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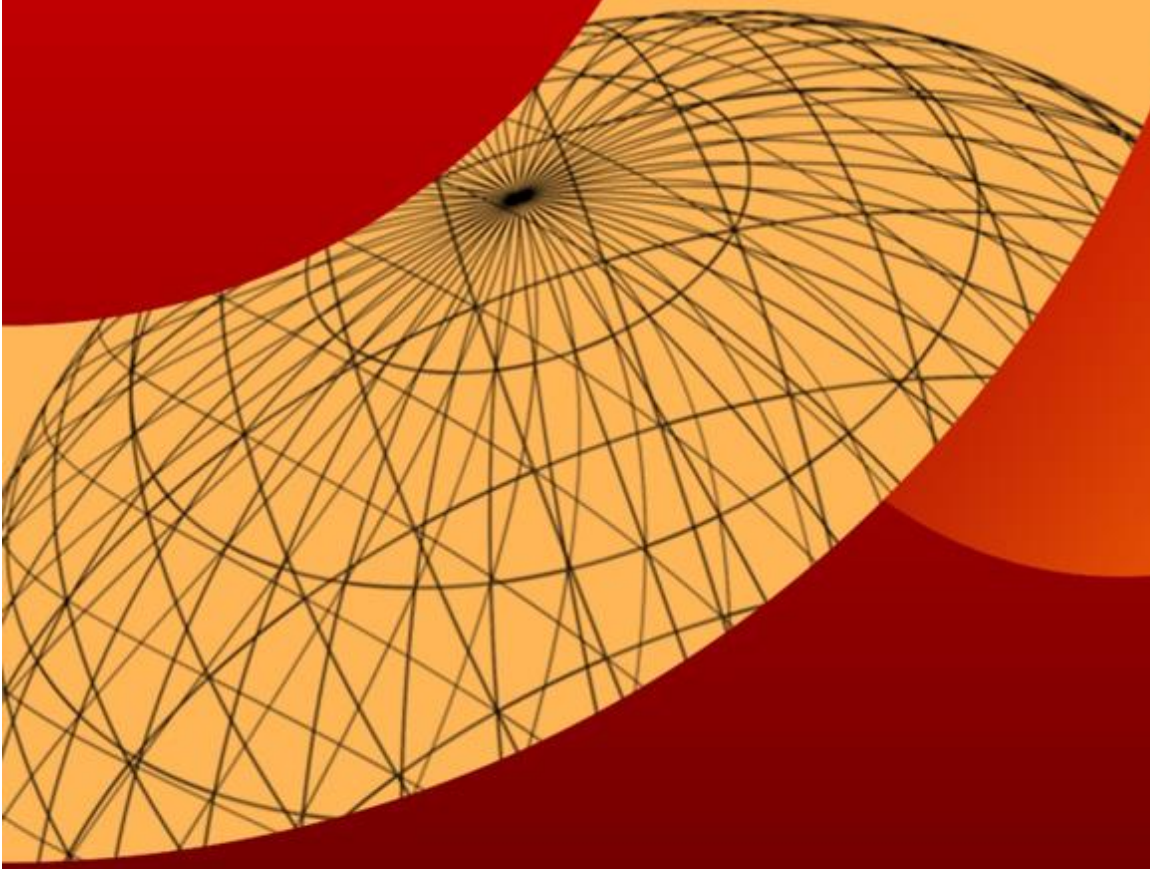

TENSOR

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JURUSAN MATEMATIKA
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
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TENSOR

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Prediction of Divorce Data in Pamekasan District Based on Comparison of Exponential Smoothing and Moving Average

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Abstract: A divorce is a form of breakdown in domestic or marital relationships which is characterized by separation. Based on the Indonesian Statistics report, the number of divorce cases in Indonesia will reach 516,334 cases in 2022. This number is up 15.31% compared to the previous year of 447,743 cases. East Java is ranked second as the province with the highest divorce cases, namely 102,065 cases throughout 2022. To know the development of divorce in the future, forecasting is needed to determine when an event will occur, an increase in the divorce rate, so that we can prepare what will be done to overcome the spike. the divorce rate. In this research, the methods used to predict the number of divorce cases in Pamekasan Regency are the Exponential Smoothing and Moving Average methods. single exponential smoothing method for both divorce lawsuits and divorce divorces with MAD values = 10.40539 and 15.3366868, MSE = 449.0276211 and 181.0038, MAPE = 22.1859129 and 23.84152 and SE values = 21.57911661 and 13, 70064 with a value of α=0.12 for contested divorce and α=0.26 for talak divorce.

