Amount of Poverty as Policy Basis: A Forecasting Using The Holt Method

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ABSTRACT

This research aims to predict the growth of the number of poor people in every district and city in NTB Province of Indonesia for the next 10 years by using Holt exponential smoothing method. This type of research is quantitative research with input data used over the last 19 years with a measure of the goodness of models namely MSE, MAD, and MAPE. Based on the optimization results obtained the smallest parameter at α of 0.9 and β of 0.1, an average value MSE of 278005053.7, MAD of 9992.28222, and MAPE of 8.9374 Optimization results also provide information that the increase in the growth of the average poor population of 70206.6604 Certainly this result can be used as a guideline by the government in determining steps and responding to rapid response strategies in dealing with this poverty problem.

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A. INTRODUCTION

Poverty is a serious problem faced by most countries in the world, especially in developing countries (Nasution, 2019). The state serves as the holder of the highest authority to formulate a policy, one of which is a policy in the field of economics; here the country plays a role in maintaining stability and prosperity to help address the problem of poverty (Fachrudin, 2015). In addressing poverty, there needs to be a community empowerment program because it has an important role to play in poverty reduction (Ramadhani & Munandar, 2019). ut what happens in some developing countries every year is an increase in the amount of poverty.

In Indonesia itself poverty is the root of the problem that some people experience, causing the gap between the rich and the poor to widen. So far, the government has been trying to eradicate poverty from year to year, but the poverty rate in Indonesia has not decreased even more concerning every year. (Habib, 2019). To reduce the level of poverty in Indonesia, namely by finding out the factors that influence the level of poverty, one of the factors is the problem of economic growth which is not evenly distributed throughout Indonesia, especially in remote areas, such as what happened in NTB Province. the poverty that occurs in rural areas is greater than in urban areas, amounting to 425,010 people, while the number of poor people in urban areas is 377,280 people. The high percentage of poor people in NTB shows that this region is

underdeveloped compared to other regions in Indonesia (S, Jannah, Kurnia, & Satria, 2019), (Fety, M, Leni, Siti Fara, & Syaharuddin, 2020).

In Lombok island, the largest poverty occurred in East Lombok Regency in 2001 with the poverty rate reaching 380,500 people, while in 2019, the largest number of poverty is still in East Lombok Regency which is 193,560 people. to prevent it all need to observe the income and willingness of basic needs in NTB Province with the amount of poverty that occurs. Therefore there will be a question of what is going on in the area, the question underpinning the emergence of a time-running study.

Time series is data obtained through the observation of an event taken from time to time, and carefully recorded based on the order of time then compiled as statistical data (Syaharuddin, 2019). From this data, we can forecast the amount of poverty that occurs in the future.

Forecasting is an important tool in effective and efficient planning, Forecasting is also a technique for estimating or predicting a value in the future by paying attention to past data as well as current data (Sucipto, 2018). An important step in choosing a forecasting method is to consider the type of data pattern so that the most appropriate method with that pattern can be tested (Aminudin & Handoko, 2019). Whereas according to Hanke and Wichern, the factors that influence the selection of forecasting models are the identification and understanding of historical patterns in data and time horizons (Firnando, 2015). However, more important is how to understand the characteristics of a forecasting method to fit the decision-making situation.

In this forecasting time, the author will use Exponential smoothing. The Exponential smoothing method is a method of smoothing the distribution curve in a time series. In Double Exponential smoothing, data has a trend pattern forecasting method that should be used is the brown method or Holt method (Putra, Asdi, & Maiyastri, 2019). The Exponential smoothing method is a continuous improvement procedure on forecasting against the latest observation objects. This method of forecasting focuses on exponentially lowering priorities on long-standing observation objects (Lubis, 2019). In exponential smoothing there are one or more accurately defined smoothing parameters and the result of the choice determines the weight imposed on the observation value (Awwaliyyah & Mahmudah, 2014).

Some previous studies using holt methods have had varying results to be used as a basis for research and research materials conducted. Lestari (2018) based on the results of his research in forecasting the Consumer Price Index in Indonesia using the holt method and Aegean moving method, the best method used is Holt Exponential smoothing. Holt Exponential smoothing method Is better used because male, MAD and MSD values are smaller than error values in the Moving Average method.

