SELECTION OF FORECASTING METHODS YAMAHA MOTORCYCLE SALES VOLUME NMAX 155CC IN FLAGSHIP SHOP YAMAHA CEMPAKA PUTIH JAKARTA PUSAT

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Abstract - *This study aims to find out what method is the best in forecasting the sales volume of Yamaha Nmax 155cc motorcycles at Flagship Shop Yamaha. In this study uses the Time Series Analysis method. The population in this study is the number of Yamaha Nmax 155cc motorcycle sales from the Yamaha Flagship Shop standing to the future. The sampling technique used was purposive sampling and the sample is sales volume data from January 2017 to December 2019. The forecasting method used in this study is past data method, cumulative average method, simple moving average method, weighted moving average method, double moving average method, single exponential smoothing method, double exponential method, least square method, thend parabolic method, semi average method and holt method. The measurement of forecasting accuracy used is the mean average error squared method (MSE). The results showed that from the method analyzed, the best method used to forecast the sales volume of Yamaha Nmax 155cc motorcycles was a double exponential smoothing method with constants 0.7, which has the smallest error value with MSE 163.10.*

Keywords: *Forecasting Method, Sales Volume*

I. INTRODUCTION

Currently, motorbikes can be said to be a vital necessity for some people. Apart from using public vehicles, motorbikes are considered to be more efficient and more efficient in terms of cost and time. This can be seen where people generally use motorbikes as a means of transportation in their daily activities. Many motorcycle brands are offered by manufacturers to consumers with various types and their respective advantages.

In a company, forecasting becomes the basis for long-term planning. Forecasting is an activity to predict or predict future events by preparing a plan in advance, where planning is made based on the capacity and ability of the company's demand. Information about past data is very important in

making forecasts. According to Nurlifa et al in Siti Uswatun Khasanah, Aries Dwi Indriyanti, 2020, forecasting is an attempt through testing past conditions to predict future conditions. Forecasting forms the basis for the company's long-term planning. The forecasting method used at the Yamaha Flagship Shop adapts to the current market conditions (market survey). The company performs a forecast using the previous month's sales data to forecast the next sales. The method used is by collecting input from customers or potential customers who are paying attention to future purchase plans. The level of sales of Yamaha Nmax 155cc motorbikes at the Flagship Shop, of course, will not always match the specified target.

The increase and decrease in the sales rate of Yamaha Nmax motorbikes every year affect the revenue of the Yamaha Cempaka Putih Flagship Shop. As an estimate, the inventory at the Yamaha Flagship Shop in December 2019 for Yamaha Nmax 155cc, which has 218 units, while sales volume reached 168 units. From this data, there is excess stock at the Flagship Shop on Yamaha Nmax 155cc of 50 units. From the description above, the researcher is interested in examining the sales volume of the Yamaha Nmax 155cc motorcycle in order to meet customer demand more precisely. Because the company only uses the estimated sales volume in the previous month.

II. LITERATURE REVIEW
2.1 The Results of Previous Research
The first research journal conducted by Bangun Unedo Putra Manurung, (Unedo & Manurung, 2015) was published in the Journal of Computer Research Vol 2 No. December 6, 2015 ISSN 2407-389X (Print Media). With the title "Implementation of the least square for predicting motorcycle sales (Case Study PT. Graha Auto Pratama). The results of the research on predicting motorcycle sales levels can be predicted using the least square method by determining the quality of the data obtained and the time with the motorcycle sales data from 2012-2014. The design of the motorcycle sales volume prediction application is designed with the Visual Basic Net 2008 programming language and MySql. For the future, the least square method can be used in predicting the number of motorcycle sales by using data on the number of previous motorcycle sales.

The second research journal was conducted by Isnayati, Mochamad Ari Saptari (Isnayati Saptari, 2015) published in the Journal of Information Systems ISSN 2598-599X. With the title Motorcycle Sales Forecasting System Using the Trend Projection Method at PT. UD Prima Nusantara. The results of this research use trend projection method with data on motorcycle sales in the monthly period in 2011-2015. By displaying a system design illustrated with a UML (unified modeling language) diagram, it also explains the description of the application user who is an administrator and includes a system design that displays the database design and user interface design. From the RMSE forecast error rate (mean squared mean), the resulting trend projection method is 247.4524807. Forecast results from sales reports and forecast reports for all Honda motorcycles brands. For the future, the trend projection method can be applied based on the previous year's sales data.

The third research journal was conducted by Stacia A. Paruntu, Indrie D. Palandeng (Palandeng et al., 2018) which was published in the Journal of Economic Research Vol.6 No.4 2018 ISSN 2303-1174, with the title "Analysis of Sales and Inventory of Bicycle Products Suzuki Motor At PT. Sinar Galesong Mandiri Malalayang ". The results of research and data analysis were carried out using the moving average, weighted moving average, and exponential smoothing methods calculated using the Pom Qm application with motorbike sales data and the number of motor inventories from January 2017 - June 2018. The calculation results of the moving avarage method, weighted moving average and exponential smoothing 3 months are more suitable for time-series data with a higher accuracy value in sales forecasting with the smallest Mean Absolute Deviation of 20.644, Mean Square Error of 589.533 and Mean Absolute Percentage Error of 19.53%.

The fourth research journal was conducted by Made AAD Kusuma Anggraeni (Anggraeni, 2015) which was published in the Journal of Economic Education Vol.5 No.1 2015 ISSN 2599-1418,

with the title "Analysis of Forecasting Sales of Scoopy Type Automatic Motorcycle Products with the Least Square Method at PT. Mertha Buana Motor 2015 ". The results of this study use time series analysis techniques by collecting sales data from 2010-2014. The least squares method used produces a forecast for the Scoopy-type automatic motorcycle in 2015 of 87 units. Due to the greater degree of accuracy than the use of the least squares method, it can be used by PT. Mertha Buana Motor in order to minimize future losses.

