

Information On Pharmacy Inventory Management With Forecasting Method (Double Moving Average & Double Exponential Smoothing)

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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

In the business era, internet progress is currently growing rapidly, technology is needed, it requires every company to have good management so that the business continues to run and survive. The decisions taken by an owner will affect the success or failure of a company in the future, by knowing how many sales requests are in the next period and how many sales products must be done by the pharmacy owner in order to predict sales data that can produce calculations for the next month. Effective planners for both the long and short term depend on the company's sales demand. (Heizer and Render, 2015). Principles are the most important part for every business organization in every decision making in management. demand not only needs to be implemented in companies that already have big names, but also apply in pharmacies so that the amount of drug stock can match consumer demand. Besides that, why do pharmacies need to forecast, so that in order to know the number of drug sales, smooth operations can run effectively, so that the managed business is able to compete with other businesses, because even though the managed business already has good human resources, sophisticated application programs but what consumers need cannot be met quickly, the business will experience losses. In this case, Cipondoh Pharmacy experienced problems. in planning drug supply information. Data on demand and supply of drugs at the Cipondoh Pharmacy can be seen that the number of requests and the amount of drug supply is often unbalanced. They are required to be able to increase competitiveness. Competition that occurs among them is competition related to the sale of products produced by the company, product prices, and the company's ability to meet consumer demand. demand. This happens because pharmacies order drug supplies without planning. Therefore, forecasters are needed to be able to analyze sales and streamline the existing system at the pharmacy.

II. RELATED WORKS/LITERATURE REVIEW (OPTIONAL)

Forecasting

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 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.
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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.

Double Moving Average Method

The single moving average method uses a number of new actual demand data to generate forecast values for future demand. This method will be effective if it can be assumed that the market demand for the product will remain stable over time.

The double moving average is the second moving average. In other words, the result of a single moving average is used to perform a double moving average. It is easier to say that it is a moving average of the previous moving average. Double moving averages can be used when the actual data has a trending pattern. In this method the order used must be the same, for example 3x3, meaning that from the initial data a moving average of order 3 is performed, then the results of MA(3) are carried out with a moving average of order 3 as well.

The procedure in the moving average is:

1. Use of single moving average
2. Adjustment, which is the difference between single MA and double MA ($S^t - S''^t$),
3. Adjusting the trend from period t to $t+m$
 n_3 = third period data and so on.
 n = Number of Periods of Moving Average

Exponential Smoothing Method

Exponential Smoothing is an exponential smoothing of time series data giving an exponentially decreasing weight for the newest to oldest observations. In other words, the older the data, the less priority (weight) the data is given. More recent data is seen as more relevant and given more weight. Exponential Smoothing is usually denoted by α , to assign weights to observations. Exponential Smoothing is usually used to make short-term forecasts, because long-term forecasts using this technique can be very unreliable. Exponential Smoothing is divided into three types, namely:

a. Simple Exponential Smoothing

This method is also often called the single exponential smoothing which is commonly used by traders for short-term forecasting. The model assumes that the data fluctuates around a fixed mean value, and also without a consistent growth trend or pattern. Unlike Moving Averages, Exponential Smoothing will offer a greater emphasis on time series through the use of a smoothing constant. The basic formula is: $S_t = \alpha S_{t-1} + (1 - \alpha) S_{t-1}$

Where :

α = smoothing constant, value from 0 to 1.

When α is close to zero, smoothing occurs more slowly. The best value for α is the one that produces the least mean squared error (MSE). There are various ways to do this, but a popular method is the Levenberg-Marquardt

algorithm. t = time period There is an alternative formula . For example, Roberts (2012) replaces y_{t-1} with the current observation, y_t . Another formula uses forecasts for the previous period and the current period.

Where :

F_{t-1} = forecast for the previous period,

A_{t-1} = Actual demand for the period,

a = weight (must be between 0 and 1). The closer to zero, the smaller the weight.