Apriliyani (2018) based on his research on The Application for Forecasting the Number of Elementary School Students in Tanah Laut District Using Holt's Double Exponential smoothing method. Based on the results of the forecasting simulation, the smallest MAPE scores were $\alpha = 0.77$ and $\beta = 0.8$ resulting in 35,655 students (Apriliyani, Rhomadhona, & Permadi, 2018).

Bidangan (2018) conducted research Comparative Forecasting Method Double Exponential smoothing one parameter Brown and Double Exponential Smoothing Method Two Parameter Holt. The results of this study show that MAPE for the double exponential smoothing method of two parameters of Holt with $\alpha = 0.31$ and $\beta = 0.99$ has a small value than using the exponential smoothing method of one parameter of Brown (Bidangan, Purnamasari, & Hayati, 2016). Fahlevi (2018) he researched Holt's Comparison and Winter's Exponential smoothing for the Consumer Price Index Forecasting Group of Transportation, Communications, and Financial Services. In this study obtained the optimal parameter value of Holt's with $\alpha = 0.7$ and $\beta = 0.1$ resulting in the smallest MAPE nisi than the MAPE value in Winter's method. Alfarisi & Sunarmintyastuti (2018) they conducted application development research to forecast sales of Tasikmalaya Embroidery using Exponential Smoothing Method. From this forecasting obtained that in the Double Exponential smoothing method Holt produces the smallest MAPE values at $\alpha = 0.9$ and $\beta = 0.1$.

From several studies that have been done that in predicting the most accurate method used and having linear properties namely holt method that produces the smallest MAPE value with different α and β,

therefore the authors will forecast the amount of poverty by using holt method with case study in NTB Province, Indonesia.

B. LITERATURE REVIEW

The Holt method is a method that uses annual time series data, on this model is usually used on data with linear trends that are not affected by the seasons (Mulyati, Fadilah, & Saleh, 2019). In smoothing with accurate values and parameters that differ from the actual data. Holt method formula, that is :

$$A_t = \alpha Y_t + (1 - \alpha)(A_{t-1} + T_{t-1})$$
$$\hat{Y}_{t+p} = A_t + T_t P$$

Where A_t = To calculate the value of the smoother, $\hat{Y}_t$ = To calculate the forecasting of the upcoming period, α = Parameter of the smoother for the data, β = The smoother parameter for trend estimation data, T_t = 1st trend estimate, Y_t = 1st actual data, P = Number of periods and $\hat{Y}_{t+p}$ = Forecast data value.

C. RESEARCH METHOD

The forecasting method used in this study is a quantitative forecasting method in which the quantitative forecasting method is a method that involves statistical analysis of past data. The type of quantitative forecasting method used in this study is the Holt method. Research methods are carried out using problem identification, problem formulation, library studies, analysis and problem solving, research stages, and draw conclusions. Identify problems starting with library studies. At this stage, secondary data collection and collection are conducted, and selecting secondary data that is to take sample data that is used as a problem that is reviewed in the discussion analysis. The focus stage of the problem in this study is research using the exponential smoothing-Holt method. The research is supported by the help of gifs and Microsoft Excel programs.

The methods of data collection in this study are library studies, documentation methods and done by collecting data and information by reviewing several kinds of literature (library materials) in the form of books, journals, articles, and information related to the problem, collecting supporting concepts, the necessary foundations in solving problems so that an idea is obtained about the basic materials of developing problem-solving efforts. The data was obtained from the source of the Central Bureau of Statistics (BPS) which is data on the number of poor people in NTB from 2001 to 2019.

The data analysis stage is obtained based on existing theories, especially about the exponential smoothing-Holt method. Data analysis is done statistically with the help of G-MFS computer programs and time series (seasonal) data. The data analysis stages include data exploration, stages of the exponential smoothing-Holt method, and comparing the smallest forecasting error values using α and β values from 0.1 to 0.9 in the case of the number of poor people in NTB by calculating MAD, MSE and MAPE. The next step is problem-solving, namely, the various sources of libraries that have been the study material, obtained a problem solver above. The last step in this study was the withdrawal of conclusions from the overall results of the simulation.