The fifth research journal was conducted by Muhammad Febiansyah, Tasya Aspiranti (Febiansyah & Aspiranti, 2018) which was published in Management Proceedings Vol.4 No.2 2018 ISSN: 2460-6545, with the title "Analysis of Honda Beat Motorcycle Sales Forecasting at PT. Astra Honda Motor Using the Adjusted Exponential Smoothing Method. The results of this study are sales forecasting using the Exponential Smoothing and Adjusted Exponential Smoothing methods with sales data from January to December during 2015. The best method used by companies is the exponential smoothing method with α = 0.7 so that the forecasting results are more accurate.

The sixth research journal was conducted by Lishura Chen (Chen & Chen, 2019) which was published in the Journal of Industrial Engineering & Management Volume 7, Issue 4, 2019 ISSN: 2169-0316. With the title "Statistical Forecasting Modeling to Predict Inventory Demand in Motorcycle Industry: Case Study". The results reveal that the estimated demand for motorcycle accessories manufacturing companies in the US market in 2010-2016. Numerical comparison on the model for 7 years used and the results of the proposed forecasting model, shows that the proposed one is more accurate. In the proposed model the MAD could be increased by 61% and MSE by 82%, this indicates a very good achievement in increasing demand forecasts.

The seventh research journal was conducted by Jessica, Seng Hansun (Jessica, 2016) which was published in the Journal of Informatics Engineering Volume 8 No. December 2, 2016 ISSN 2085 - 4552. With the title "Forecasting Motorcycle Sales Using Nearest Symmetric Trapezoidal Fuzzy Number". The results reveal that the design and development of motorcycle forecasting applications using the Fuzzy Time Series with the closest symmetrical trapezoid figure approach from April 2013 to March 2014. Three experiments were conducted, namely (1) monthly for all categories-all types with MSE = 54.42 and MAPE = 4.28%, (2) Monthly beat of CW fuel injection with MSE = 3.67 and MAPE = 4.04% and (3) every day all categories-all types with MSE = 1.42 and MAPE = 27.36%. This shows that the fuzzy time series method provides higher accuracy than the single exponential smoothing method.

The eighth research journal Shelvy Kurniawan, and Steven Sanjaya Raphaeli (Kurniawan & Raphaeli, 2018) published in Computer, Mathematics and Engineering Applications, 9 (2), December 2018 ISSN: 2087-1244. With the title "Optimizing Production Process through Production Planning and Inventory Management in Motorcycle Chains Manufacturer". The results reveal that the forecasting method used using addictive decomposition (the average of all data) produces accurate forecasts from October 2014 to September 2017. The addictive decomposition method can be used to solve the problem of production shortages as experienced by the company in the last three years. Compared to other forecasting methods, the addictive decomposition method has the smallest error rate because this method conforms to the seasonality of the data pattern.

2.2 Operations Management

According to Herjanto (2015: 2) operations management is an activity carried out by coordinating all activities and resources to achieve a certain goal.
According to Heizer and Render (2016: 3) operations management is an activity or activity related to the creation of goods and services through a process of transformation from input to output.

2.3 Definition of Forecasting

Forecasting is the art and science of predicting events in the future. Forecasting will involve taking historical data (such as last year's sales) and projecting them into the future with a

mathematical model. According to Handoko (2015: 260) in Palandeng et al., 2018 suggests that the essence of forecasting is forecasting future events based on past time patterns and the use of policies on projections with past patterns.

2.4 Time Horizon Forecasting

Forecasting is usually classified by the future time horizon that surrounds it. The time horizon in this study includes long-range forecasting which is generally 3 years or more in its time span, long-term forecasting is used in planning for new products, capital expenditures, location of facilities or expansion, and research and development.

2.5 Type of Forecasting

Organizations use the main types of forecasting in planning operations for the future. By doing demand forecasts, it is a projection of the demand for products or services from the company. This forecast often uses current point of sale data. Demand-driven forecasting will drive a company's production, capacity and scheduling system and serve as input for financial planning, marketing and personnel.

2.6 Type of Forecasting

Quantitative forecasts use a variety of mathematical models that rely on historical data or associative variables to forecast demand.

2.7 Definition of Sales

According to Phandermord et al. (2019) in Angling Ananditya, Sriyono, 2020 sales are an activity of buying and selling goods and services to consumers.

2.8 Sales Volume

Sales volume is the level of sales in units (units / total / rupiah) in a certain period earned by the company. According to Winardi in (Saragih 2017) in Sabil, Fildzah Ghassani, Suhartono, 2020 sales volume is the result of sales expressed in qualitative, fiscal or volume terms.

2.9 Sales Forecasting

Sales forecasting is a component of the management function as one of the contributors to the company's success. According to Berutu, Eko and Priyo (2013) every company cannot avoid predicting or predicting sales for the purposes of planning various activities that must be carried out.

2.10 Motorcycles

The growth of motorcycles in Indonesia from year to year continues to increase. Motorbikes are two-wheeled means of transportation that are very affordable for some Indonesians because they are the most economical, effective and efficient.

2.11 Time Series Forecasting Methods

According to Heizer and Render (2016), time series forecasting is based on a sequence of data points that are evenly placed (weekly, monthly, quarterly and others).

2.12 Types of Data Patterns

The random data pattern occurs when the observed data fluctuates around the average value of a constant or mean value. Unseen patterns make this pattern difficult to predict, for example a product whose sales are not increasing or decreasing. The suitable forecasting methods are autoregressive (AR), moving average (MA), Single Exponential Smoothing, and Double Exponential Smoothing methods.

2.13 Measures of Forecasting Error

The mean error is squared (Mean Squared Error-MSE). The squared average error is the average of the difference squared between the predicted and observed values.

2.14 Relationship Between Variables

In this study there is only one independent variable, the independent variable used in this study is the sales volume forecasting method. According to Sugiyono (2015) an independent variable is a variable that stands alone without making comparisons and looking for relationships between these variables and other variables.

III. RESEARCH METHOD

The research method used in this research is quantitative descriptive research, which is a systematic effort to provide answers to a problem and uses research stages with a quantitative approach. This study aims to describe systematically, factually and accurately about the facts and characteristics of certain populations or to try to describe phenomena in detail.