2010 Mathematical Subject Classification : *****(You can write more than one, separated by commas).
Keywords: Forecasting, Divorce, Exponential Smoothing, Moving Average

1. Introduction

Marriage is a fundamental need for every individual, both socially and personally, to establish relationships born out of love and consciousness. In Islam, marriage is highly encouraged as a means to maintain lineage and increase the Muslim population. Marriage is a significant and crucial matter in Islam, so much so that the Prophet Muhammad (peace be upon him) said, "Whoever marries has completed half of his faith, so let him fear Allah regarding the remaining half" (Narrated by Al-Baihaqi and Al-Hakim) (Israfil, et al., 2021). According to Indonesian statistics, the number of divorce cases in Indonesia reached 516,334 cases in 2022. This is a 15.31% increase compared to the previous year, which recorded 447,743 cases. West Java Province had the highest number of divorce cases nationally throughout 2022, reaching 113,643 cases or 22% of the total national divorce cases. East Java Province ranked second with 102,065 cases throughout 2022. Following that, there is Central Java with 85,412 cases. The report also notes that

there were 448,126 divorces in Indonesia in 2022 based on their causes. Disputes and arguments were the primary factors causing divorce nationally last year. The number reached 284,169 cases, equivalent to 63.41% of the total divorce cases in the country. Other common causes of divorce were economic factors, with 110,939 cases (24.75%). This was followed by cases where one party left, totaling 39,359 cases (8.78%), domestic violence (KDRT) with 4,972 cases (1.1%), and alcoholism with 1,781 cases (0.39%).

To anticipate the future trends of divorce rates, forecasting is necessary to determine when an increase in divorce cases may occur. This allows for preparation and implementation of strategies to address any surges in divorce rates. Forecasting is an estimation of the likelihood of future events based on historical data.

A common quantitative method used for forecasting is time series analysis. Time series data consists of recorded observations over successive time intervals, such as daily, weekly, monthly, or yearly periods (Apriliza, et al., 2022).

In this study, the methods employed to forecast the number of divorce cases in Pamekasan Regency are Exponential Smoothing and Moving Average. According to Handoko (1984), Exponential Smoothing is a forecasting technique that applies exponential weighting to past data, where recent data points carry more weight in the moving average calculation. On the other hand, Moving Average is a method that calculates the average of a set of consecutive data points over a specific time period in a time series dataset (Agustian & Wibowo, 2019).

Research on divorce forecasting has been conducted by Bachri (2019) titled "Forecasting the Number of Divorce Cases Using Single Moving Average at the Religious Court of Sumber." The results of the study showed that based on Single Moving Average calculations, the number of divorces expected in the next 4 months would increase compared to the next 3 months. Therefore, with the implementation of a divorce case forecasting application, the Religious Court of Sumber could easily estimate and anticipate the number of divorces occurring.

Research on the Exponential Smoothing method was conducted by Rachman (2018) titled "Application of Moving Average and Exponential Smoothing Methods in Forecasting Garment Industry Production." The results of the study showed that the forecast results with the two alternative methods, along with error calculation, concluded that consumer demand forecasting using the Exponential Smoothing method with α=0.9, as the estimated consumer demand for January was 78,146.30 pieces, which was higher than other methods. Additionally, the forecast error rates MAD=1,239.58 and MSE=6,005,490.73 were lower than other methods.

Based on this background, the researcher is interested in comparing the Exponential Smoothing, Moving Average, and ARIMA methods to forecast the number of divorce cases in Pamekasan Regency.

2. Research Methods

2.1 Data collection

At this stage, the process of collecting secondary data regarding divorce was carried out at the Pamekasan Regency Religious Court. The data taken is data on the number of divorce cases every month over a period of 5 years from 2019 to 2023.