The formula used is usually an important point, because most

Exponential Smoothing is done using software. Whichever formula you use, you have to make initial observations and can also average the first few observations, or set the second smoothing value to be the same as the original observation value to get the ball rolling.

b. Double Exponential Smoothing

This Exponential Smoothing method is considered more reliable for analyzing data which shows the trend. This is a more complicated method that adds a second equation to the procedure:

$$b_t = (S_t - S_{t-1}) + (1 - b) b_{t-1}$$

Where: b is a constant selected with reference to . As can be selected through the Levenberg-Marquardt algorithm.

c. Triple Exponential Smoothing

If your data shows trend and seasonality, use the triple type

Exponential Smoothing. For the seasonal component, it is indeed the most important factors to show variations in the dependent variable during a 1 year period. In addition to the equations for the two previous types, this third equation is used to deal with the seasonal aspect: $I_t = y_t / S_t + (1-B) I_{t-L} + m$ Where :

y = observation,

S = smoothing observations,

b = trend factor,

I = seasonal index,

F = estimate m periods in the future,

t = time period

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. *Tehcnical 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

Double Moving Average & Double Exponential Smoothing method

Moving Average (MA) and the second method Exponential smoothing (Es). It should be noted that the second method is the development of the first method by adding different weighting factors. This can be based if the effect of newer data is greater than older data on future conditions

Double Moving Average Method Formula:

$$S't = \alpha D_t + (1 - \alpha) S't-1$$

$$S''t = \alpha S't + (1 - \alpha) S''t-1$$

$$a_t = S't + (S't - S''t)$$

$$b_t = (\alpha/(1 - \alpha))(S't - S''t)$$

$$F_{t+m} = a_t + b_t m$$

Double Exponential Smoothing Method Formula:

$$S'_t = \alpha D_t + (1 - \alpha) S'_{t-1}$$

$$S''_t = \alpha S'_t + (1 - \alpha) S''_{t-1}$$

$$a_t = S'_t + (S'_t - S''_t)$$

$$b_t = (\alpha/(1 - \alpha))(S'_t - S''_t)$$

$$F_{t+m} = a_t + b_t m$$

The Double Moving Average Method Formula:

$$S'_t = \alpha D_t + (1 - \alpha) S'_{t-1}$$

$$S''_t = \alpha S'_t + (1 - \alpha) S''_{t-1}$$

$$a_t = S'_t + (S'_t - S''_t)$$

$$b_t = (\alpha/(1 - \alpha))(S'_t - S''_t)$$

$$F_{t+m} = a_t + b_t m$$

Forecasting Results with Double Moving Average Method:

HASIL PERAMALAN DENGAN METODE DOUBLE MOVING AVERAGE :

[← Kembali](#)

Bulan	Tahun	D _t	S'	S''	a	b	F _t	
Januari	2019	5						
Februari	2019	18	11.5					
Maret	2019	25	21.5	16.5	26.5	10	16.5	
April	2019	36	30.5	26	35	9	26	
Mei	2019	51	43.5	37	50	13	37	
Juni	2019						63	m = 1
Juli	2019						76	m = 2

The Double Exponential Smoothing Method Formula:

$$S't = \alpha D_t + (1 - \alpha) S't-1$$

$$S''t = \alpha S't + (1 - \alpha) S''t-1$$

$$a_t = S't + (S't - S''t)$$

$$b_t = (\alpha/(1 - \alpha))(S't - S''t)$$

$$F_{t+m} = a_t + b_t m$$

Forecasting Results With Methods

HASIL PERAMALAN DENGAN METODE DOUBLE EXPONENTIAL SMOOTHING :

[← Kembali](#)

Bulan	Tahun	D _t	S'	S''	a	b	F _t	
Januari	2019	5	5	5	5	0	0	
Februari	2019	18	6.3	5.13	7.47	0.13	7.6	
Maret	2019	25	8.17	5.434	10.906	0.304	11.21	
April	2019	36	10.953	5.9859	15.9201	0.5519	16.472	
Mei	2019	51	5.1	0.51	9.69	0.51	10.2	
Juni	2019						10.2	m = 1
Juli	2019						10.71	m = 2
Agustus	2019						11.22	m = 3

IV. RESULTS

HASIL PERAMALAN DENGAN METODE DOUBLE MOVING AVERAGE :

[← Kembali](#)

Bulan	Tahun	D _t	S'	S''	a	b	F _t	
Januari	2019	5						
Maret	2019	25	15	7.5	22.5	15	7.5	
April	2019						37.5	m = 1
Mei	2019						52.5	m = 2
Juni	2019						67.5	m = 3

DMA Method Forecasting Results View Image

The second view of this page displays a form containing Year, Item, and period. And display the calculation results from forecasting according to the selected item

V. CONCLUSIONS

After conducting research and making observations at the Cipondoh Pharmacy, several conclusions can be drawn with the program that has been made, as follows:

1. With a program that uses the forecasting method, it can assist in managing the stock of goods that will be needed in the following month.
2. With this system, the pharmacy owner can view stock and manage sales data and find out computerized sales income.
3. shop owner can save cost in stock items.

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