In this study, the population used is the number of sales of Yamaha Nmax motorbikes from the Yamaha Cempaka Putih Flagship Shop standing to the future (infinite population). The sampling technique in this research is to take purposive sampling technique. Selection of sampling aims to determine the sample by taking certain data that are deemed appropriate and related to the research being conducted.

The data collection methods used are as follows:
1) Primary data
2) Secondary data

The data processing and discussion stages are carried out in the following ways:
1) Data is processed using POM-QM software for windows version 5.
2) Data is also presented in tables and graphs to make it more systematic in understanding and analyzing data.

Analysis of Yamaha Nmax motorcycle sales data using 11 forecasting methods. The 11 methods are measured using the MSE (average squared error) method to determine the most accurate forecasting, where the lowest error rate of the 11 forecasting methods is the most appropriate method.

IV. RESEARCH RESULTS AND DISCUSSION

4.1 Description of Data

Based on the results of research conducted by researchers, it can be seen that the development data on the sales volume of Yamaha Nmax 155cc motorbikes at the Yamaha Flagship Shop are as follows:

Table 1. Total Sales of Yamaha Nmax 155cc Jan 2017 - Dec 2019

Month	Sales		
	2017	**2018**	**2019**
January	83	42	109
February	70	99	120
March	68	97	124
April	106	102	90
May	113	103	52

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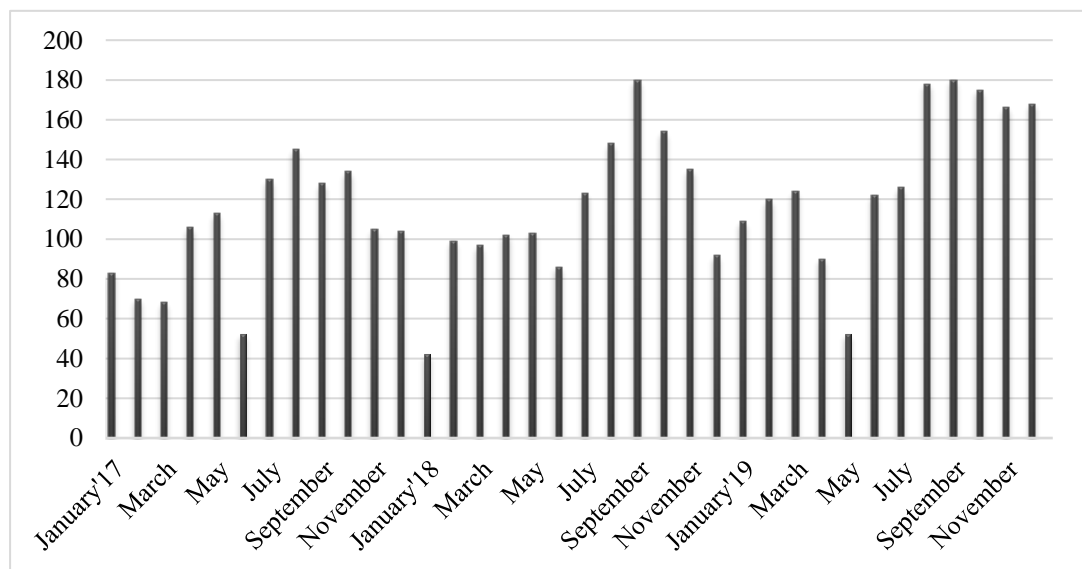|			
June	52	86	122
July	130	123	126
August	145	148	178
September	128	180	180
October	134	154	175
November	105	135	166
December	104	92	168

Source: Yamaha Flagship Shop (2020)

Figure 1. Development of Yamaha Nmax155cc Motorcycle Sales Volume at the Flagship Shop Yamaha 2017 – 2019

4.2 Data Analysis Results

The following is the sales data analyzed using forecasting methods which will be calculated using Pom Qm software.

1. Past Data Method

Based on the results of processing data on the sales volume of Yamaha Nmax 155cc motorbikes at the Yamaha Flagship Shop, the method of passing data has an MSE value of 1055.40. The following is the MSE calculation for the data passing method:

Table 2. Forecast Results and Error Rate of the Passing Data Method

Month	Sales Forecast (unit)		
	2017	2018	2019
January		104.00	92.00

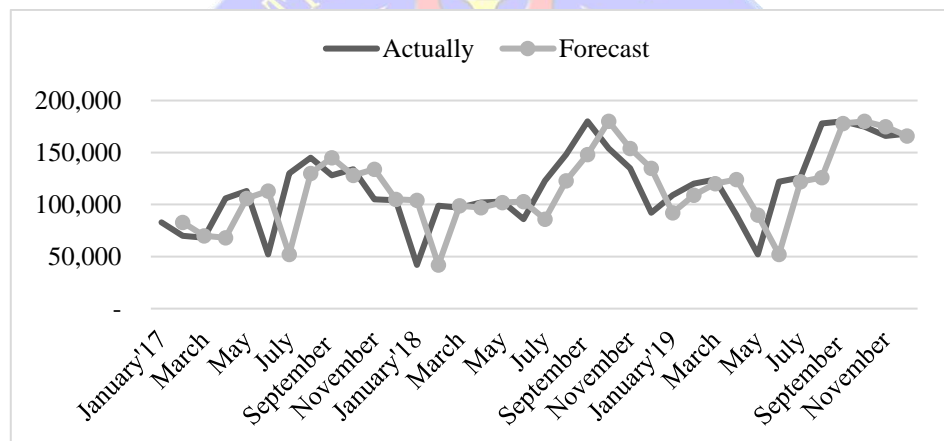|			
February	83.00	42.00	109.00
March	70.00	99.00	120.00
April	68.00	97.00	124.00
May	106.00	102.00	90.00
June	113.00	103.00	52.00
July	52.00	86.00	122.00
August	130.00	123.00	126.00
September	145.00	148.00	178.00
October	128.00	180.00	180.00
November	134.00	154.00	175.00
December	105.00	135.00	166.00
MSE		1055.40	

