

FORECASTING THE TOTAL SALES AND BENEFITS OF DRUG USING THE SINGLE EXPONENTIAL SMOOTHING METHOD (CASE STUDY: BENTAR PHARMACY)

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ABSTRACT

Forecasting is an important thing in corporate strategy planning. The Single Exponential smoothing method is a time series forecasting method. The purpose of the research is to predict the number of sales of Enervon C drugs and the value of profits at the Bentar Pharmacies each month. The study used sales data for 3 years from January 2015 to December 2017. The chosen alpha value was 0.5 by having a MAD value of 5.029360202. Forecasting results are carried out by the Single Exponential Smoothing method with the smallest error calculation results. MAD value on the number of sales of Enervon Aktive 30s with $\alpha = 0.1$ forecasting results 6.9118 with MAD of 7.363601841, $\alpha = 0.2$ forecasting results of 6.0622 with MAD of 5.375139148, $\alpha = 0.3$ forecasting results of 5.7198 with MAD of 5.375139148, $\alpha = 0.4$ forecasting results 5,3421 with MAD of 5,121971763, $\alpha = 0.5$ forecasting results 4,9617 with MAD of 5,029360202, $\alpha = 0.6$ forecasting results 4,5888 with MAD of 5,04912007, $\alpha = 0.7$ forecasting results 4.2229 with MAD of 5.206054971, $\alpha = 0.8$ forecasting results of 3.8533 with MAD of 5.385531046, and $\alpha = 0.9$ forecasting results of 3.456869004 with MAD of 5.599237215. And the value of drug benefits obtained from forecasting results in 2017 by comparing the actual benefits and the benefits of forecasting.

Keywords: Forecasting, Single Exponential Smoothing, Alpha, MAD, Tracking signal, MAPE.

1. INTRODUCTION

Forecasting is an important thing in corporate strategy planning. The Single Exponential smoothing method is a time series forecasting method. The purpose of the research is to predict the number of sales of Enervon C drugs and the value of profits at the Bentar Pharmacies every month. The study used sales data for 3 years from January 2015 to December 2017. The chosen alpha value was 0.5 by having a MAD value of 5.029360202.

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Based on this study the author takes the title "Forecasting the Number of Sales and Value of Drug Profits using the Single Exponential Smoothing Method (Case Study: Bentar Pharmacies)".

2. BASIC THEORY

2.1 Forecasting

Forecasting is an activity of a business function that estimates and the use of these products can be made in the right quantity. Forecasting is an allegation of requests that will come based on forecasting variables, often based

on historical time series data. Forecasting uses forecasting techniques that are both normal and informal, according to Vincent Gaspers [1].

2.1.1 Single Exponential Smoothing Method

In the single exponential smoothing method the weight given to the data is α for the latest data, $\alpha (1 - \alpha)$ for old data, $\alpha (1 - \alpha)^2$ for older data, and so on. The magnitude of α is between 0 and 1. The closer to 1 means that the most recent data is paid more attention. Mathematically the amount of Forecasting is:

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

Information:

F_{t+1} : Prediction for period $t + 1$

X_t : Real value of period t

F_t : Forecast for period t

Error = $(X_t - F_t)$ is an error forecast or forecast error period, with it can be said that the forecast in the coming period is the previous forecast plus α (alpha) multiplied by the forecast error of the previous period.

3. SYSTEM ANALYSIS AND SYSTEM DESIGN

3.1 Problem Analysis

As is well known that the aim of the researchers is to create a decision support simulation system to predict the number of sales and the value of profit Enervon C drugs often experience demand in predicting sales and calculating the value of drug profits is sometimes still lacking. In drug sales every year sometimes it is still not able to determine whether each year the sales of these drugs have increased or decreased.

3.2 System Planning

The system designed is an application system that implements Single Exponential Smoothing to predict the amount of Drug Sales and the value of profits by displaying the Forecasting page to calculate forecasting.

3.2.1 Single Exponential Smoothing Calculation Process

The SES calculation process with an alpha value of 0.5 first determines the smoothing value.

