

Analysis Forecasting Sales with Single Exponential Smoothing Method

Abraham Manalu¹, Dewi Roito², Eika Rizkiadina³, Yonata Laia^{4*}

Faculty of Technology and Computer Science, Universitas Prima Indonesia Medan
Sampul Street No. 4, Sei Putih Bar., Medan Petisah, Medan, North Sumatera

Email: ¹brammanalu134@gmail.com, ²manullangdewi043@gmail.com, ³erizkiadina@gmail.com,
^{4*}yonata@unprimdn.ac.id

Abstrak - Saat ini seperti yang kita ketahui bahwasanya penggunaan sistem berbasis komputer hampir semua kegiatan setiap orang tergantung pada sistem berbasis komputer. salah satu saat ini yang sangat memadai dalam penggunaan aplikasi adalah sistem penjualan, pada penelitian ini adalah masalah yang di hadapi oleh perusahaan susahya menentukan jumlah persediaan stok barang setiap bulannya. Penyebabnya adalah karena jumlah jenis barang yang tidak sedikit sehingga ini menjadi penyebab kurangnya terpenuhi permintaan konsumen setiap harinya. Perusaan yang memang memiliki jumlah persediaan yang stok atau persediaan barangnya dalam skala besar maka perlu sistem khusus dalam pengendalian ini agar persediaan yang di butuhkan selalu terpenuhi, gunanya adalah agar pemasukkan perusahaan lebih meningkat lagi. Peneliti sebagai orang paham teknologi sehingga memberikan ide terhadap perusahaan agar menggunakan sistem yang dapa meminimalisir kekurang persediaan barang. Hal inilah yang menjadi peneliti ingin memecahkan masalah tersebut dengan Metode single exponential smoothing. Dikarenakan metode yang digunakan dapat Melakan peramalan dalam waktu jangka pendek misalnya 1 bulan kedepan. Hasil dari penelitian ini berhasil meramalkan jumlah persediaan barang yang di stok setiap bulannya.

Kata Kunci: Single Exponetial smoothing, Peramalan, Penjualan

Abstract - Currently, as we know that the use of computer-based systems, almost everyone's activities depend on computer-based systems. one that is currently very adequate in the use of the application is the sales system, in this research the problem faced by the company is the difficulty of determining the amount of inventory stock each month. The reason is because the number of types of goods is not small so this is the cause of the lack of fulfillment of consumer demand every day. Companies that do have a number of inventories whose stock or inventory is on a large scale, so it needs a special system in this control so that the required inventory is always met, the point is for the company's income to increase even more. Researchers as technology-savvy people provide ideas for companies to use a system that can minimize the lack of goods inventory. This is what the researcher wants to solve the problem with the single exponential smoothing method. Because the method used can do fortune-telling in the short term for example 1 month ahead. The results of this study succeeded in predicting the amount of inventory in stock every month.

Keywords: Single exponential smoothing, Forecasting, The sales

INTRODUCTION

Stock adjustment of inventory data is one of the essential parts of every company engaged in sales. Inventory goods is one of the most critical merchandise in a trading company (Ferawati et al., 2020) In every business, stock of goods is one thing that is very important for the smooth sale of goods to customers (Zalukhu & Handriani, 2019) nd they are also used for production continuity (Pradana & Jakaria, 2020). High inventory allows the company to meet sudden demand in sufficient quantities, evenly distributed and affordable to the community (Sukanda & Dewi, 2018).

Every company engaged in sales is constantly experiencing an increase and decrease in transactions. Each officer must provide a system that can conduct sales transactions and inventory processing effectively and efficiently. So far, most companies still use a manual system whose work must take a long time to forecast the stock of goods available by sales.

Each officer concerned with the inventory of goods is required to provide a plan every month or every week so that can be ordered from the supplier according to the stock of goods that have run out. Research carried out by an information system becomes a tool for forecasting in more effective and efficient planning



with the exponential smoothing method (Raharja et al., 2013). The Exponential Smoothing method is also called Exponential smoothing, which is one of the forecasts with an average taking technique because the weighting is given by an exponential function (Raharja et al., 2013), (Fachrurrazi, 2015), (Faisol & Aisah, 2016). Exponential Smoothing is a fairly good forecasting method in the long and medium-term (Faisol & Aisah, 2016).