D. RESULTS AND DISCUSSION

To perform forescassting required data from the previous period. The previous period data was used as a guide to be able to do forecasting. Data on the amount of poverty in each district and ntb provincial city, can be shown by Figure 1:

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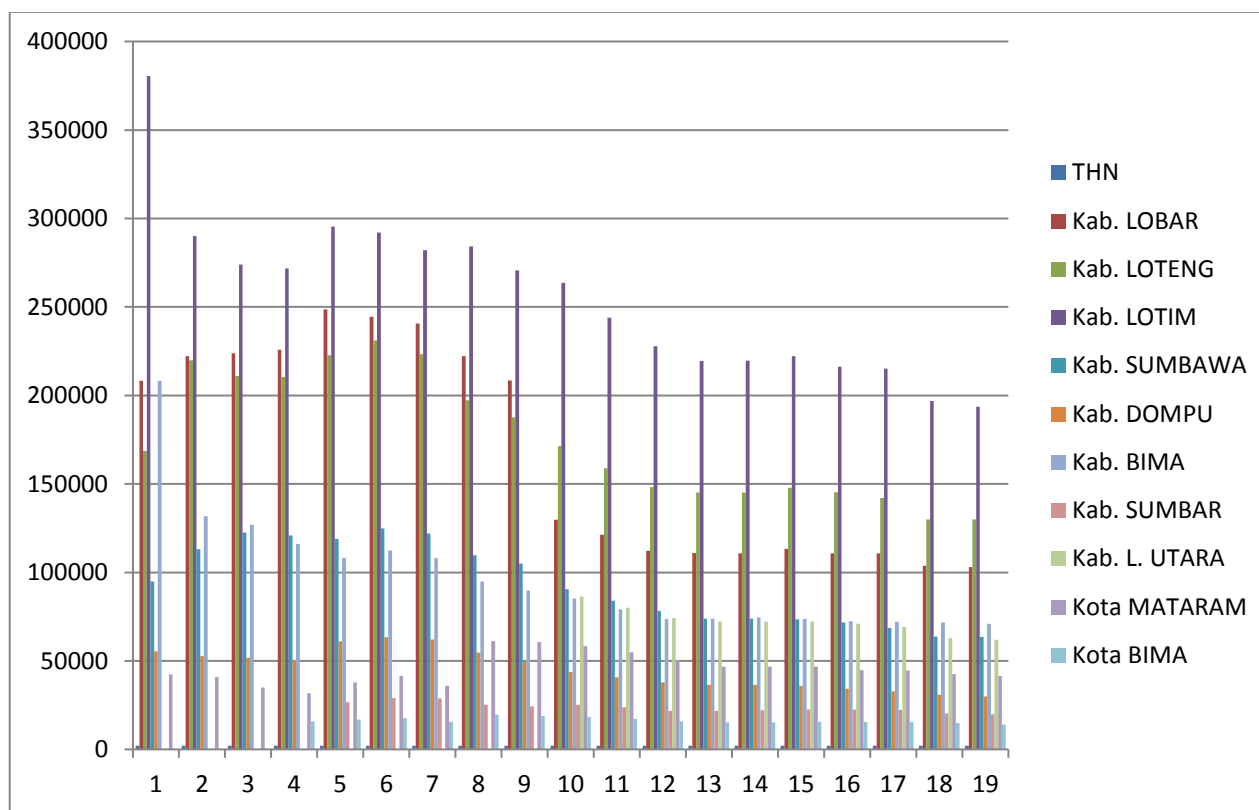
Figure 1. Poverty data in every district and city of NTB province

Based on the research that has been done, with various α and β values returns the smallest MAPE value, that is :

- Simulation results with α = 0.77 , β = 0.88 and period 1, that is :

Table 1. Simulation results with α = 0.77 , β = 0.88 and the period 1.

NO	KABUPATEN	PREDIKSI	MAD	MSE	MAPE
1	Regency of west lombok	99147.3806	14300.7299	443389591.305	9.9855
2	Regency of central Lombok	123417.5897	11963.9467	269414562.6803	6.3781
3	Regency of East Lombok	183065.2454	17467.9805	593088915.8061	6.6516
4	Regency of Sumbawa	60551.4121	5331.6973	42710687.4534	5.4963
5	Regency of Dompu	28309.9771	2714.923	17944623.8709	5.4588
6	Regency of Bima	70439.6904	9609.3733	297099623.4791	8.5451
7	Regency of Sumbar	18536.4365	1514.1605	3725881.0916	6.293
8	Regency of North Lombok	58160.5928	2688.8366	9288345.3499	3.8985
9	Mataram city	40069.7627	5266.9138	65470146.3283	10.7816
10	Bima city	13294.6127	1209.247	2501575.8664	7.0926

- simulation results with α = 0.31 , β = 0.99 and the period 1, that is :

Table 2. Simulation results with α = 0.31 , β = 0.99 and the period 1.

