IMPLEMENTATION OF LEAST SQUARE METHOD FOR SALES PREDICTION IN TRIA MS GLOW

Fauriatun Helmiah[1*], Dahriansah[1]

[1]Information Management, Sekolah Tinggi Manajemen Informatika dan Komputer Royal, Indonesia

Corresponding author:
fauriatunh@gmail.com

ABSTRACT

Tria Ms Glow is a skincare reseller of Ms Glow brand located in the city of Stabat, at this time Ms. Glow's products are demanded by many consumers especially women. But over time the demand for Ms Glow products more and makes the owner a little overwhelmed with the number of requests so to avoid and minimize future losses, it is necessary to have a sales forecasting activity using the Least Square method, Least Square method is one of the methods in the form of data series periodic or time series, which required sales data in the past to forecast sales in the future. In this case, the data used is sales data from January to March 2020. The result is forecasting applications can help Tria Ms. Glow in predicting skincare sales in the next period according to needs. In this case, the next period is the following month based on the last month entered.

INTRODUCTION

Nowadays, there are so many different types of skincare products that appear in various brands, considering that women love beauty and want to always look beautiful. One of the most popular skincare products at this time is the brand Ms. Glow, in this product there are various variants according to the needs and according to the type of consumer's skin. In this case, the authors chose the 3 most popular variants, namely the Anti Acne package, the Luminous package and the Whitening package. Tria Ms Glow is a reseller of this skincare product and finds obstacles as there are many interested people and requests for this product and to minimize losses. the expiration date is approaching, until the sale price falls. The method used in predicting sales is the least square method because this method can be used to make forecasts by minimizing the criteria function for the number of squares of prediction errors [1].

Forecasting Method is a way to estimate quantitatively what will happen in the future, based on relevant data in the past. This method is very useful in carrying out an analysis approach to the behavior or patterns of past data, so that it can provide systematic, pragmatic ways of thinking, working and solving as well as providing a more level of confidence [2].

The forecasting process using the Least Square method begins by determining the number of N (number of periods/years) and the number of data pairs that will be used in forecasting as the base period [3], [4]. Then a value (a Trend value) will be determined. Then the system will calculate the value of b (change in Trend value) with respect to X (time period) [5], [6]. The results of these calculations will be used to determine the value of Y (estimated) or the results of forecasting in the period predicted the level of sales remarks [3], [7].

Table 1. Data Input

No	Product Varian Name	Sale In 2020					Sale Amount
		Jan	Feb	Maret	April	Mei	
1	Anti Acne Package	80	85	100	100	100	465
2	Luminous Package	90	92	98	99	100	479
3	Whitening Package	90	96	97	99	100	482

Table 2. Data Output

No	Data Name	Source
1	Sales Forecasting	Tria Ms Glow Stabat

Input data is used to process data as input material so that it can calculate future sales predictions in order to minimize losses. This method This research is a descriptive study that is conducting a survey of the location and direct interviews with related parties. The sample data was obtained from a skincare sales transaction at Tria Ms Glow [3].

METHOD

The method used in this research is the least square method, which is a periodic series method in which sales data is needed in the past to forecast sales in the future [8].
Method equation [9] *Least Square*, as follows:

$$Y = a + bX \qquad (1)$$

To find the values of a and b of the trend equation two normal equations can be used as follows:

$$\sum Y = n.a + b.\sum X \qquad (2)$$

$$\sum XY = a.\sum X + b.\sum x^2 \tag{3}$$

If the midpoint of the data is as a base year, then $\sum X = 0$ and can be removed from the two equations above and become:

$$a = \frac{\sum y}{n}$$
$$b = \frac{\sum xy}{\sum x^2} \tag{4}$$

If there are several odd periods, the midpoint of the time is determined $X = 0$, so that the positive and negative numbers will be equal to zero.

Information :

Y = Periodic data (Time Series) = estimated trend data
X = Time variable (day, week, month or year)
a = Value of the trend in the base year
b = Average growth in the value of the trend in each year
n = Amount of data.

Prediction Stages (*Forecasting*)
There are 5 (five) forecasting stages, namely:
1. Determining the problem to be analyzed and collect data needed in the analysis process.
2. Preparing the data to be processed correctly.
3. Establish forecasting methods in accordance with the data that has been prepared.
4. Implement predetermined methods and make predictions on the data for some time to come.
5. Evaluate forecasting results [9].

Forecasting Techniques
Forecasting techniques can be done in 2 ways, namely:
1. Qualitatively (nonstatistical method) is an assessment method that emphasizes someone's opinion (judgment). This was important because the results of the forecasting are determined based on intuitive thoughts, opinions and knowledge of the people who compose them.
2. Quantitatively (statistical method) is a method of assessment that emphasizes numerical calculations using a variety of statistical methods. The results of forecasting are made very dependent on the method used in the forecasting.

Quantitative forecasting can be used if there are 3 conditions, namely:
a. Information about the past.
b. This information can be showed the quantitative in the form of data.

This information can be assumed that some aspects of past patterns will contunue in the future. The latter condition is made as a continuous

assumption, this assumption is the capital that underlies all quantitative forecasting methods and also qualitative forecasting methods, regardless of how sophisticated the method is.

c. Quantitative forecasting methods there are 2 types of forecasting, namely
d. Time series model, in this method the estimation of the future is based on the past value of a variable. The time series forecasting technique consists of moving average, exponential smoothing, and regression which is least square [10].