The exponential smoothing method parameter is denoted by α (alpha). This picture is used to process the employee section because, with this method, pharmacies can predict what steps will be taken to meet consumer demand. Forecasting or interpreting the results obtained cannot provide 100% results in forecasting data because the future is uncertain. What is uncertain is what can be tested using different alphas to get maximum results. In this study, we succeeded in carrying out sales forecasting based on the transaction history in the past months, which is reference data in forecasting (Al'afi et al., 2020).

Previous researchers said that forecasting predicts future events by utilizing past data (Prasetya et al., 2015).

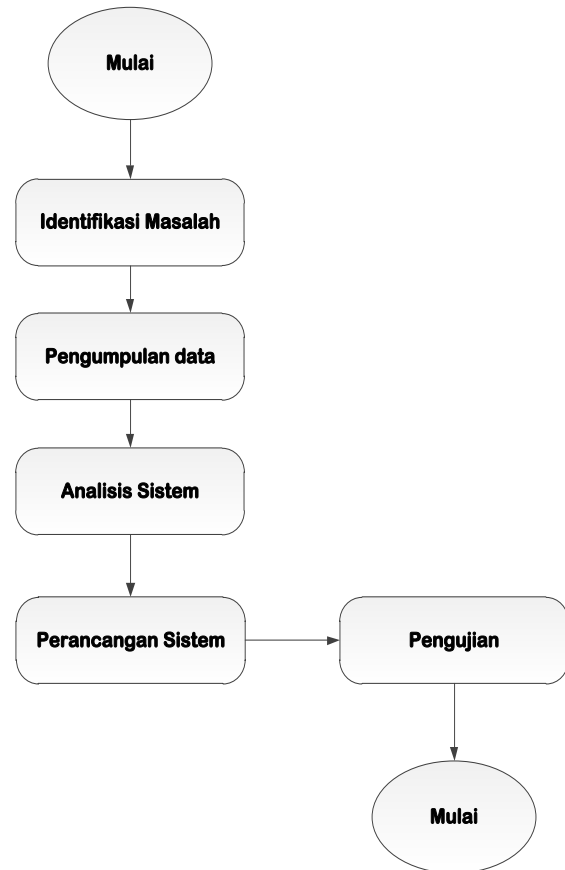
Forecasting aims to minimize forecasting errors that can be measured using Mean Absolute Deviation (MAD) and Mean Square Error (MSE). The other purpose of this forecasting is to predict future events and take advantage of past data (Fachrurrazi, 2015). Time horizon in Forecasting is usually classified based on future time, and Forecasting is an attempt to forecast future situations with data from the past. Based on the time horizon, Forecasting can be divided into three types :

- A. Short range forecast
 It is typically less than 3 months but has a time span of up-to 1 year. It is used in planning, purchasing for job schedules, job assignments, work force levels, product levels.
- B. Medium range forecast
 It is typically 3 months to 1 year but has a time span from one to three years. It is used for sales planning, production planning, cash budgeting and so on.
- C. Long range forecast
 This has a time span of three or more years. It is used for designing and installing new plants, facility location, capital expenditures, research and development, etc.

Sales predictions are not just forecasting or simple additions, but this is one that can control inventory so that the stock needed by consumers is still fulfilled (Gustriansyah, 2017). Information is a fact that has been processed in a certain way that describes a real event to be processed so that it can be understood and used in making a decision (d. Y. K. Harfizar, 2017).

RESEARCH METHODOLOGY

In the opinion of Heizer and Rander (2015, 118), to make a demand forecast must use a particular method. All forecasting methods have the same idea, to use past data to predict or project future data. Based on the technique, forecasting methods can be categorized into qualitative and quantitative methods. The dependent variable to perform forecasting will remain the same, namely, and the independent variable is x .