NO	KABUPATEN	PREDIKSI	MAD	MSE	MAPE
1	Regency of west lombok	122337.4332	27018.0644	1208510060.4881	20.9864
2	Regency of central Lombok	134265.5622	19260.5031	467709874.7243	10.9124
3	Regency of East Lombok	202619.1032	35243.8563	1857626632.9777	13.6827
4	Regency of Sumbawa	65573.0679	9607.8536	114024306.4853	10.5422
5	Regency of Dompu	31917.9651	6368.8182	64020265.0708	14.6368
6	Regency of Bima	76142.7897	22163.9898	797114838.0961	22.3823
7	Regency of Sumbar	20644.0827	1734.3632	4183421.2999	7.4264
8	Regency of North Lombok	62479.066	4125.7081	22196842.0531	5.9555
9	Mataram City	41937.5334	8257.4407	110353983.8713	16.9996
10	Bima City	14761.2736	1599.569	3274210.3676	9.7244

- simulation results with α = 0.7 , β = 0.1 and the period 1, that is :

Table 3. simulation results with α = 0.7 , β = 0.1 and the period 1.

NO	KABUPATEN	PREDIKSI	MAD	MSE	MAPE
1	Regency of west lombok	97740.4993	15624.3494	648728220.8773	10.4652
2	Regency of central Lombok	131615.4919	22947.7622	722960844.117	12.5778
3	Regency of East Lombok	176602.9764	30994.0717	1353114910.6207	11.8285
4	Regency of Sumbawa	62451.8196	9046.309	129314026.2825	9.3612
5	Regency of Dompu	27970.7963	3050.8416	20254135.4355	6.1656
6	Regency of Bima	56737.2151	30685.2369	1052751451.2359	33.4332
7	Regency of Sumbar	19423.5121	1232.4967	2208216.8667	5.1231
8	Regency of North Lombok	58253.3142	3048.307	11085043.6391	4.3055
9	Matama City	40977.1115	4406.96	55188053.4617	9.0272
10	Bima City	13910.2874	973.2167	1758116.8848	5.7204

- simulation results with α = 0.9 , β = 0.1 and the period 1, that is :

Table 4. simulation results with α = 0.9 , β = 0.1 and the period 1.

NO	KABUPATEN	PREDIKSI	MAD	MSE	MAPE
1	Regency of west lombok	98676.6347	13140.0127	498445751.7359	8.5292
2	Regency of central Lombok	130429.8787	18361.9942	490709657.5007	9.9275
3	Regency of East Lombok	178790.3363	25315.1913	930237839.6587	9.6511
4	Regency of Sumbawa	62350.2894	7104.8499	85643054.1449	7.2679
5	Regency of Dompu	28145.8049	2522.3837	15869358.96	5.068
6	Regency of Bima	60018.4592	24587.0784	695143272.1846	26.328
7	Regency of Sumbar	19277.3136	1151.3027	2188359.4232	4.7938
8	Regency of North Lombok	58537.926	2762.2749	8651527.7447	3.9296
9	Mataram City	40767.6644	4037.54	51366548.9693	8.3701
10	Bima City	13744.2892	940.1944	1795166.558	5.5088