Figure 2. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting by Method Data Passing

2. The Cumulative Average Method

Based on the results of processing data on the sales volume of Yamaha Nmax 155cc motorbikes at the Yamaha Flagship Shop, the cumulative average method has an MSE value of 1098.39. The following is the MSE calculation for the cumulative average method:

Table 3. Forecast Results and Average Cumulative Method Error Rate

Month	Sales Forecast (unit)		
	2017	2018	2019
January		104.50	113.50

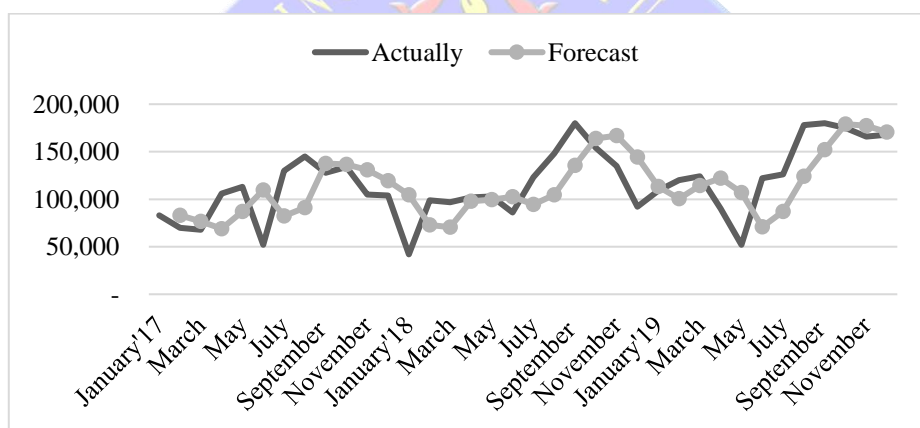| Month			
February	83.00	73.00	100.50
March	76.50	70.50	114.50
April	69.00	98.00	122.00
May	87.00	99.50	107.00
June	109.50	102.50	71.00
July	82.50	94.50	87.00
August	91.00	104.50	124.00
September	137.50	135.50	152.00
October	136.50	164.00	179.00
November	131.00	167.00	177.50
December	119.50	144.50	170.50
MSE		1098.39	

Figure 3. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting by Method Cumulative Average Method

3. Simple Moving Average Method

Based on the data processing results of Yamaha Nmax 155cc motorcycle sales volume at the Yamaha Flagship Shop, the 2-month moving average method has the smallest MSE value of 1125.73 compared to other simple moving averages. The following are the results of forecasting the sales volume of Yamaha Nmax 155cc motorcycles using the 2-month moving average method:

Table 4. Forecast Results and Levels of the Simple Moving Average Method 2 Months

Month	Sales Forecast (unit)		
	2017	**2018**	**2019**
January		104.50	113.50

Month			
February		73.00	100.50
March	76.50	70.50	114.50
April	69.00	98.00	122.00
May	87.00	99.50	107.00
June	109.50	102.50	71.00
July	82.50	94.50	87.00
August	91.00	104.50	124.00
September	137.50	135.50	152.00
October	136.50	164.00	179.00
November	131.00	167.00	177.50
December	119.50	144.50	170.50
MSE		1125.73	

Table 5. Results of Comparison of Forecast Error Size (MSE) on 2-month to 9-month Moving Average Method

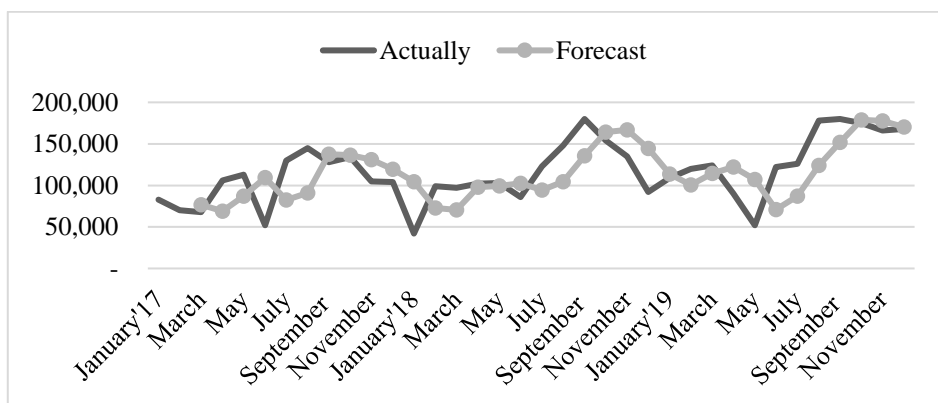| Simple Moving Average (Monthly)	Forecasting Error Measures (MSE)
2	1125.73
3	1282.83
4	1370.08
5	1420.71
6	1495.86
7	1520.18
8	1556.97
9	1573.39

Figure 4. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting by Method Simple Moving Average Method

4. Method of Moving Average

Based on the results of processing the Yamaha Nmax 155cc motorcycle sales volume data at the Yamaha Flagship Shop, the weighted moving average method is based on an average of the previous 2 months, where the first month is given a weight of 2, the second month is given a weight of 1, with the smallest MSE value equal to 1050.62 compared to other weighted moving average. So that the researcher only displays the results of forecasting the sales volume of Yamaha Nmax 155cc motorcycles using the moving average weighted method 2 months earlier as follows:

Table 6. Forecast Results and Error Rates with the Weighted Moving Average Method 2 Months

Month	Sales Forecast (unit)		
	2017	2018	2019
January		104.33	106.33
February		62.67	103.33
March	74.33	80.00	116.33
April	68.67	97.67	122.67
May	93.33	100.33	101.33
June	110.67	102.67	64.67
July	72.33	91.67	98.67
August	104.00	110.67	124.67
September	140.00	139.67	160.67
October	133.67	169.33	179.33
November	132.00	162.67	176.67
December	114.67	141.33	169.00