Source : (Manalu, et.al 2022)

Figure 1. Forecasting System Work Process

Based on previous research, forecasting must use specific methods, even though the forecasting method has a good way of processing data, that is, using past data to predict future data. The technique used is the forecasting method, namely qualitative and quantitative.

$$F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$$

Description :

F_t = the current basic value for the current period (t)

A_{t-1} = actual demand for the current period (t)

F_{t-1} = the previous basic value from the previous period

α = smoothing factor for the basic value

RESULTS AND DISCUSSION

Table 1. Order Data

No	Month	Order
1	January	102
2	February	105
3	March	108
4	April	105
5	May	106
6	June	108
7	July	111
8	August	115
9	September	118
10	October	116
11	November	121
12	Desember	123
13	January	127
14	February	128
15	March	124
16	April	127
17	May	126
18	June	130
19	July	134
20	August	134
21	September	136
22	October	139
23	November	137
24	Desember	140

Source : (Manalu, et.al 2022)

In the table above is the data that will be used in this study, where the data to be used is from January 2021 to December 2022 The method that forecasting will use is to solve the problem with the single exponential smoothing method.

This forecasting method will use random values; examples of values are ($\alpha = 0.2$), ($\alpha = 0.3$), ($\alpha = 0.4$), ($\alpha = 0.5$), ($\alpha = 0.6$), ($\alpha = 0.7$), ($\alpha = 0.8$), ($\alpha = 0.9$), dan ($\alpha = 0.95$). $\alpha = 0.2$, $F_1 =$ because at $t=1$, the value of f_1 (First Forecasting data) becomes the value of $F_1 = 102$

- a. constant calculation $\alpha = 0.2$
 $F_2 = \alpha X_1 + (1 - \alpha) F_1 = (0.2 * 105) + (1 - 0.2)102 = 102.6$
 $F_3 = \alpha X_2 + (1 - \alpha) F_2 = (0.2 * 108) + (1 - 0.2)102.6 = 103.68$
- b. constant calculation $\alpha = 0.3$
 $F_2 = \alpha X_1 + (1 - \alpha) F_1 = (0.3 * 105) + (1 - 0.3)102 = 102.9$
 $F_3 = \alpha X_2 + (1 - \alpha) F_2 = (0.3 * 108) + (1 - 0.3)102.9 = 104.43$
- c. constant calculation $\alpha = 0.4$
 $F_2 = \alpha X_1 + (1 - \alpha) F_1 = (0.4 * 105) + (1 - 0.4)102 = 103.2$

- $F_3 = \alpha X_2 + (1 - \alpha) F_2 = (0.4 * 108) + (1 - 0.4)103.2 = 105.12$
- d. constant calculation $\alpha = 0.5$
 $F_2 = \alpha X_1 + (1 - \alpha) F_1 = (0.5 * 105) + (1 - 0.5)102 = 103.5$
 $F_3 = \alpha X_2 + (1 - \alpha) F_2 = (0.5 * 108) + (1 - 0.5)103.5 = 105.75$
 constant calculation $\alpha = 0.6$
 $F_2 = \alpha X_1 + (1 - \alpha) F_1 = (0.6 * 105) + (1 - 0.6)102 = 103.8$
 $F_3 = \alpha X_2 + (1 - \alpha) F_2 = (0.6 * 108) + (1 - 0.6)103.8 = 106.32$
- e. constant calculation $\alpha = 0.7$
 $F_2 = \alpha X_1 + (1 - \alpha) F_1 = (0.7 * 105) + (1 - 0.7)102 = 104.1$
 $F_3 = \alpha X_2 + (1 - \alpha) F_2 = (0.7 * 108) + (1 - 0.7)104.1 = 106.83$
- f. constant calculation $\alpha = 0.8$
 $F_2 = \alpha X_1 + (1 - \alpha) F_1 = (0.8 * 105) + (1 - 0.8)102 = 104.4$
 $F_3 = \alpha X_2 + (1 - \alpha) F_2 = (0.8 * 108) + (1 - 0.8)104.4 = 107.28$
- g. constant calculation $\alpha = 0.9$
 $F_2 = \alpha X_1 + (1 - \alpha) F_1 = (0.9 * 105) + (1 - 0.9)102 = 104.7$
 $F_3 = \alpha X_2 + (1 - \alpha) F_2 = (0.9 * 108) + (1 - 0.9)104.7 = 107.67$
- h. constant calculation $\alpha = 0.95$
 $F_2 = \alpha X_1 + (1 - \alpha) F_1 = (0.95 * 105) + (1 - 0.95)102 = 104.8$
 $F_3 = \alpha X_2 + (1 - \alpha) F_2 = (0.95 * 108) + (1 - 0.95)104.8 = 107.84$