Based on the simulation results above it is known that the smallest MAPE value is more found in two places namely in Table 1.2 as much as 50% and Table 1.5 as much as 50%, as well as the MSE value. But the most accurate mentors between the two are parameters consisting of α = 0.9 and β = 0.1. therefore we will do a re-stimulation with α = 0.9 , β = 0.1 and period 10.
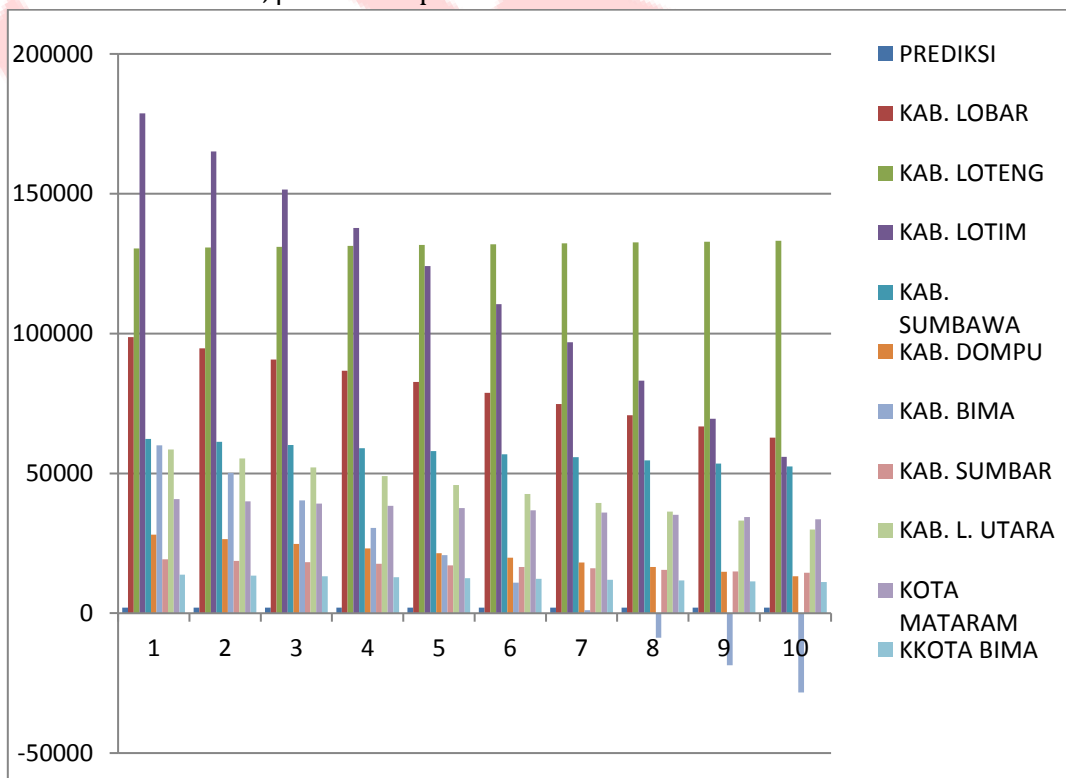
Figure 2. Predictive result data from the year 2020 – 2029

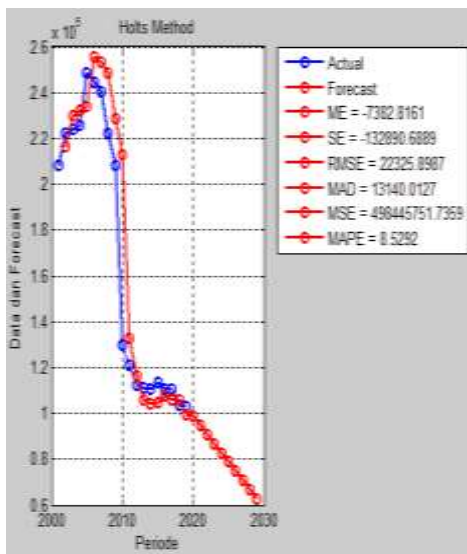As for the chart hasi predictions from the year 2020 – 2029 That is:
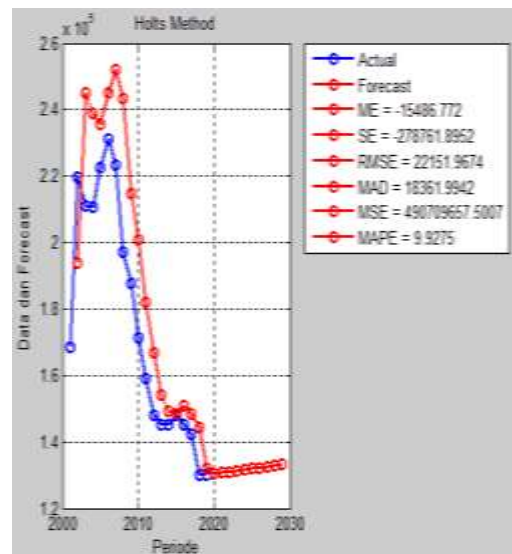

Figure 3. Prediction chart West Lombok Regency
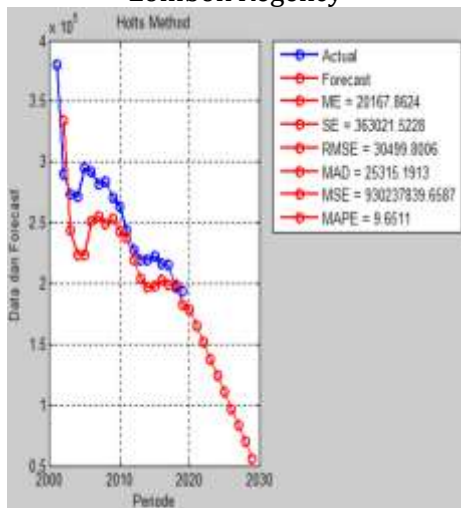