MSE	1050.62

Table 7. Results of Comparison of Forecast Error Size (MSE) on Weighted Moving Average Method

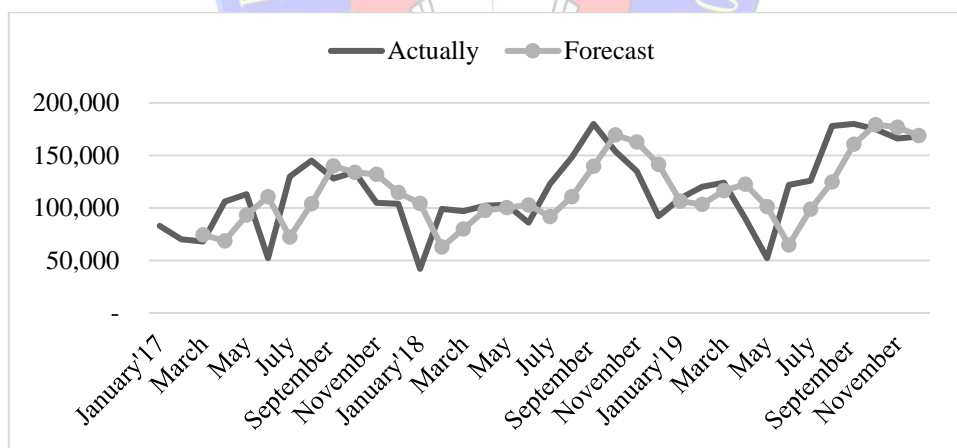| Weighted Moving Average (Montly)	Forecasting Error Measures (MSE)
2	1050.62
3	1259.70
4	1309.74
5	1387.03
6	1436.13
7	1477.48
8	1496.19
9	1513.88

Figure 5. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting by Method 2-Month Weighted Moving Average Method

5. Double Moving Average Method

Based on the results of processing the Yamaha Nmax 155cc motorcycle sales volume data at the Yamaha Flagship Shop that the double moving average method is based on a simple moving average as a basic series, the result is called the second data, then the moving average of the second data is calculated, the result is called data third and so on. With the smallest MSE value of 2319.02.

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So that the researcher only displays the results of forecasting the sales volume of Yamaha Nmax 155cc motorcycles using the 5-month multiple moving average method:

Table 8. Forecast Results and the Moving Average Method Error Rate Double 5 Months

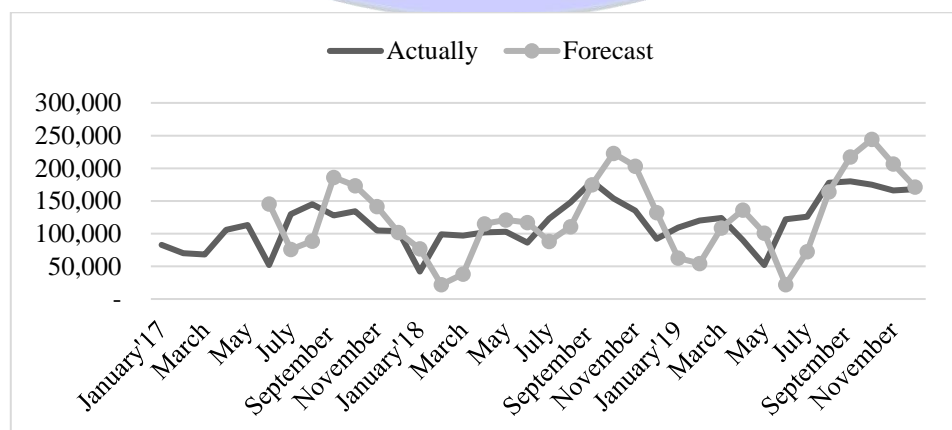| Month	Sales Forecast (unit)		
	2017	**2018**	**2019**
January		76.94	62.88
February		22.00	54.19
March		38.44	108.88
April		115.25	136.06
May		120.88	101.00
June	145.50	117.31	22.06
July	75.75	88.31	72.38
August	88.75	110.88	164.13
September	186.06	174.88	217.25
October	173.44	223.06	244.25
November	141.50	203.38	206.56
December	102.06	132.13	171.63
MSE		2319.02	

Figure 6. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting by Method 5-Month Double Moving Average Method

6. Single Exponential Smoothing Method

Based on the results of processing the Yamaha Nmax 155cc motorcycle sales volume data at the Yamaha Flagship Shop, the single exponential refinement method is based on the calculation of exponential average (smoothing) of past data, by giving a weight called a smoothing constant of 0.7 having the smallest MSE value of 995.12 compared to other smoothing constants. The following are the results of forecasting the sales volume of Yamaha Nmax 155cc motorcycles using a single exponential refining method with a smoothing constant of 0.7:

Table 9. Forecast Results and Error Rate of Exponential Refining Method Single with Alpha 0.7:

Month	Sales Forecast (unit)		
	2017	**2018**	**2019**
January		106.80	106.97
February	83.00	61.44	108.39
March	73.90	87.73	116.52
April	69.77	94.22	121.76
May	95.13	99.67	99.53
June	107.64	102.00	66.26
July	68.69	90.80	105.28
August	111.61	113.34	119.78
September	134.98	137.60	160.53
October	130.09	167.28	174.16
November	132.83	157.98	174.75
December	113.35	141.89	168.62
MSE		995.12	

Table. 10 Results Comparison of Forecast Error Size (MSE) on Single Exponential Refining Method with Alpha 0.1 to 0.9

Refinement Exponential Single with Alpha	Forecasting Error Measures (MSE)
0.1	1310.90
0.2	1175.48
0.3	1110.32
0.4	1059.99
0.5	1023.95