2.2 Application of the Exponential Smoothing method

At this stage the data obtained will be applied to the Exponential Smoothing Algorithm method

a. Determining Parameter Values
   The first step is to determine the value of the parameter α
b. Calculating the single exponential smoothing value
   Before calculating the double exponential smoothing value, you must calculate the single exponential smoothing value.
c. Calculating the double exponential smoothing value
   After calculating the single exponential smoothing value, the next step is to calculate the double exponential smoothing value.
d. Calculating the value of triple exponential smoothing
   Calculate the triple exponential smoothing value.
e. Determine the constant values $(\boldsymbol{a_t})$, $(\boldsymbol{b_t})$ and $(\boldsymbol{c_t})$
   Determine the constant value $(\boldsymbol{a_t})$ for the double exponential smoothing adjustment and for the triple exponential smoothing adjustment. Calculate the constant value $(\boldsymbol{b_t})$of the double exponential to determine the estimate from one period to the next time period for the triple exponential. And calculate the constant value $(\boldsymbol{c_t})$for the triple exponential.
f. Determine the forecasting value calculated for the single exponential, double exponential and triple exponential.
g. Determine the magnitude of the forecasting percentage error.

2.3 Application of the Moving Average method

a. For SMA look for the average based on original data for each given period, for DMA look for the average based on SMA data for each given period, for TMA look for the average based on DMA data for each given period and for WMA look for the average average based on weight.
b. Determine the forecasting value for SMA which is calculated), DMA, TMA and WMA.
c. Determine the magnitude of the forecasting percentage error.

2.4 Comparing the results of the Exponential Smoothing and Moving Average methods

At this stage, a comparison of the results of the two methods that have been applied is carried out, namely by comparing the errors obtained from the two methods. The best method is the method that has the smallest error.

3. RESULTS AND DISCUSSION

3.1 Descriptive statistics

For each problem that will be handled, there are several descriptions to find out in advance about the data information used in this research. There is data on the number of months in each year for divorce and lawsuit divorce. The data is primary data taken from religious courts in Pamekasan, data requested from 2019 to 2023 in September. In this research, the descriptive statistics used are Maximum values, Minimum values, Average values, Standard Deviation and Variance values. The following is a statistical table. The descriptive description is shown in Table 4.1 as follows:

Table 1 Data statistika jumlah cerai talak dan cerai gugat di pamekasan.

	Mean	Stand Deviasi	Variansi	Maksimum	Minimum
Cerai Talak	47,5614	12,98449	168,5971	93	25
Cerai Gugat	84,73684	19,97062	225,0797	143	42

Based on Table 1, it can be seen that divorce divorce has the smallest (minimum) value of 25 divorce cases that occurred in May 2023 and the largest (maximum) value of 93 divorce cases that occurred in October

2019. The average value is 47.5614 with standard The deviation is 12.98449 and the variance is 225.0797, and contested divorce has the smallest (minimum) value of 42 divorce cases that occurred in August 2022 and the (maximum) value of 143 divorce cases that occurred in July 2021. The average value is 84.73684 with a standard deviation of 19.97062 and variance of 225.0797.

3.2 Data Forecasting with Exponential Smoothing

a. Determining Parameter Values
   The α parameter used is in the range 0.01-0.99 with a difference of 0.01.
b. Single Exponential Smoothing Method
   The first step that must be taken in the Smoothing calculation is to carry out the first smoothing calculation or what is often called Single Exponential Smoothing with the α parameter value used in the range 0.01-0.99 with a difference of 0.01. Following are the results of Single Exponential Smoothing using the most optimal α:

Table 2 Results of Single Exponential Smoothing:

Bulan	X_{gugat}	X_{talak}	S'(gugat)	S'(talak)
Januari	102	51	102	51
Februari	101	48	101,88	50,22
Maret	70	37	97,28	46,7828
April	89	44	72,28	46,059272
Mei	64	45	86	45,783861
Juni	46	28	61,84	41,160057
Juli	106	70	53,2	48,658442
Agustus	111	44	106,6	47,447247
September	93	47	108,84	47,330963
Oktober	116	93	95,76	59,204913
November	96	59	113,6	59,151635
Desember	97	50	96,12	56,77221
⋮	⋮	⋮	⋮	⋮
September	79	49	46,44	37,094188

Table 2 is the result of a single exponential smoothing value using the best α value for divorce divorce $\alpha = 0.26$ and divorce divorce $\alpha = 0.12$.

c. Determining the value of double exponential smoothing S"
   Following are the results of double exponential smoothing:

Table 3 Results of double exponential smoothing:

Bulan	X_{gugat}	X_{talak}	S"(gugat)	S"(talak)
Januari	102	51	102	51
Februari	101	48	101,9999	50,9997
Maret	70	37	101,9868	50,998006
April	89	44	101,6688	50,995646
Mei	64	45	101,5396	50,992733
Juni	46	28	101,1624	50,987579
Juli	106	70	100,6168	50,984429
Agustus	111	44	100,6712	50,980643
September	93	47	100,7726	50,976534
Oktober	116	93	100,6972	50,97671
November	96	59	100,8482	50,977684
Desember	97	50	100,7999	50,978541
⋮	⋮	⋮	⋮	⋮
September	79	49	94,44072	50,393099

Table 3 is the result of smoothing using the double exponential smoothing method using the best α, namely 0.01, for both talak divorce and contested divorce.

d. Determining the triple Exponential Smoothing value S'''
   Following are the results of triple exponential smoothing:

Table 4 Results of triple exponential smoothing:

Bulan	X_{gugat}	X_{talak}	S'''(gugat)	S'''(talak)
Januari	102	51		
Februari	101	48	102	51
Maret	70	37	101,999	50,99998
April	89	44	101,9546	50,99993
Mei	64	45	101,3303	50,99986
Juni	46	28	101,0638	50,99974
Juli	106	70	100,3087	50,99959
Agustus	111	44	99,27011	50,9994
September	93	47	99,40853	50,99917
Oktober	116	93	99,62628	50,99894
November	96	59	99,51181	50,99873
Desember	97	50	99,82575	50,99853
⋮	⋮	⋮	⋮	⋮
September	79	49	88,02077	50,93289

Table 4.4 is the result of triple exponential smoothing values using the best α value for divorce divorce α=0.01 and divorce divorce α=0.02.

e. Determine the values of $a_t, b_t$and c_t

For a_t and b_t, double exponential smoothing uses the formula $a_t = 2S'_t - S"_t$ dan $b_t = \frac{\alpha}{1-\alpha}(S'_t - S"_t)$ to produce the following values:

Table 5 results of calculating a_t and $b_t$for double exponential smoothing:

Bulan	X_{gugat}	X_{talak}	a_t(gugat)	a_t(talak)	b_t(gugat)	b_t(talak)
Januari	102	51				
Februari	101	48	101,98	50,94	−0,0001	−0,0003
Maret	70	37	99,3801	50,6609	−0,0131	−0,00169
April	89	44	38,3932	50,52599	−0,31797	−0,00236
Mei	64	45	75,83117	50,41311	−0,12919	−0,00291
Juni	46	28	26,10036	49,96193	−0,3772	−0,00515
Juli	106	70	−7,96245	50,35754	−0,54562	−0,00315
Agustus	111	44	111,4832	50,22724	0,054332	−0,00379
September	93	47	120,9688	50,15891	0,101488	−0,00411
Oktober	116	93	85,68736	51,01162	−0,07543	0,000175
November	96	59	130,9028	51,17157	0,151028	0,000974
Desember	97	50	91,17175	51,14911	−0,04838	0,000857
⋮	⋮	⋮	⋮	⋮	⋮	⋮
September	79	49	−10,2267	47,69254	0,42798	0,497517

Table 5 is the result of calculating $a_t$and b_t with double exponential smoothing using the best α value, namely 0.01, for both divorce and lawsuit.

For a_t, b_t and c_t, triple exponential smoothing uses the formula $a_t = 3S'_t - 3S"_t + S'''_t$,$b_t = \frac{\alpha}{2(1-\alpha)^2}[(6-5\alpha)S'_t - (10-8\alpha)S"_t + (4-3\alpha)S'''_t]$ and $c_t = \frac{\alpha^2}{(1-\alpha)^2}[S'_t - 2S"_t + S'''_t]$ resulting in the following values:

Table 6 Results of a_t, $b_t$and c_t Triple Exponential Smoothing:

Bulan	X_{gugat}	X_{talak}	⋯	$c_{t(talak)}$
Januari	102	51	⋯	
Februari	101	48	⋯	0
Maret	70	37	⋯	$-5{,}19 \times 10^{-7}$
April	89	44	⋯	$-2{,}33 \times 10^{-6}$
Mei	64	45	⋯	$-5{,}92 \times 10^{-7}$
Juni	46	28	⋯	$9{,}152 \times 10^{-8}$
Juli	106	70	⋯	$-2{,}76 \times 10^{-6}$