Figure 4. Prediction chart Central Lombok Regency

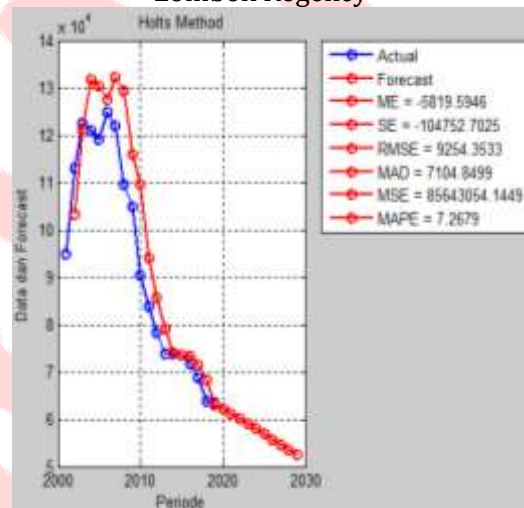**Figure 5.** Prediction chart East Lombok Regency

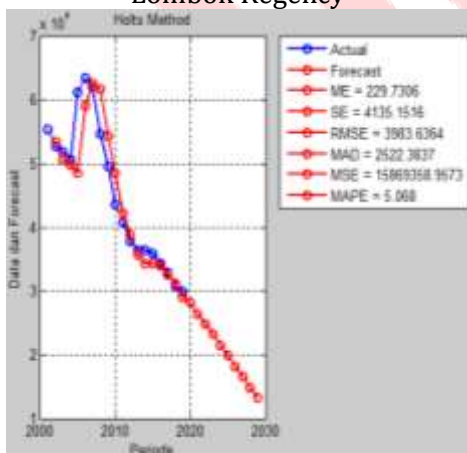**Figure 6.** Prediction chart Regency of Sumbawa
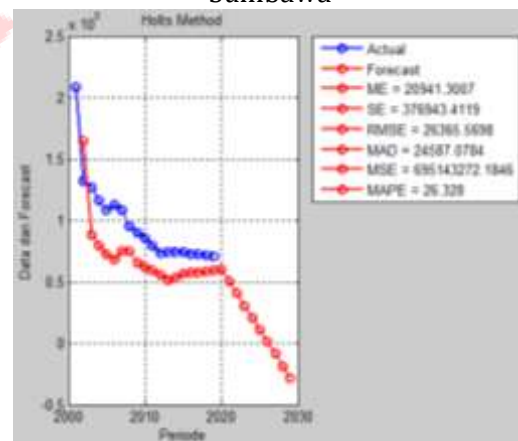

Figure 7. Prediction chart Regency of Dompu

Figure 8. Prediction chart Regency of Bima

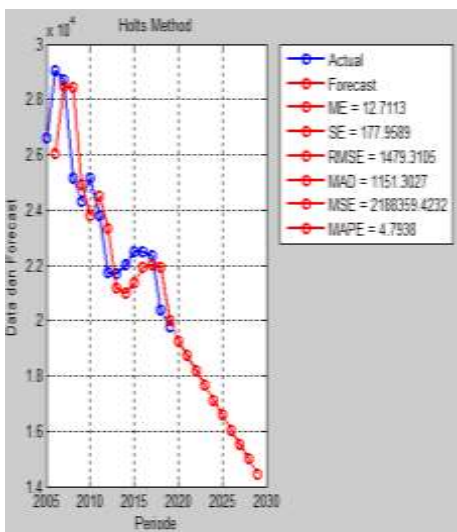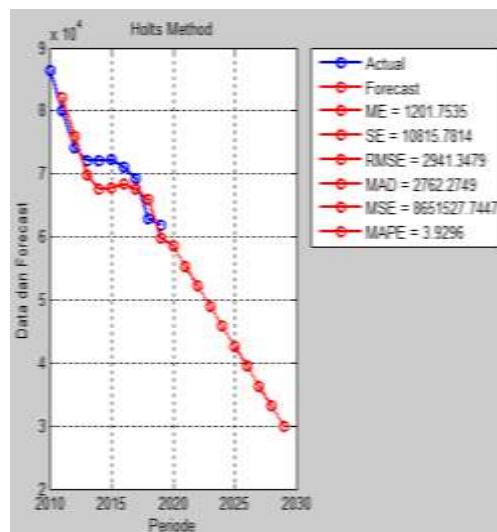**Figure 9.** Prediction chart West Sumbawa Regency