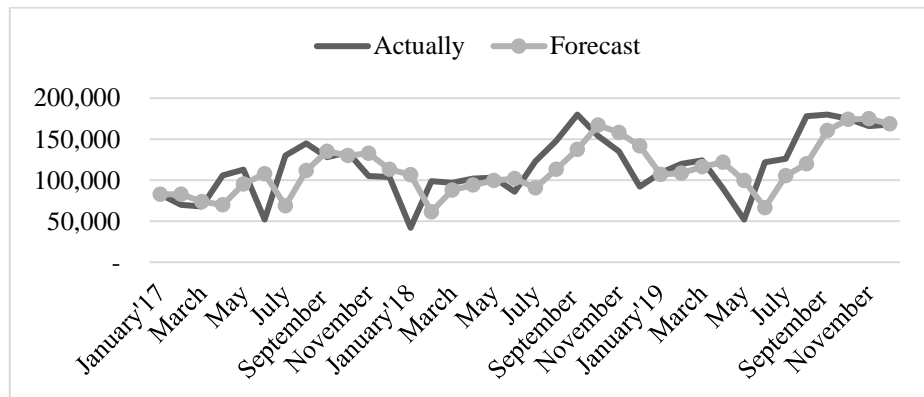|	
0.6	1002.65
0.7	995.12
0.8	1000.76
0.9	1020.18

Figure 7. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting by Method Single Exponential Smoothing Method with Alpha 0.7

7. Double Exponential Refining Method

Based on the results of processing the Yamaha Nmax 155cc motorcycle sales volume data at the Yamaha Flagship Shop, the double exponential refinement method is based on the calculation of a single refinement method developed by handling trend patterns with a smoothing constant of 0.7 obtaining the smallest MSE value of 163.10. The table below shows the results of forecasting the sales volume of Yamaha Nmax 155cc motorcycles using the double exponential refining method with a smoothing constant of 0.7.

Table 11. Forecast Results and Error Rate of Exponential Refining Method Single with Alpha 0.7

Month	Sales Forecast (unit)		
	2017	**2018**	**2019**
January		16.08	109.81
February	64.80	114.02	124.64
March	65.64	100.71	127.00
April	120.49	105.11	77.30
May	120.15	104.34	32.99
June	29.75	79.60	144.30
July	154.52	135.88	134.29

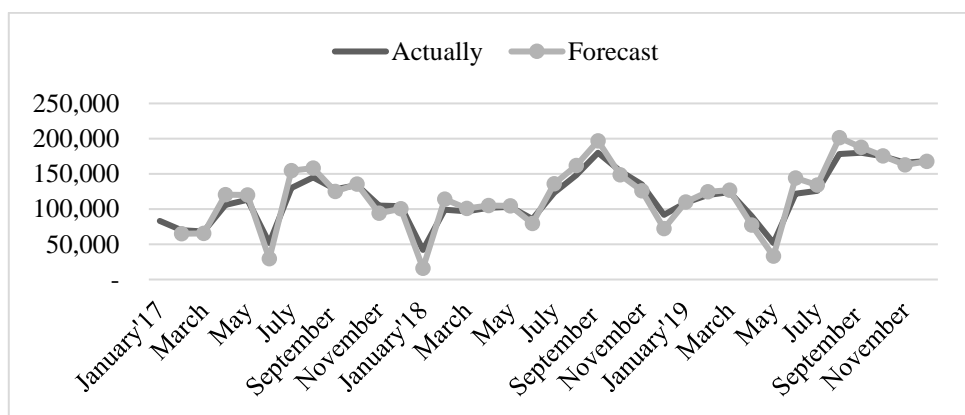|			
August	158.36	161.86	201.28
September	125.21	196.96	187.78
October	135.56	148.69	175.34
November	93.87	125.80	162.50
December	100.26	72.05	167.75
MSE		163.10	

Figure 8. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting Method Double Exponential Smoothing Method with a Smoothing Constant of 0.7

8. Linear Trend of Least Square Method

Based on the results of processing the Yamaha Nmax 155cc motorcycle sales volume data at the Yamaha Flagship Shop, the linear trend of the least squares method is calculated by matching a functional form in such a way that the error component can be minimized, with an intercept value of 116.92 and a slope value of 0.92. resulting in an MSE of 969.03. Following are the results of forecasting the sales volume of Yamaha Nmax 155cc motorcycles using the linear trend of the least squares method:

Table 12. Forecast Results and Error Rate of Linear Trend of Least Square Method

Month	Sales Forecast (unit)		
	2017	2018	2019
January	84.72	106.80	128.88
February	86.56	108.64	130.72
March	88.40	110.48	132.56
April	90.24	112.32	134.40

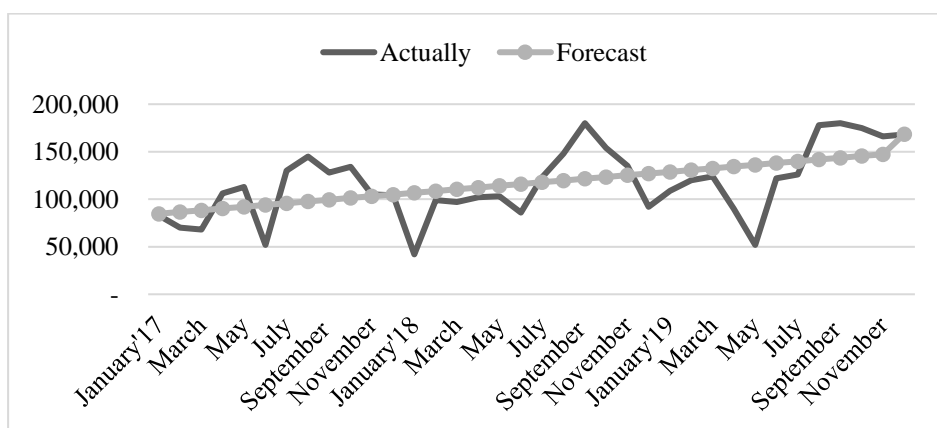|			
May	92.08	114.16	136.24
June	93.92	116.00	138.08
July	95.76	117.84	139.92
August	97.60	119.68	141.76
September	99.44	121.52	143.60
October	101.28	123.36	145.44
November	103.12	125.20	147.28
December	104.96	127.04	149.12
MSE		969.03	