Agustus	111	44	⋯	$5{,}022 \times 10^{-6}$
September	93	47	⋯	$7{,}078 \times 10^{-8}$
Oktober	116	93	⋯	$-2{,}63 \times 10^{-7}$
November	96	59	⋯	$7{,}739 \times 10^{-6}$
Desember	97	50	⋯	$4{,}613 \times 10^{-7}$
⋮	⋮	⋮	⋯	⋮
September	79	49	⋯	$-5{,}21 \times 10^{-7}$

Table 6 shows the results of a_t, b_t and c_t of triple exponential smoothing using the best α value, namely 0.01 for those divorced by divorce and 0.02 for those divorced by lawsuit.

Determine the forecasting value of single exponential, double exponential and triple exponential. The results of forecasting data on divorce lawsuits and divorce divorces using a single exponential are as follows:

Table 7 Forecasting Results Using Single Exponential Smoothing

Bulan	X_{gugat}	X_{talak}	F_t(gugat)	$F_t$talak)
Januari	102	51	102	51
Februari	101	48	101,88	49,235543
Maret	70	37	98,0544	42,03918
April	89	44	96,967872	43,192441
Mei	64	45	93,011727	44,255561
Juni	46	28	87,37032	34,694815
Juli	106	70	89,605882	55,459642
Agustus	111	44	92,173176	48,719627
September	93	47	92,272395	47,708224
Oktober	116	93	95,119707	74,346687
November	96	59	95,225343	65,320498
Desember	97	50	95,438301	56,309711
⋮	⋮	⋮	⋮	⋮
September	79	49	78,825172	41,094294

Table 7 is the forecasting result using single exponential smoothing with the best α value, namely 0.26 for divorced divorces and 0.12 for divorced individuals.

The results of forecasting data on divorce lawsuits and divorce divorces using double exponential smoothing are as follows:

Table 8 Forecasting Results Using Double Exponential Smoothing:

Bulan	X_{gugat}	X_{talak}	F_{t+m}(gugat)	F_{t+m}(talak)
Januari	102	51		
Februari	101	48	101,9798	50,9394
Maret	70	37	99,3539	50,65751
April	89	44	37,75726	50,52127
Mei	64	45	75,57279	50,40728
Juni	46	28	25,34596	49,95163
Juli	106	70	−9,0537	50,35124
Agustus	111	44	111,5918	50,21967
September	93	47	121,1718	50,15069
Oktober	116	93	85,5365	51,01197
November	96	59	131,2048	51,17351
Desember	97	50	91,07499	51,15082
⋮	⋮	⋮	⋮	⋮
September	79	49	−9,37073	48,68758

Table 8 is the forecasting result using double exponential smoothing with the best α value of 0.01 for both divorce and lawsuit divorce.

The results of forecasting data on divorce lawsuits and divorce divorces using triple exponential smoothing are as follows:

Table 9 Forecasting Results Using triple exponential smoothing:

Bulan	X_{gugat}	X_{talak}	F_{t+m}(gugat)	F_{t+m}(talak)
Januari	102	51		
Februari	101	48	108,0341	52,50422
Maret	70	37	111,0173	53,20723
April	89	44	112,9363	53,7412
Mei	64	45	115,7999	54,4438
Juni	46	28	117,6528	55,14475
Juli	106	70	119,0266	55,54318
Agustus	111	44	122,8549	56,73994
September	93	47	126,3372	57,30934
Oktober	116	93	128,9143	58,00332
November	96	59	132,5394	59,52621
Desember	97	50	135,1663	60,22437
⋮	⋮	⋮	⋮	⋮
September	79	49	89,25786	49,11307

Table 4.9 is the results of forecasting using triple exponential smoothing with the best α value, namely 0.01 for talak divorce and 0.02 for lawsuit divorce.