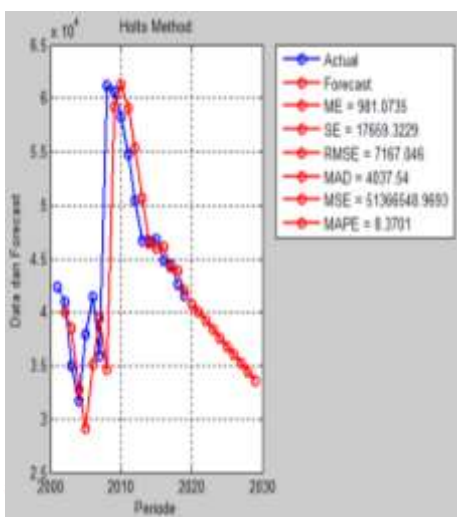**Figure 10.** Prediction chart Regency of North Lombok
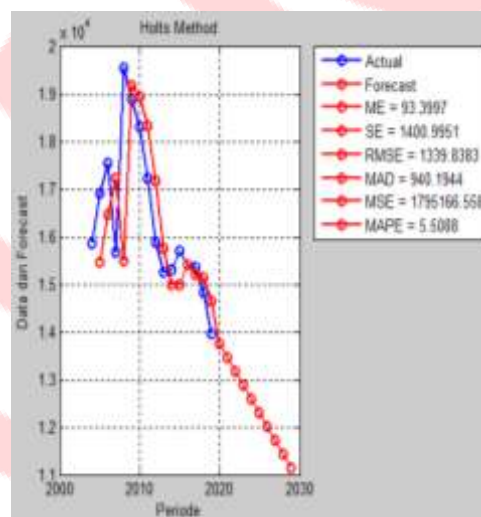

Figure 11. Prediction chart Mataram City

Figure 12. Prediction chart Bima City

Based on Figure 2 obtained the smallest MAPE result in West Lombok Regency = 8.5292, Central Lombok Regency = 9.9275 , East Lombok Regency = 9.6511, Sumbawa Regency = 7.2679 , Dompu Regency = 5,068, Bima Regency = 26,328, West Sumbawa Regency = 4.7938, North Lombok Regency = 3.9296, Mataram City = 8.3701, and Bima City = 5.5088. Although the predicted results change, the MSE and MAPE values remain the same.

Thus, the parameter value of the simulation result is nil α of 0.9 and the value of β = 0.1 resulting in me, MAD, and MAPE values being accurate values. For previous research, it is necessary to re-assessment with α dab β values that can produce MSE, MAD MAPE, and smaller and accurate predictive results.

By predicting poverty rates in NTB, the central government is working to accelerate development and the sector is allocated to accelerate poverty reduction efforts. Out of a total budget of 5 trillion, about 1 trillion is allocated to programs targeted at supporting poverty relief efforts such as accelerating road construction, economic infrastructure development, social development, and social assistance.

H. CONCLUSION AND SUGGESTION

For researchers who will continue this research, we hope that the next researcher can find the smallest MAPE values with α and β that have not been studied so that will produce new findings in predicting the Holt Method. In performing optimization and analysis with MAD, MSE, and MAPE to find out the percentage of

errors in the results of the role. Then it can be the smallest MAPE value that is in Alpha = 0.9, Beta = 0.1, and period =1. The result of the simulation is in West Lombok Regency = 8.5292, Central Lombok Regency = 9.9275 , East Lombok Regency = 9.6511, Sumbawa Regency = 7.2679 , Dompu Regency = 5,068, Bima Regency = 26,328,West Sumbawa Regency = 4.7938, North Lombok Regency = 3.9296, Mataram City = 8.3701, and Bima City = 5.5088. So, the number of poor people in NTB in the last ten years is 0.36%. This decrease in the amount of poverty will have an effect on poverty reduction that the central government has planned so that it will cause the population in NTB to be reduced

ACKNOWLEDGEMENT

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