Table 3.1 calculation of alpha 0.5

Year	Period	Sales Amount	0,5	xt-ft	xt-ft ABS Error	xt-ft /xt
2015	January	29	29	0	0	0
	February	12	29	-17	17	1,416666667
	March	11	20,5	-9,5	9,5	0,863636364
	April	15	15,75	-0,75	0,75	0,05
	May	5	15,375	-10,375	10,375	2,075
	June	4	10,1875	-6,1875	6,1875	1,546875
	July	6	7,09375	-1,09375	1,09375	0,182291667
	August	28	6,546875	21,453125	21,453125	0,766183036
	September	5	17,2734375	-12,2734375	12,2734375	2,4546875
	October	20	11,13671875	8,86328125	8,86328125	0,443164063
	November	2	15,56835938	-13,56835938	13,56835938	6,784179688
	December	10	8,784179688	1,215820313	1,215820313	0,121582031
2016	January	2	9,392089844	-7,392089844	7,392089844	3,696044922
	February	5	5,696044922	-0,696044922	0,696044922	0,139208984
	March	1	5,348022461	-4,348022461	4,348022461	4,348022461
	April	10	3,17401123	6,82598877	6,82598877	0,682598877
	May	8	6,587005615	1,412994385	1,412994385	0,176624298
	June	1	7,293502808	-6,293502808	6,293502808	6,293502808

	July	1	4,146751404	-3,146751404	3,146751404	3,146751404
	August	7	2,573375702	4,426624298	4,426624298	0,6323749
	September	4	4,786687851	-0,786687851	0,786687851	0,196671963
	October	2	4,393343925	-2,393343925	2,393343925	1,196671963
	November	6	3,196671963	2,803328037	2,803328037	0,46722134
	December	4	4,598335981	-0,598335981	0,598335981	0,149583995
2017	January	9	4,283457081	4,716542919	4,716542919	0,524060324
	February	13	6,170074249	6,829925751	6,829925751	0,525378904
	March	9	8,902044549	0,097955451	0,097955451	0,010883939
	April	5	8,94122673	-3,94122673	3,94122673	0,788245346
	May	5	7,364736038	-2,364736038	2,364736038	0,472947208
	June	5	6,418841623	-1,418841623	1,418841623	0,283768325
	July	6	5,851304974	0,148695026	0,148695026	0,024782504
	August	9	5,910782984	3,089217016	3,089217016	0,343246335
	September	10	7,14646979	2,85353021	2,85353021	0,285353021
	October	3	8,287881874	-5,287881874	5,287881874	1,762627291
	November	8	6,172729125	1,827270875	1,827270875	0,228408859
	December	3	6,903637475	-3,903637475	3,903637475	1,301212492
			4,961742961			
	Amount			- 48,07651408	181,0569673	44,64547294

Smoothing value used is 0.5 after that determine the smallest error value with the formula MAD

$$\frac{\sum |X_t - F_t|}{n} = \frac{181,0569}{36} = 5,029360202$$

Then calculate MAPE

$$\sum_{t=1}^n \frac{100|Actual - Forecast|Actual}{n}$$

$$= \frac{44,64547294}{36} = 1,240152026$$

Tracking Signal

$$= \frac{RSFE[\sum(X_t - F_t)]}{MAD}$$

$$= -\frac{48,07651408}{5,029360202}$$

$$= -9,559170977$$

3.3 System Planning

The following have determined the stages or steps that will be carried out in system design:

- Flowchart
- DFD level 0
- DFD level 1.