Determine the magnitude of the forecasting percentage error using MAD, MSE, MAPE and SE. The results of the MAD, MSE, MAPE and SE calculations are as follows:

Table 10 Results of MAD, MSE, MAPE and SE calculations

	MAD	MSE	$MAPE$	SE	α
SES_{gugat}	15,3366868	449,0276211	22,1859129	21,57911661	0,12
DES_{gugat}	31,42907371	1914,151166	37,33569	44,53938	0,01
TES_{gugat}	19,07193448	632,0925615	28,98769	25,59449	0,02
SES_{talak}	10,40539	181,0038	23,84152	13,70064	0,26
DES_{talak}	22,24942	794,2935	47,49607	28,69106	0,01
TES_{talak}	10,75023	184,8389	26,89546	13,84053	0,01

Based on Table 10, it can be concluded that the best method is the Single Exponential Smoothing method for both divorce and divorce, because it produces the smallest error values for MAD, MSE, MAPE and SE with $\alpha = 0.12$ for divorce and $\alpha = 0.26$ for divorce. who divorced and divorced.

f. Application of the Moving Average Method

Forecasting uses the Single Moving Average method

The results of forecasting using the Single Moving Average method are as follows:

Table 11 Forecasting Results using the Single Moving Average method

Bulan	X_{gugat}	X_{talak}	S'_t(gugat)	S'_ttalak)
Januari	102	51		
Februari	101	48		
Maret	70	37		
April	89	44	120,6667	60
Mei	64	45	108	58
Juni	46	28	89,66667	51,33333
Juli	106	70	101,6667	62,33333
Agustus	111	44	109	62,33333
September	93	47	118,6667	63
Oktober	116	93	142	84,66667
November	96	59	138,6667	81
Desember	97	50	134	83
⋮	⋮	⋮	⋮	⋮
September	79	49	101,6667	71,52047

Table 11 is the result of forecasting divorce and divorce using the Single Moving Average method.

g. Forecasting using the Double Moving Average method
The results of forecasting using the Double Moving Average method are as follows:
Table 12 Forecasting Results using the Double Moving Average method

Bulan	X_{gugat}	X_{talak}	S''_t(gugat)	S''_ttalak)
Januari	102	51		
Februari	101	48		
Maret	70	37		
April	89	44		
Mei	64	45		
Juni	46	28		
Juli	106	70	140	77,22222
Agustus	111	44	136,1111	78
September	93	47	139,6667	79,66667
Oktober	116	93	157,1111	90,77778
November	96	59	169,4444	97
Desember	97	50	177,7778	103,8889
⋮	⋮	⋮	⋮	⋮
September	79	49	135,7778	81,63158

Table 4.12 is the result of forecasting divorce and divorce using the Double Moving Average method.

h. Forecasting using the Triple Moving Average method
The results of forecasting using the Triple Moving Average method are as follows:
Table 13 Forecasting Results using the Triple Moving Average method

Bulan	X_{gugat}	X_{talak}	S''_t(gugat)	S''_ttalak)
Januari	102	51		
Februari	101	48		
Maret	70	37		
April	89	44		
Mei	64	45		
Juni	46	28		
Juli	106	70		
Agustus	111	44		
September	93	47		
Oktober	116	93	190,963	108,5556
November	96	59	200,7778	115,1481
Desember	97	50	214,6667	123,7778
⋮	⋮	⋮	⋮	⋮
September	79	49	88,97661	174,3333

Table 13 is the result of forecasting divorce and divorce using the Triple Moving Average method.

i. Forecasting using the Weighted Moving Average method
The results of forecasting using the Weighted Moving Average method are as follows:
Table 14 Forecasting results using the Weighted Moving Average method

Bulan	X_{gugat}	X_{talak}	W(gugat)	W(talak)
Januari	102	51		
Februari	101	48		
Maret	70	37		
April	89	44	85,66667	43
Mei	64	45	84,66667	42,33333
Juni	46	28	73,33333	43,33333
Juli	106	70	59,16667	36,33333
Agustus	111	44	79	51,83333
September	93	47	98,5	50
Oktober	116	93	101,1667	49,83333
November	96	59	107,5	69,5

Desember	97	50	102,1667	68,33333
⋮	⋮	⋮	⋮	⋮
September	79	49	65,83333	70,52047

Table 4.14 is the result of forecasting divorce lawsuits and divorce divorces using the Weighted Moving Average method.

j. Determine the magnitude of the forecasting percentage error using MAD, MSE, MAPE and SE. The results of the MAD, MSE, MAPE and SE calculations are as follows:

Table 15 Results of MAD, MSE, MAPE and SE calculations

	MAD	MSE	$MAPE$	SE
SMA_{gugat}	30,48765	1161,928	42,5418	34,7364
DMA_{gugat}	65,939	4903,294	88,14867	71,43828
TMA_{gugat}	118,8179	14815,75	156,5194	124,3379
WMA_{gugat}	17,75926	543,9311	24,01661	23,7666
SMA_{talak}	17,38525	397,7589	43,03333	20,30327
DMA_{talak}	37,43224	1634,156	90,58796	41,19476
TMA_{talak}	66,44741	4783,631	158,8348	70,56119
WMA_{talak}	12,46727	275,8486	27,61237	16,90797

| WMA_{talak} | 12,46727 | 275,8486 | 27,61237 | 16,90797 |

Based on Table 15, it can be concluded that the best method is the Weighted Moving Average method for both divorce and divorce, because it produces the smallest error values for MAD, MSE, MAPE and SE.

k. Compare exponential smoothing and moving average

The next step is to compare the best results from exponential smoothing and moving average, the comparison results are as follows:

Table 16 Comparison Results of the Two Methods

	MAD	MSE	$MAPE$	SE
SES_{gugat}	15,3366868	449,0276211	22,1859129	21,57911661
SES_{talak}	10,40539	181,0038	23,84152	13,70064
WMA_{gugat}	17,75926	543,9311	24,01661	23,7666
WMA_{talak}	12,46727	275,8486	27,61237	16,90797

Based on the comparison results in Table 4.16, it can be concluded that the best method is Single Exponential smoothing for both divorce and lawsuit. Still, α for divorce is 0.12 and divorce is 0.26 because it produces the smallest MAD, MSE, MAPE and SE values. The most. The graph of the results of the best forecasting method is as follows:

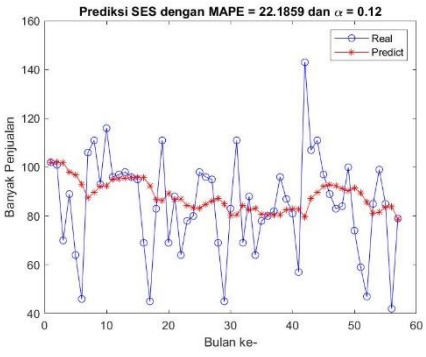

Fig 1 Results of forecasting divorce lawsuits using the SES method

Figure 4.1 shows a graph of divorce forecasting using the single exponential smoothing method with α=0.12.

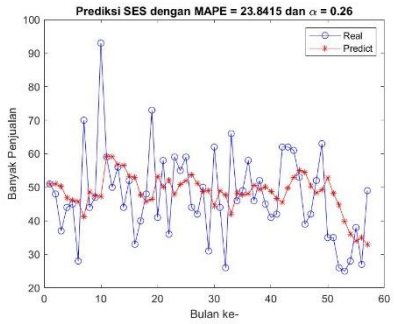

Fig 2 Divorce Divorce Forecasting Results using the SES method

This is a graph of forecasting divorce using the single exponential smoothing method with α=0.26, based on Figure 4.2.

4. Conclusion

In this research, there are two variables, namely divorce divorce and divorce lawsuit. Divorce has the smallest (minimum) value of 25, occurring in May 2023, and the largest (maximum) value of 93, occurring in October 2019. The average value is 47.5614 with a standard deviation of 12.98449, and a variance of 225.0797, and contested divorce has the smallest (minimum) value of 42, occurring in August 2022 and the largest (maximum) value of 143, occurring in July 2021. The average value is 84.73684, with a standard deviation of 19.97062 and a variance of 225.0797. The best results from the exponential smoothing method are the single exponential smoothing method for both divorced and divorced divorcees with MAD values = 10.40539 and 15.3366868, MSE = 449.0276211 and 181.0038, MAPE = 22.1859129 and 23.84152 and SE value = 21.57911661 and 13.70064 with a value of α=0.12 for divorce suit and α=0.26 for divorce divorce. The best results from the moving average method are the weighted moving average method with MAD values = 17.75926 and 12.46727, MSE = 543.9311 and 275.8486, MAPE = 24.01661 and 27.61237 and SE values = 23.7666 and 16.90797. The best comparison results from the single exponential smoothing and weighted moving average methods are the single exponential smoothing method for both divorced and divorced with MAD = 10.40539 and 15.3366868, MSE = 449.0276211 and 181.0038, MAPE = 22, 1859129 and 23.84152 and SE values = 21.57911661 and 13.70064.

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