CONCLUSION

The sale of basic necessities is part of the distribution of the sale and purchase of basic food categories. The demand for goods is a point in the distribution of customers for goods. Employees act to prepare and record purchase orders for goods for the following month. The activity of sorting available and unavailable inventory data often takes a long time. The Exponential Smoothing method is a forecasting method on moving averages by giving weights that are easy to analyze. Time series sales data with Exponential Smoothing forecasting method is expected to be able to handle optimal inventory for inventory control. The use of data from the last 2 years as reference data for past recordings for forecasting experiments for the next 3 months. Experiments with different Alphas tested previously and previously used data from the previous 6 months in research using data from the last 2 years. This system can provide recommendations in the stock of goods so that the supply of sales is still met.

REFERENCES

- Al'afi, A. M., Widiart, W., Kurniasari, D., & Usman, M. (2020). Peramalan Data Time Series Seasonal Menggunakan Metode Analisis Spektral. *Jurnal Siger Matematika*, 1(1), 10–15. <https://doi.org/10.23960/jsm.v1i1.2484>
- Fachrurrazi, S. (2015). Peramalan Penjualan Obat Menggunakan Metode Single Exponential Smoothing Pada Toko Obat Bintang Geurugok. *Jurnal Techsi*, 7(1), 19–30.
- Faisol, F., & Aisah, S. (2016). Penerapan Metode Exponential Smoothing Untuk Peramalan Jumlah Klaim Di Bpjs Kesehatan Pamekasan. *Jurnal Matematika "MANTIK,"* 2(1), 46. <https://doi.org/10.15642/mantik.2016.2.1.46-51>
- Ferawati, Davita Fersiartha, K., & Yuliana, I. (2020). Analisis Pengaruh Persediaan Barang Dan Penjualan Terhadap Laba Perusahaan (Studi Kasus Cv Davin Jaya Karimun). *Jurnal Cafeteria*, 1(2), 33–44. <https://doi.org/10.51742/akuntansi.v1i2.146>
- Gustriansyah, R. (2017). Analisis Metode Single Exponential Smoothing Dengan Brown Exponential Smoothing Pada Studi Kasus Memprediksi Kuantiti Penjualan Produk Farmasidi Apotek. *Seminar Nasional Teknologi Informasi Dan Multimedia 2017*, 3(March), 5–12. <https://ojs.amikom.ac.id/index.php/semnasteknomedia/article/view/1653>
- Pradana, V. A., & Jakaria, R. B. (2020). Pengendalian Persediaan Bahan Baku Gula Menggunakan Metode EOQ Dan Just In Time. *Bina Teknika*, 16(1), 43. <https://doi.org/10.54378/bt.v16i1.1816>
- Prasetya, I., Rahayu, D. Y., Kom, M., & Pendahuluan, I. (2015). *Penentuan Harga Jual Sepeda Motor Bekas Menggunakan Fuzzy Logic (Metode Tsukamoto) Dan Implementasinya*. 1–8.
- Raharja, A., Angraeni, W., Si, S., Kom, M., Vinarti, R. A., & Kom, S. (2013). Peramalan Penggunaan Waktu Telepon Di Pt . Telkomsel Divre3 Surabaya. *Jurnal Sistem Informasi*, 1–9.
- Sukanda, R. S., & Dewi, A. S. (2018). Tinjauan Atas Pengelolaan Persediaan Bahan Baku Pada Divisi Kendaraan Khusus Pt Pindad Persero Kota Bandung. *Jurnal Riset Akutansi*, X(1), 10–111.
- Zalukhu, S., & Handriani, I. (2019). Aplikasi Sistem Inventory (Studi Kasus : Pt . Cakra Medika Utama). *Jsai*, 2(1), 116–122.