4.3.1 Flowchart

The whole system flow chart is a description of the processes related to the running of the system. At this stage it is depicted as shown in the following flow chart:

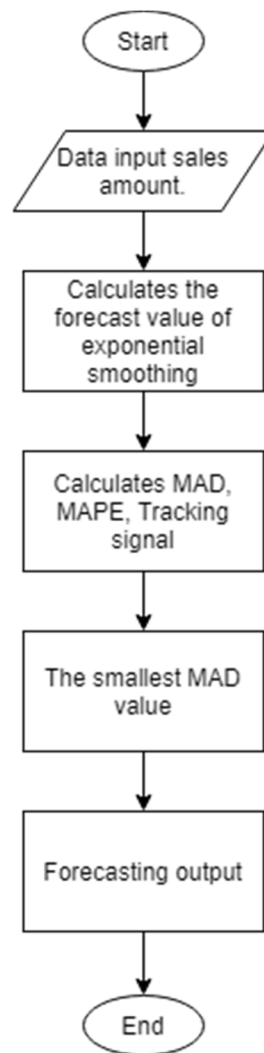


Figure 3.8 SES Process Flowchart

Based on the flowchart of figure 3.8, it can be explained that the system process starts from inputting the data of sales. The next process is calculating the value of SES smoothing. The next process is calculating the Error value with MAD, MAPE, Tracking Signal.

4.3.2 Data Flow Diagram Level 0

DFD level 0 is the initial process flow of a system. DFD level 0 of the system used in the Final Project is described as follows:

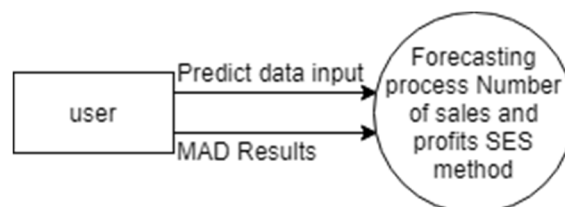


Figure 3.9 DFD level 0

The picture above shows the user can input data, and predict data with the Single Exponential Smoothing Method and produce MAD values.

4.3.3 Data Flow Diagram Level 1

DFD level 1 is an advanced process from level 0, in DFD level 1 the system design is explained in more detail. DFD level 1 of the system used in the Final Project is described as follows:

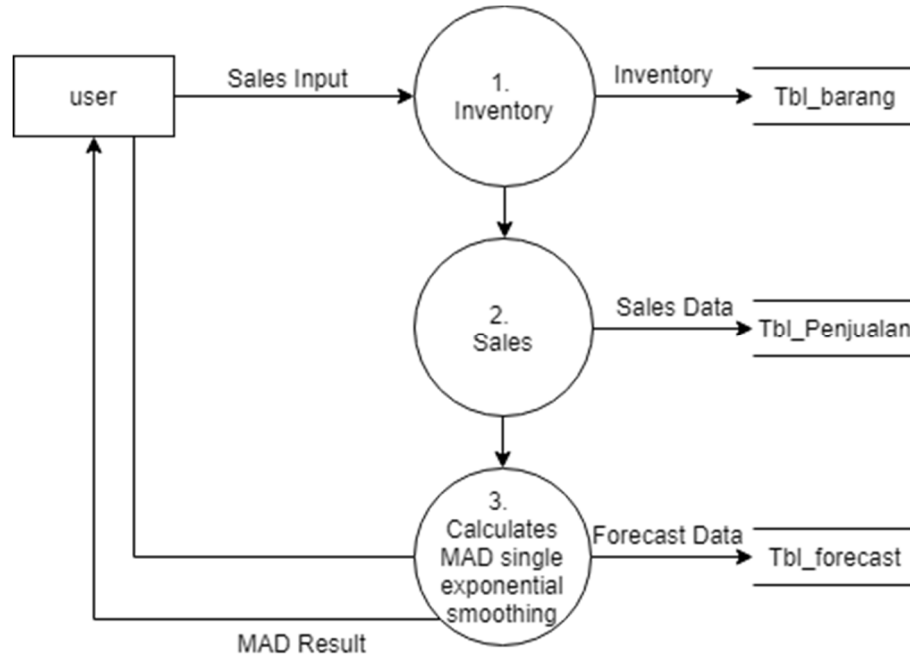


Figure 3.10 DFD level 1

Based on Figure 3.10, it can be explained that the user inputs sales data to input the data process of the goods, then the process of processing the tire pressure data begins. After that, enter the goods data table, then the user can also see the MAD results from the poses counting MAD.