Figure 9. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting on Trend Linear Quadratic Method

9. Trend Parabolic Method or quadratic

Based on the results of processing the Yamaha Nmax 155cc motorcycle sales volume data at the Yamaha Flagship Shop, the parabolic trend method produces a trend with an increase or decrease in the slope along with the increase or decrease in the quadratic unit of parameter c used, with a obtained of 49.68, b of 0.92 and a value of c of 0.012 results in an MSE of 4800.08. Following are the results of forecasting the sales volume of Yamaha Nmax 155cc motorcycles using the parabolic trend method:

Table 13. Forecast Results and Error Rates Parabolic Trend Methods or Quadratic

Month	Sales Forecast (unit)		
	2017	**2018**	**2019**
January	32.18	41.01	63.67
February	32.39	42.37	66.18
March	32.69	43.83	68.79

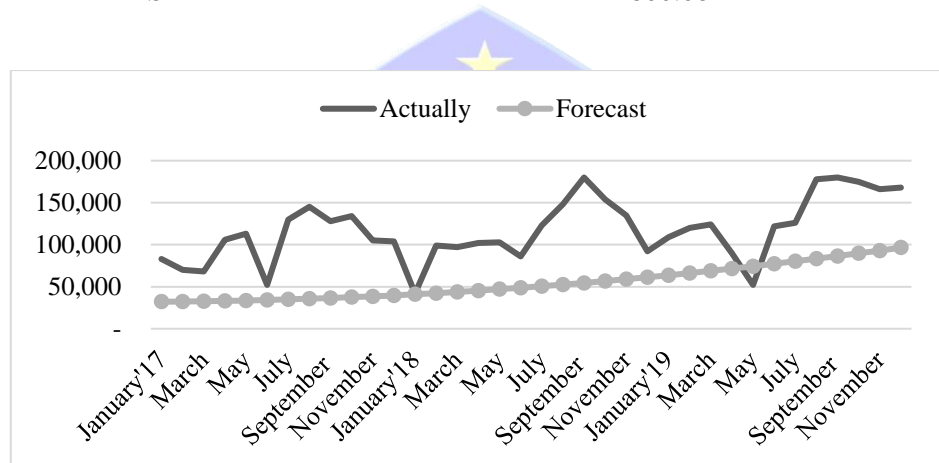|			
April	33.09	45.38	71.49
May	33.59	47.03	74.29
June	34.18	48.77	77.19
July	34.87	50.61	80.18
August	35.65	52.55	83.27
September	36.53	54.58	86.45
October	37.51	56.71	89.73
November	38.58	58.93	93.11
December	39.75	61.25	96.58
MSE		4800.08	

Figure 10. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting at Parabolic or Quadratic Trending Methods

10. Semi Average Method

Based on the results of processing data on the sales volume of Yamaha Nmax 155cc motorbikes at the Yamaha Flagship Shop, the half-average method is calculated by grouping the data into 2 with the base value of each group being 99.47 and 135.67, with the median value obtained by both groups of 8.00. and 26.00 which resulted in an MSE of 952.10. The following are the results of forecasting the sales volume of Yamaha Nmax 155cc motorcycles using the half average method.

Table 14. Forecast Results and Half-Average Method Error Rates

Month	Sales Forecast (unit)		
	2017	**2018**	**2019**
January	91.47	103.47	133.67
February	92.47	104.47	134.67

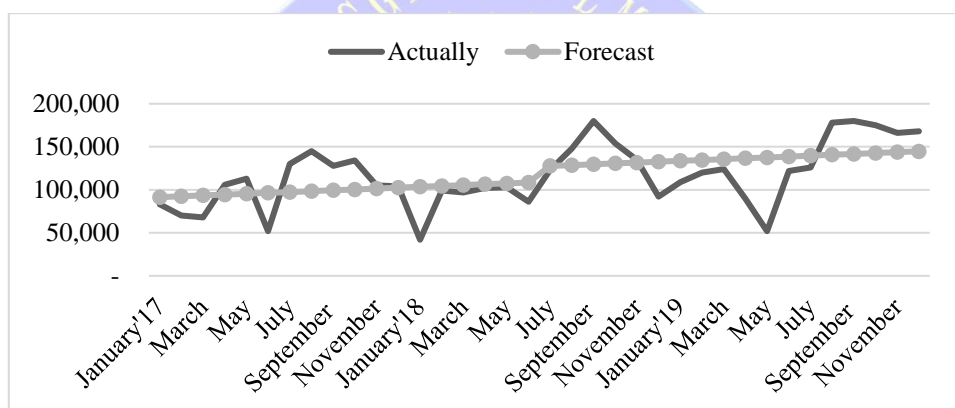| Month			
March	93.47	105.47	135.67
April	94.47	106.47	136.67
May	95.47	107.47	137.67
June	96.47	108.47	138.67
July	97.47	127.67	139.67
August	98.47	128.67	140.67
September	99.47	129.67	141.67
October	100.47	130.67	142.67
November	101.47	131.67	143.67
December	102.47	132.67	144.67
MSE		952.10	

Figure 12. Graph of Yamaha Nmax 155cc Motorcycle Sales Forecasting by Method Semi Average

11. Two Parameter Method (Holt Method)

Based on the data processing results of Yamaha Nmax 155cc motorcycle sales volume at the Yamaha Flagship Shop, the two-parameter method is calculated with a trend of 0.4 and a slope of 0.9 which results in the smallest MSE of 974.10 compared to other trend and slope values. So that researchers only display the results of forecasting the sales volume of Yamaha Nmax 155cc motorcycles using the two parameter method as follows:

Table 15. Forecast Results and Error Rates for the Two-Parameter Method (Holt Method)

