Bit-Tech
Vol.4, No.1, August 2021
Available online at: http://jurnal.kdi.or.id/index.php/bt

Analysis and Design of Inventory Control Information Systems With Forecasting Methods: Moving Average and Exponential Smoothing

Stefanus[1)], Riki[2)]*
[1)3)]Universitas Buddhi Dharma
Jl. Imama Bonjol No 41-Karawaci Ilir, Tangerang, Indonesia
[1)] stefanusschneider@gmail.com
[3)] riki@ubd.ac.id

Article history:

Received 16 July 2021;
Revised 3 August 2021;
Accepted 8 August 2021;
Available online 30 August 2021

Keywords: {use 4-6 keywords}

Sale
Forecasting
Moving average
Exponetial Smooting

Abstract

Inventory inventory on CV. Mitra Marga Sejahtera often experiences stockpiling of goods so that it wastes more costs and the manual process of recording goods using excel, so that they often experience data corruption and loss of sales data. Forecasting methods are usually used by the sales department in planning (sales planning) based on the results of sales forecasts, so that forecasting information can be useful for Production which uses Moving Average and Exponential Smoothing. the program that has been made using the forecasting method can help manage the stock of goods that will be needed in the coming months, so that store managers can save costs in stock items that are not excessive

I. INTRODUCTION

Technological developments are now growing rapidly, from software to hardware. Each company strives to always improve the quality of its products and marketing management with the aim of maximizing profits according to the targets desired by each company. Therefore, the company or store requires an information system that aims to carry out the data storage process.

Many companies or shops input stock with a manual system, CV. Mitra Marga Sejahera is a computer shop that sells complete computer spare parts. On CV. Mitra Marga Sejahtera is still doing a manual system, namely by recording manually, where there are still many errors in the process of inputting goods into and out.

From the above problems, the main problem arises, namely, the process of determining the quantity of goods that accumulate and waste more costs. Then an idea emerged in creating a system that helps in the process of sales data and forecasting future stock of goods. With this system, it is hoped that it can help shop owners handle incoming stock so that it can be computerized properly between the user and the user interface itself.

In this problem, an application for inventory control is needed, which becomes the accumulation of stock which becomes more expensive. So the computer shop requires a forecasting tool (Forcasting). The process of estimating (measurement) the amount or amount of something in the future based on data in the past which is analyzed scientifically, especially using statistical methods.

The forcasting or forecasting method used is the Single Moving Average and exponential smoothing (Exponential Smoothing) which is a forecasting method that calculates the average of a time series value and then is used to estimate the value in the next period. The reason for using Single Moving Average and Exponential Smoothing is that the formula is quite easy and has a small error rate.

II. RELATED WORKS/LITERATURE REVIEW (OPTIONAL)

(Forcasting

According to [1] "The definition of forecasting (forecasting) is the art and science of predicting future events. This can be done by using historical data and calculation processes to predict a projection of future events. Another way that can be taken is by subjective intuition or with a mathematical model compiled by the management.

According to [2] "Forecasting is input or basic input in the decision-making process of operations management because forecasting provides information in future requests. One of the main objectives of operations management is

* Corresponding author

ISSN 2622-2728 (online) 2622-271X (print)
doi:

to balance supply or supply and demand, and having a forecast of future demand is very important to determine how much capacity, supply or supply is needed to balance demand.

Forecasting methods are usually used by the sales department in planning (sales planning) based on the results of sales forecasts, so that forecasting information can be useful for Production Planning and Inventory Control (PPIC). According to [3] where forecasting plays an important role, among others:

1. Scheduling of existing resources.
2. Forecasting the level of demand for products, materials, labor, finance, or services is an important input for scheduling.
3. Forecasting is needed to determine future resource requirements.
4. Determine the desired resources.
5. All organizations or companies must determine what resources they want to have in the long run.

Types of Forecasting

In production activities, forecasting the level of demand for a product is needed to anticipate changing demand. In general, the types of forecasting according to [4]

1. Economic Forecast
   Planning useful indicators helps organizations to prepare medium to long term forecasts, which explain about the business cycle predicting inflation rate, availability of money, funds needed to build other planning indicators.
2. Economic Forecast . Economic Forecast
   Planning useful indicators helps organizations to prepare medium to long term forecasts, which explain about the business cycle predicting inflation rate, availability of money, funds needed to build other planning indicators.
3. Demand Forecast Demand Forecast
   Forecast sales and demand for a company at each period in the time horizon. Sales forecasts that control production, capacity, and scheduling systems and serve as inputs for financial, marketing, and human resource planning.

Single Moving Average

The Single Moving Average forecasting method is done by taking a group of observed values which are then searched for the average, then using the average as a forecast for the next period. The term moving average is used, because each time new observational data is available, a new average is calculated and used as a forecast.