4.3.4 Data Flow Diagram Level 2

DFD level 2 is a continuation of the SES process from level 1, in DFD level 2 the system design is explained in more detail. DFD level 2 of the system used in the Final Project is described as follows:

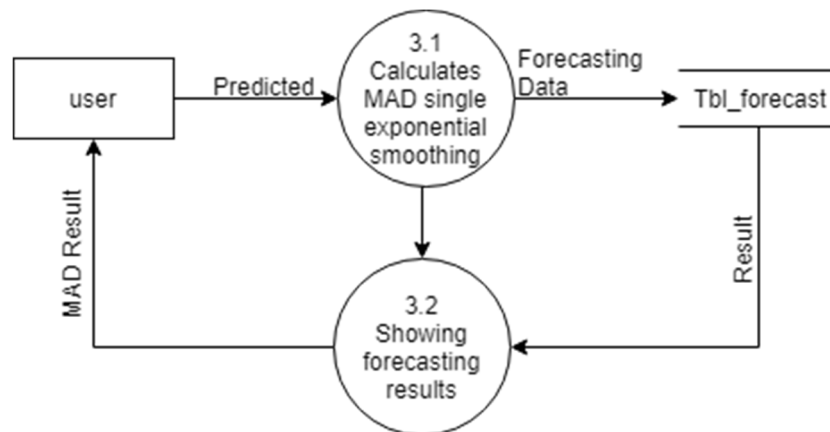


Figure 3.11 DFD level 2

5. SYSTEM IMPLEMENTATION

5.1 Program Application Implementation

Interface implementation is a form or menu that exists in a system. As for one of the menu views on the application:

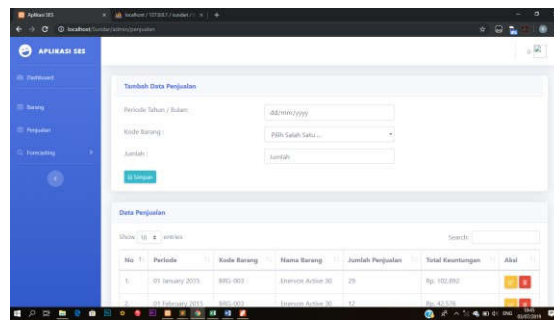


Figure 5.1 Display Sales Form

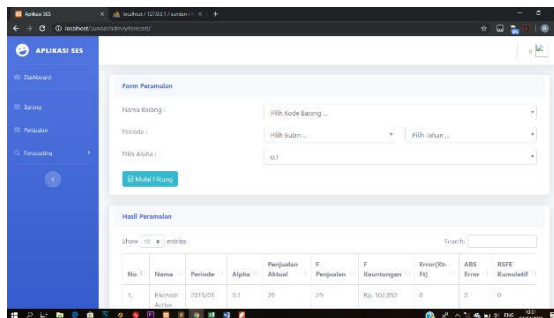


Figure 5.2 forecasting menu

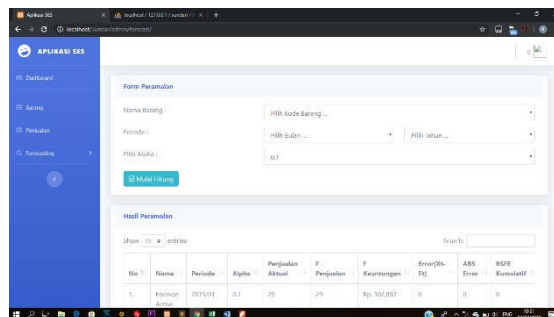


Figure 5.3 Forecasting results menu

In the forecasting menu displays the results of forecasting.

6. CONCLUSION

- Forecasting results are carried out using the Single Exponential Smoothing method by calculating the error value and accurate forecasting is chosen.
- The selected alpha value is 0.5 by having a MAD value of 5.029360202.
- The profit value of the drug is obtained from forecasting results in 2017 by comparing the actual profit of IDR 301,580 and the forecasting profit of IDR 304,345.

7. REFERENCES

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