December 2019 or a total of 11 periods at Kedai Pojok Kedaung catering using the Single Exponential Smoothing and Double Exponential Smoothing methods with alpha values 0.1 to 0.9 and beta values 0.1 to 0.9 with testing using MAD and MAPE methods get the smallest error accuracy value of 26.88% in the SES method and get an accuracy value of 22.71% in the DES method and the accuracy
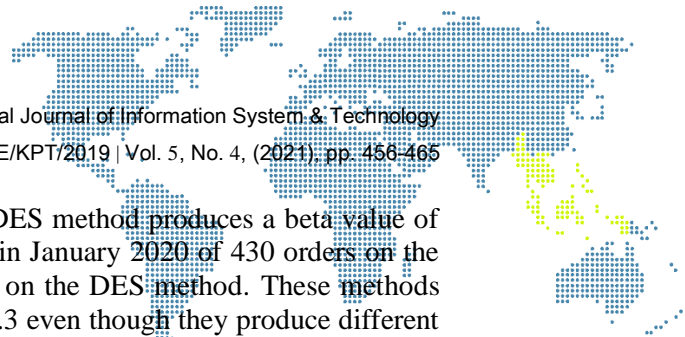
value both produces an alpha value of 0.3, and the DES method produces a beta value of 0.3. This calculation makes a sales prediction value in January 2020 of 430 orders on the SES method. It has a sales prediction of 402 orders on the DES method. These methods produce the lowest error value at an alpha value of 0.3 even though they produce different predictive values. The difference in the prediction results is because in the DES process, before making a prediction, the value of the level and trend is calculated first and then calculates the predicted value. So it can be concluded that the alpha value that produces the lowest error value is 0.3. In proving that the alpha value of 0.3 is the lowest error value, it is necessary to make predictions with the same sales data using the Triple Exponential Smoothing method or other methods that can be used to predict.

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