Month	Sales Forecast (unit)		
	2017	**2018**	**2019**
January		106.63	103.87

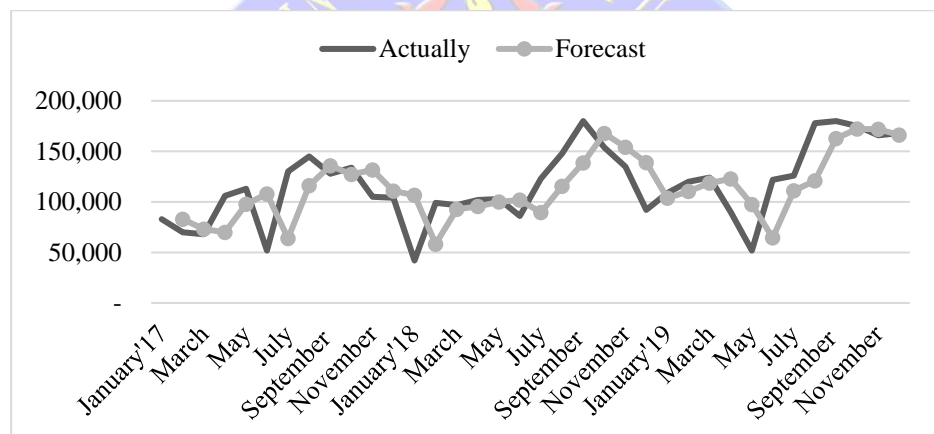|			
February	83.00	58.32	110.42
March	73.12	92.87	118.66
April	69.88	95.63	122.68
May	97.89	100.09	97.55
June	107.81	101.80	64.45
July	63.91	89.42	111.18
August	116.27	115.56	120.92
September	135.76	138.81	162.85
October	127.33	167.83	172.34
November	131.63	154.19	171.87
December	110.70	138.87	166.13
MSE		974.10	

Figure 12. Forecasting Graph of Yamaha Nmax 155cc Motorcycle Sales at Two Parameter Method (Holt Method)

4.3 Discussion

From the explanation above, the best sales volume forecasting method can be seen from the MSE values. The best forecast is a forecast that has the smallest error value and vice versa if the higher the error value is, the method is less precise for making predictions on the sales volume of a company. Based on the comparison of the 11 sales volume forecasting methods, it is known that the MSE value used to predict the sales volume of Yamaha Nmax 155cc motorbikes at the Yamaha Flagship Shop is the lowest in the double exponential smoothing method with an error value of 163.10. Thus, the best sales volume forecasting method of the 11 methods is using the double exponential smoothing method with a smoothing constant of 0.7.

4.4 Research Findings

The results showed that the double exponential smoothing method with a smoothing constant of 0.7 has the smallest error rate, which means that this method has the highest accuracy value exceeding the other ten methods that have been studied, to be used as a sales forecasting method for Yamaha Nmax 155cc motorcycles. at the Yamaha Flagship Shop.

The results of this study use 11 forecasting methods with the use of pom qm software compared to the research conducted by Bangun Unedo Putra Manurung (2015) where the research used the least square method which was designed with the Visual Basic Net 2008 programming language and MySql.

The results of the study used 11 forecasting methods with the smallest MSE error rate compared to the RMSE error rate generated by the trend projection method carried out by Isnayati and Mochamad Ari Saptari (2015) where in this study the best and most accurate method was achieved by the trend projection method, this happened. because the research conducted by Isnayati shows the system design which is described by the UML (Unified modeling language) diagram.

The results of this study use 11 forecasting methods compared to research conducted by Stacia A. Paruntu, Indrie D. Palandeng (2018) where their research uses the moving average, weighted moving average, and 3-month exponential smoothing methods, this happens because of research conducted by Stacia A .Paruntu and D. Palandeng do not include the double exponential refinement method as a comparison of forecasting method analysis.

Fourth, research conducted by Made A.A.D Kusuma Anggraeni (2015) which uses the least square method with a greater degree of accuracy. Compared to the research that the authors conducted using 11 forecasting methods with the smallest MSE error rate.

Fifth, research conducted by Muhammad Febiansyah, Tasya Aspiranti (2018) used the Exponential Smoothing method with a constant of 0.7. From the research conducted by Muhammad Febiansyah, Tasya Aspiranti, there is an equation in the selection of a constant of 0.7. But do not add the double exponential smoothing method as a comparison of the other methods.

Sixth, research conducted by Lishura Chen (2019) uses a center moving average, this happens because the research conducted by Lishura Chen does not include the double exponential smoothing method and other forecasting methods as a comparison of forecasting method analysis.

Seventh, research conducted by Jessica, Seng Hansun (2016) where this research uses the Fuzzy Time Series, this happens because the research conducted by Jessica, Seng Hansun does not include the double exponential smoothing method and other forecasting methods as a comparison of forecasting method analysis.

Eighth, research conducted by Shelvy Kurniawan and Steven Sanjaya Raphaeli (2018) where this research uses addictive decomposition, this happens because the research conducted by Shelvy Kurniawan and Steven Sanjaya Raphaeli does not include the double exponential smoothing method and other forecasting methods such as in the author's research as comparative analysis of forecasting methods.

V. CONCLUSIONS AND SUGGESTIONS
5.1 Conclusion

Based on the results of the research conducted by the researcher, the researcher draws the conclusion that the double exponential smoothing method with a smoothing constant of 0.7 is the best method used to predict the sales volume of Yamaha Nmax 155cc motorbikes at the Yamaha Flagship Shop in the past. will come because it has the smallest MSE value compared to the other 10 methods.

5.2 Suggestions

Based on the results of the research above, the researchers provided suggestions and input as a consideration for the Flagship Shop in improving quality and efficiency in company operations, especially in order to maintain sales volume.

Yamaha's flagship shop should optimize the use of sales forecasting techniques with the best method. Because the more the forecast is closer to the best result, then what the company plans will be achieved.

This is important in order to avoid shortcomings in meeting the target sales volume of Yamaha Nmax 155cc motorbikes at the Yamaha Flagship Shop in the future and to make the results of this study as a preparation for budget plans, revenues, the need for human resources and other costs. So that the plan for the expense and income budget can be realized accurately.

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