The Single Moving Average uses some past actual data to generate forecasts. Moving averages are useful if we assume that market demand will be stable over the time we forecast. Systematically, the simple moving average is shown as follows

$$MA = (n1 + n2 + n3 + ...) / n$$

Information :
MA = Moving Average
n1 = First Period Data
n2 = Second period data
n3 = Third period data
n = Number of periods moving average

Exponential Smoothing

The single exponential smoothing method is a forecast method by smoothing the fluctuations from the forecast results. Forecast with single exponential smoothing method on each data will be given a weight symbolized by alpha. Alpha values range from 0 to 1 [5]. The alpha value in the forecast model used for the total patient visits is determined from the results of trial and error. The alpha value obtained after the trial-and-error process is 0.05. This alpha value of 0.05 is then entered into a single exponential smoothing forecast model with processing with the help of computer software.

The forecasting formula with exponential smoothing method is:

$$F't = (F't1 + a * (Dt'1 - Ft1))$$

Information:
F_{t+1} = Forecast for the next period
D_t = Actual demand in period t

F_t = pre-determined forecast for period t
a = Weight factor

Stock

According to [6] defines inventory as "Inventories are generally intended for goods owned by trading companies, both in the form of wholesale and retail businesses when these goods have been purchased and the condition is ready for sale".

According to [7] “Inventory is one of the company's assets that is very important because it directly affects the company's ability to obtain opinions. Therefore, inventory must be managed and recorded properly so that the company can sell its products and earn income so that the company's goals are achieved. Inventories are materials or goods that are stored to be used to fulfill certain purposes, for example to be used in the production process or spare parts of an equipment or machine. Inventories can be in the form of raw materials, auxiliary materials, work in process (WIP), finished goods, or spare parts. It can be said that there is no company that operates without inventory even though inventory is only an idle source of funds, because before the inventory is used it means that the funds involved cannot be used for other purposes. So important is this inventory that accountants include it on the balance sheet as one of the current asset items.

Sales

Influence and provide instructions so that buyers can adjust their needs to the production offered and enter into agreements regarding prices that are beneficial for both parties.

According to [9]"sales is a process of exchanging goods or services between sellers and buyers".

There are several types of sales, namely:

1. *Trade Selling*
   Is a type of sales made by traders to wholesalers, the main purpose of which is to resell.
2. *Tehnical Selling*
   Is a way or efforts to increase sales by providing advice and advice to consumers or final buyers of goods and services. In this case, the entrepreneur has the main task of identifying and analysing all kinds of problems faced by buyers and then showing how the products or services offered can solve the problems of consumers and buyers.
3. *Missionary Selling*
   Is a form of entrepreneurship where entrepreneurs or companies try to increase their sales by encouraging buyers and of course to buy their products or services? In this case the entrepreneur or company concerned has its own distributor in distributing or distributing its products or services.
4. *Missionary Selling*
   It is an attempt to open stone transactions by turning a potential customer into a consumer

III. METHODS

Single Moving Average (SMA)

To complete this method there are several characteristics, namely:

1. To determine the forecast in the future period requires historical data for a certain period of time.
2. The longer the period of the moving average, the more visible the smoothing effect in the forecast or the smoother the moving average.

Moving Average formula or moving average is as follows:

$$(ft) = \frac{\sum amount\ of\ data\ n\ previous\ period}{n}$$

$$(ft) = \frac{\sum At{\sim}1\ +\ At{\sim}2\ +\ At{\sim}3 + \ldots + At{\sim}n}{n}$$

Information:
Ft = Forecasting for the coming period
n = Number of Moving Average forecasting periods
At~1 = Actual data one period before forecasting

At~2 = Actual data two periods before forecasting
At~3 = Actual data for three periods before forecasting
At~4 = Actual data one n before forecasting
The nth number must be adjusted to the requested problem.

Calculation of Forecasting the V-gen 4 GB Ram inventory at CV. Mitra Marga Sejahtera in 2020 using the Single Moving Average method. To calculate the 2020 forecast, it is necessary to calculate the 2019 forecast.

Table 3.3 SMA Forecasting Method

Month	Stock	3 Months Period
January	9	-
Febuary	11	-
March	10	-
April	8	10
May		9.67

By using the Single Moving Average (moving average) method, the forecast for April and May with the Single Moving Average (3 months) is:

1. April 2019 = $\frac{9 + 11 + 10}{3}$ = 10
2. May 2019 = $\frac{11 + 10 + 8}{3}$ = 9.67 (10)

Single Exponential Smoothing (SES)
The forecasting formula with exponential single smoothing method is:

$$F't = (F't1 + a * (Dt'1 - Ft1))$$

Information:
F_{t+1} = Forecast for the next period
D_t = Actual demand in period t
F_t = pre-determined forecast for period t
a = Weight factor