RESULT AND DISCUSSION

The purpose of this research is to know the prediction of forecasting sales in the future, research data is taken from January to May 2020 based on sales data. Least Square algorithm. The following is the least square algorithm prediction

Table.3 Data on the number of Ms. Glow Anti Acne's Skincare Sales during January - May 2020

Period	Y (Sales Amount)	Unit	X	X.Y	X^2
January	80	Package	-2	-160	4
February	85	Package	-1	-85	1
March	100	Package	0	0	0
April	100	Package	1	100	1
May	100	Package	2	200	4
$\sum$	465	-	0	55	10

$a = \sum y / n = 465 / 5 = 93$
$b = \sum XY / \sum X^2 = 55 / 10 = 5,5$
$y = a + bX = 93 + 5,5(3) = 109,5$

The prediction of Ms. Glow Anti Acne Package sales in June is 109.5 or equal to 109 Packages.
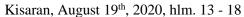
1. Calculation of Skincare Sales Prediction "Ms Glow"

Table. 4 Data Jumlah Penjualan Skincare Ms Glow Luminous selama Januari– Mei 2020

Periode	Y (jumlah penjualan)	Satuan	X	X.Y	X^2
Januari	90	Package	-2	-180	4
Februari	92	Package	-1	-92	1
Maret	98	Package	0	0	0
April	99	Package	1	99	1
Mei	100	Package	2	200	4
$\sum$	479	-	0	27	10

$a = \sum y / n = 479 / 5 = 95,8$
$b = \sum XY / \sum X^2 = 27 / 10 = 2,7$
$y = a + bX = 95,8 + 2,7 (3) = 103,6$

The prediction for the sales of Ms Glow Luminous Package in June is 103.6 or equal to 104 Packages.

2. Calculation of Sales Prediction Skincare"Ms Glow"

Table. 4 Data on the number of Ms. Glow Whitening's Skincare Sales during January – May 2020

Period	Y (Sale Amount)	Unit	X	X.Y	X^2
January	90	Package	-2	-180	4
February	96	Package	-1	-96	1
March	97	Package	0	0	0
April	99	Package	1	99	1
May	100	Package	2	200	4
$\sum$	482	-	0	23	10

$a = \sum y / n = 482 / 5 = 96,4$
$b = \sum XY / \sum X^2 = 23 / 10 = 2,3$
$y = a + bX = 96,4 + 2,3 (3) = 103,3$

The prediction for the sales of Ms Glow Whitening Package in June was 103.3 or equal to 104 packages.

CONCLUSION

The results of the discussion in this study can be concluded that the least square method used for the prediction of sales of the Least Square Method is applied to TriaMs Glow and can predict the number of Ms Glow skincare sales and is able to minimize errors in forecasting.

BIBLIOGRAPHY

[1]   Y. Wang, Q. Chen, M. Sun, C. Kang, and Q. Xia, "An Ensemble Forecasting Method for the Aggregated Load with Subprofiles," *IEEE Trans. Smart Grid*, vol. 9, no. 4, pp. 3906–3908, 2018, doi: 10.1109/TSG.2018.2807985.

[2]   D. Liu, L. Zeng, C. Li, K. Ma, Y. Chen, and Y. Cao, "A Distributed Short-Term Load Forecasting Method Based on Local Weather Information," *IEEE Syst. J.*, vol. 12, no. 1, pp. 208–215, 2018, doi: 10.1109/JSYST.2016.2594208.

[3]   H. Chi, "A Discussions on the Least-Square Method in the Course of Error theory and Data Processing," *Proc. - 2015 Int. Conf. Comput. Intell. Commun. Networks, CICN 2015*, pp. 486–489, 2016, doi: 10.1109/CICN.2015.100.

[4]   C. Fan and C. Liu, "A novel algorithm for circle curve fitting based on the least square method by the points of the Newton's rings," *Proc. - 2015 Int. Conf. Comput. Commun. Syst. ICCCS 2015*, pp. 256–260, 2016, doi: 10.1109/CCOMS.2015.7562911.

[5]   Y. Fujita, S. Ikuno, T. Itoh, and H. Nakamura, "Modified improved interpolating moving least squares method for meshless approaches," *IEEE Trans. Magn.*, vol. 55, no. 6, pp. 1–4, 2019, doi: 10.1109/TMAG.2019.2900374.

[6]   S. Kou, X. Gong, Q. Zhu, and G. Wang, "Parameter identification of battery model based on forgetting factor recursive least square method," *Proc. 2018 IEEE 4th Inf. Technol. Mechatronics Eng. Conf. ITOEC 2018*, no. Itoec, pp. 1712–1715, 2018, doi: 10.1109/ITOEC.2018.8740487.

[7]   J. Chen and Y. Yin, "Filter Design Based on A Novel Non-iterative Least Square Method with Adjustable Parameter," *2018 IEEE Int. Conf. Signal Process. Commun. Comput. ICSPCC 2018*, no. 10, pp. 1–3, 2018, doi: 10.1109/ICSPCC.2018.8567764.

[8]   F. R. Hariri, "Metode Least Square Untuk Prediksi Penjualan Sari Kedelai Rosi," *Simetris J. Tek. Mesin, Elektro dan Ilmu Komput.*, vol. 7, no. 2, p. 731, 2016, doi: 10.24176/simet.v7i2.788.

[9]   B. U. P. Manurung, "Implementasi Least Square Dalam Untuk Prediksi Penjualan Sepeda Motor (Studi Kasus : Pt . Graha Auto Pratama)," *JURIKOM (Jurnal Ris. Komputer)*, vol. 2, no. 6, pp. 21–24, 2015.

[10]   A. Purba, "Perancangan Aplikasi Peramalan Jumlah Calon Mahasiswa Baru yang mendaftar menggunakan Metode Single Exponential Smoothing (Studi Kasus: Fakultas Agama Islam UISU)," *J. Ris. Komput.*, vol. 2, no. 6, pp. 8–12, 2015.