

Profit Prediction on MSME using Least Square Method

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Abstract:- This objective of this study is to forecast the profits of Micro, Small and Medium Enterprises (MSMEs) using the Least Square Method. The data used are profit data for MSMEs located in Malang from November 2019 to October 2022. The method used in this research is the Least Square Method. This method is used to predict profit. The results of the profit forecasting in November 2022 have increased by IDR 6,264,396.

Keywords:- Forecasting, MSMEs, Least Square Method.

I. INTRODUCTION

Forecasting as the art and science of predicting future events. Forecasting will involve taking historical data (last year's sales) and projecting them into the future with a mathematical model [1]. Careful planning is based on data and predictions that are estimated to be quite precise. This is because forecasts will assist in making decisions in revenue and planning the number of sales to meet needs and be able to take advantage of existing market opportunities that will emerge in the future. In forecasting activities, forecasting techniques are needed. This aims to find out future demand and minimize forecasting errors. The concept of profit in financial statements is an important component that is able to describe the ability of business actors to operate a business and business [2]. Companies must be able to plan production parameters well, including production capacity to meet market demand promptly and in the correct quantity. This is done to increase the company's profits.

During the COVID-19 Pandemic, MSMEs experienced shocks to profits, which resulted in many MSMEs going out of business. This is because MSMEs have not implemented a profit prediction system, which causes them to be still unable to control their operational activities. Profit is very important because it is an indicator of the success of a business. Therefore, profit prediction is needed so MSMEs can continue to survive and carry out the production process.

Research done previously by Medyantiwi Rahmawita and Ilham Fazri is about applying drug sales forecasting using the least square method at Bhayangkara Hospital [3]. Subsequent research was conducted by Suci Andriyani, namely regarding the application of the least squares method for forecasting the inventory of OPPO brand mobile phones on Raja Smart Phone [4]. Subsequent research was conducted by Putra Manurung, the research is about applying sales

motor at PT Graha Auto Pratama [5]. There are differences between this study and previous research, namely at an earlier research, the object of research and the use of the least squares method used to forecast sales. Meanwhile, this research uses the least squares method to predict the profit generated. Microsoft Excel was used to perform calculations because Microsoft Excel is a powerful application and analytical tool.

II. LITERATURE REVIEW

A. Forecasting

To be able to predict, predict or predict something (the value of a variable) in the future, it is necessary to have past data. The quality of a forecast, estimate or prediction is closely related to the information that can be absorbed from past data [6]. Forecasting is an estimate using certain techniques [1]. Forecasting is the science of predicting events that will occur in the future. This forecasting involves taking data from the past to be projected in the future. An accurate forecasting can never be done, but it can reduce the uncertainty that will occur in the future. So, forecasting can be defined as a science that uses past data to predict events that will occur in the future to reduce the uncertainty that will happen.

B. MSMEs

Business is a productive business unit established by individuals or companies in the economic sector. According to Law no. 20 of 2008 concerning Micro, Small, and Medium Enterprises (MSME) are [7]:

- Micro business is owned by an individual or business entity where the company meets the micro business criteria regulated in the law.
- Small business is a business in the economic field owned by an individual and is not a subsidiary that is owned, controlled, or becomes part directly or indirectly of a medium or large business.
- Medium Enterprises are businesses run by individuals or business entities that are not subsidiaries or branches of companies that are owned, controlled, or become part directly or indirectly of small businesses or large businesses with an annual turnover that has been stipulated in the law.

Based on some of the definitions above, MSME can be defined as businesses owned by individuals or business entities operating in the economic sector which are not subsidiaries or branches of companies.

C. Least Square Method

The Least Square Method is a method for determining the trend equation of data, including Time Series analysis with two cases of even and odd data [5]. The Least Square method is a method in the form of time series data, which requires past sales data to forecast future sales so that the results can be determined. The Least Square method is an analytical method used to predict the future. It takes quite a lot of various kinds of information (data), and it is observed over a relatively long period so that from the results of the analysis, it can be seen to what extent the fluctuations have occurred and what factors have influenced these changes. Least Square is a forecasting method that sees trends from time series data. The least squares method uses certain statistical and mathematical calculation methods to determine the function of a straight line as a substitute for a broken line formed by historical data of the company [8]. The following is the Least Square method equation:

$$Y = a + bx$$

Description:

- Y : time series
- a and b : coefficients
- x : specified time

Where:

$$b = \frac{\sum XY}{\sum X^2}$$

$$a = \frac{\sum Y}{n}$$

$\sum xy$: The cumulative amount of time multiplied by historical data

$\sum x^2$: The average number of timeframes squared

$\sum y$: The average amount of profit

n : Number of periods (years)

III. METHODOLOGY

This research was conducted at one of the MSMEs in Malang, Arini Stick. The problem that often arises in this business is never predicting profit results which result in entrepreneurs not being unable to predict future sales volume, so they are not efficient in using time and energy. Forecasting techniques are needed to overcome the problems that occur. This study uses the Least Square method in predicting profit for each month. An analysis is required in order to determine the income in the following month to find a solution if an obstacle occurs. The research was carried out by finding sales and profit data each month, after which it was continued by processing the data using the least square method using Microsoft Excel because Microsoft Excel is a powerful application as an analytical tool.