Calculation of Forecasting the V-gen 4 GB Ram supply at CV. Mitra Marga Sejahtera in 2020 using the Single Exponential Smoothing method, namely:

Table 3.4 SES Method Forecasting

Month	Stock	3 Months Period
January	9	9
Febuary	11	9.2
March	10	9.28
April	8	9.152

$$F't = (F't1 + a * (Dt'1 - Ft1))$$

Known value of a = 0.1

1. January = 9 + 0.1 x (9 – 9)
   9 + 0.1 x 0 = 9
2. February = 9 + 0.1 x (11 – 9)
   9 + 0.1 x 2 = 9.2
3. March = 9.2 + 0.1 x (10 – 9.2)
   9.2 + 0.1 x 0.8 = 9.28
4. April= 9.28 + 0.1 x (8 – 9.28)
   9.28 + 0.1 x -1.28 = 9.152

So the forecasting results of 4GB DDR3L V-Gen Ram for May 2019 with the Single Exponential Smoothing Method are 9,152.

IV. RESULTS

In this application there are several menus that are used as the transaction process, namely:
Dashboard, displaying the main page in summary criteria of transactions that have been processed previously
Master data, pages for item stick transactions, users and forecasting data that have been calculated for the period
Sales data, transactions for goods that have been sold based on Point of Sale
Forecasting, transaction processing forecasting calculations using Moving Average and Exponential Smoothing.

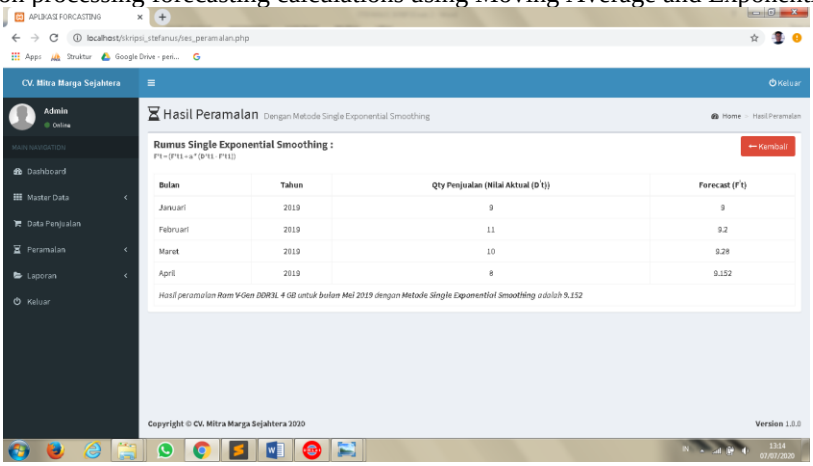

Fig 1. Dashboard

This page display displays a form containing the year, item, alpha value and displays the results of the forecast according to the selected item.

V. CONCLUSIONS

After doing research and making observations on CV. Mitra Marga Sejahtera, several conclusions can be drawn. With the program that has been made forcasting methods, it can help manage the stock of goods that will be needed in the coming months, so that store managers can save costs in stock items that are not excessive and with this system, they can see and managing sales data and knowing computerized sales revenue.

References

[1] Heizer and B. Render, in *Operations Management Edisi Kesembilan Buku Dua*, Jakarta, Salemba Empat, 2011 : 136, p. 136.

[2] Stevenson, in *Operations Management*, Jakarta, Salemba Empat, 2011 : 72, p. 72.

[3] Hartini, in *Teknik Mencapai Produksi*, Bandung, Lubuk Agung, 2011 : 18, p. 18.

[4] Heizer and R. , in *Operations Management*, Jakarta, Salemba Empat, 2015 : 115, p. 115.

[5] B. Langi and R. , "Penggunaan Metode Exponensial Smoothing dalam Meramal Pergerakan Infl asi Kota Palu.," *Jurnal Ilmiah Sains.*, p. 13, 2013 : 13.

[6] S. K. Earl and F. Skousen, in *Akuntansi Keuangan.*, Jakarta, Salemba Empat, 2011 : 572, p. 572.

[7] Rudianto, in *Pengantar Akuntansi Konsep & Teknik Penyusunan Laporan Keuangan*, Jakarta, Erlangga, 2012 : 222, p. 222.

[8] B. Swastha, Manajemen Pemasaran modern, Yogyakarta: Liberty, 2014 : 34.

[9] a. aku and b. buku, “title is short,” *Journal of Dummy*, vol. 1, no. 1, pp. 1-10, 2017.

[10] BPS - Statistics Indonesia, " Produksi Daging Ayam Ras Pedaging menurut Provinsi, 2009-2019," https://www.bps.go.id/, Jakarta, 2020.

[11] M. Prasojo, in *Pengantar Sistem Informasi Manajemen*, Bandung, CV.Remadja Karya, 2011 : 488, p. 488.