TABLE I. PROFIT (LOSS) DATA IN MSMEs FROM NOVEMBER 2019 TO OCTOBER 2022

Year	Month	Profit (y)
2019	November	Rp 3.370.000
	Desember	Rp 3.852.300
2020	January	Rp 4.234.500
	February	Rp 3.985.000
	March	Rp 3.394.500
	April	Rp 2.834.000
	May	Rp 2.532.000
	June	Rp 2.124.000
	July	Rp 2.439.500
	August	Rp 2.567.000
	September	Rp 3.820.000
	October	Rp 3.125.500
2021	November	Rp 3.362.000
	December	Rp 2.956.000
2021	January	Rp 3.546.000

	February	Rp 2.872.000
	March	Rp 3.003.000
	April	Rp 4.012.000
	May	Rp 3.760.000
	June	Rp 3.960.000
	July	Rp 3.780.000
	August	Rp 6.321.000
	September	Rp 3.432.000
	October	Rp 4.322.000
	November	Rp 4.470.000
	December	Rp 5.120.000
2022	January	Rp 5.092.000
	February	Rp 4.782.000
	March	Rp 5.461.000
	April	Rp 4.795.000
	May	Rp 4.128.000
	June	Rp 6.936.000
	July	Rp 4.782.000
	August	Rp 3.988.000
	September	Rp 4.356.000
	October	Rp 5.440.000
	Total	Rp 142.954.300

Source: Author, 2022.

Data processing uses Least Square Method to obtain forecasting the results. The following steps are:

- A certain value is required on the variable time (x) so that the total value of the time variable is zero or $\sum x = 0$.
- Define profit as y.
- Calculate the x times y.
- Find the value of a and b using the formula:

$$\sum y = n \cdot a, a = \frac{\sum y}{N}$$

$$\sum yx = b \sum x^2, b = \frac{\sum yx}{\sum x^2}$$

- Determine the probability distribution of total profit.

The formula is:

$$Y = a + bx$$

Description:

Y : time series

a and b : coefficients

x : specified time

IV. RESULTS AND DISCUSSION

TABLE II. LEAST SQUARE METHOD

Year	Month	Profit (y)	x	xy
2019	November	Rp 3.370.000	-18	-Rp 60.660.000
	Desember	Rp 3.852.300	-17	-Rp 65.489.100
2020	January	Rp 4.234.500	-16	-Rp 67.752.000
	February	Rp 3.985.000	-15	-Rp 59.775.000
	March	Rp 3.394.500	-14	-Rp 47.523.000
	April	Rp 2.834.000	-13	-Rp 36.842.000
	May	Rp 2.532.000	-12	-Rp 30.384.000
	June	Rp 2.124.000	-11	-Rp 23.364.000
	July	Rp 2.439.500	-10	-Rp 24.395.000
	August	Rp 2.567.000	-9	-Rp 23.103.000
	September	Rp 3.820.000	-8	-Rp 30.560.000
	October	Rp 3.125.500	-7	-Rp 21.878.500
	November	Rp 3.362.000	-6	-Rp 20.172.000
	December	Rp 2.956.000	-5	-Rp 14.780.000
2021	January	Rp 3.546.000	-4	-Rp 14.184.000
	February	Rp 2.872.000	-3	-Rp 8.616.000
	March	Rp 3.003.000	-2	-Rp 6.006.000
	April	Rp 4.012.000	-1	-Rp 4.012.000
	May	Rp 3.760.000	1	Rp 3.760.000
	June	Rp 3.960.000	2	Rp 7.920.000
	July	Rp 3.780.000	3	Rp 11.340.000
	August	Rp 6.321.000	4	Rp 25.284.000
	September	Rp 3.432.000	5	Rp 17.160.000
	October	Rp 4.322.000	6	Rp 25.932.000
	November	Rp 4.470.000	7	Rp 31.290.000
	December	Rp 5.120.000	8	Rp 40.960.000
2022	January	Rp 5.092.000	9	Rp 45.828.000
	February	Rp 4.782.000	10	Rp 47.820.000
	March	Rp 5.461.000	11	Rp 60.071.000
	April	Rp 4.795.000	12	Rp 57.540.000
	May	Rp 4.128.000	13	Rp 53.664.000
	June	Rp 6.936.000	14	Rp 97.104.000
	July	Rp 4.782.000	15	Rp 71.730.000
	August	Rp 3.988.000	16	Rp 63.808.000
	September	Rp 4.356.000	17	Rp 74.052.000
	October	Rp 5.440.000	18	Rp 97.920.000
Total		Rp 142.954.300	0	Rp 273.687.400

Source: Data Proceed, 2022

$$a = \frac{\text{Rp } 142.954.300}{37}$$

$$a = \text{Rp } 3.863,630$$

$$b = \frac{\text{Rp } 273.687.400}{4,218}$$

$$b = \text{Rp } 64,886$$

Trend Linear Equation:

$$Y = a + bx$$

$$Y = \text{Rp } 3,863,630 + \text{Rp } 64,886 x$$

Profit Prediction in November 2022 (x = 37):

$$Y = \text{Rp } 3,863,630 + \text{Rp } 64,886 x$$

$$= \text{Rp } 3,863,630 + \text{Rp } 64,886 (37)$$

$$= \text{Rp } 6,264,396$$

From the calculation results, an estimated profit in November 2022 is obtained, which is Rp 6,264,396. This shows that in November 2022, there was an increase in sales, so that which had an impact on increasing profits.

V. CONCLUSION

Based on the results of data processing, it can be concluded that MSMEs can apply profits using the Least Square Method because it is a way of calculating predictions that is relatively easy to apply. The Least Square method can be applied to profit predictions in future periods using previous profit data. The least square method can be more accurate in profit forecasting.

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