

## **PRODUCT SALES FORECASTING IMPLEMENTATION USING THE METHOD SINGLE EXPONENTIAL SMOOTHING**

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**Abstract:** Sales of products that are frequently sold and new products at HNI Range fluctuate, namely sometimes increasing and sometimes decreasing. This is because consumers often move to other stockists because the product they want is not available, whereas if they have to buy, they must pre-order and wait a few days. This problem had an impact on product stock control which could not be predicted properly by HNI Kisaran. The purpose of this study is to apply the Single Exponential Smoothing method for forecasting product sales at HNI Kisaran based on the data obtained. The research method used in this research is qualitative research which is research that only collects data and explains descriptively/narratively without having to be processed by statistical tests. This research will only utilize data obtained from research sites and input them without changing anything. Manual calculation results and computerized calculation results have the same results. Using the Single Exponential Smoothing method can help HNI Kisaran to determine the amount of product that must be provided in order to be able to meet customer demand.

**Keywords:** forecasting; product; single exponential smoothing

**Abstrak:** Penjualan produk yang sering terjual dan produk baru di HNI Kisaran mengalami fluktuasi yaitu kadang kala meningkat dan kadang kala menurun. Hal ini disebabkan karena konsumen sering berpindah-pindah ke Stockis lainya dikarenakan produk yang diinginkan tidak ada sedangkan jika harus membeli, harus melakukan Pre Order terlebih dahulu dan menunggu beberapa hari. Masalah tersebut berdampak pada pengendalian stok produk yang tidak dapat diprediksi dengan baik oleh pihak HNI Kisaran. Tujuan penelitian ini adalah menerapkan metode *Single Exponential Smoothing* untuk peramalan penjualan produk di HNI Kisaran berdasarkan data yang diperoleh. Metode penelitian yang digunakan dalam penelitian ini adalah penelitian kualitatif yang merupakan penelitian yang hanya mengumpulkan data dan menjelaskan secara deskriptif/narasi tanpa harus diolah dengan pengujian statistik. Penelitian ini hanya akan memanfaatkan data yang diperoleh dari tempat riset dan menginputkannya tanpa mengubah apapun. Hasil perhitungan manual dan hasil perhitungan komputerisasi memiliki hasil yang sama. Menggunakan metode *Single Exponential Smoothing* dapat membantu pihak HNI Kisaran untuk menentukan jumlah produk yang harus disediakan agar mampu memenuhi permintaan pelanggan.

**Kata kunci:** peramalan; produk; single exponential smoothing

## INTRODUCTION

HNI is a company engaged in the field of beauty and health that creates products that can help maintain the appearance and health of the body. HNI Range is part of HNI Corporation. During the period from February 2022 to January 2023 sales of frequently sold products and new products at HNI Range experienced fluctuations, namely sometimes increasing and sometimes decreasing. This is because consumers often move to other stockists because the product they want is not available, whereas if they have to buy, they must pre-order and wait a few days.

This problem had an impact on product stock control which could not be predicted properly by HNI Kisaran. At the end of each month, employees only directly count the number of products remaining in the warehouse and then report them to the owner and owner of HNI Kisaran. They also place orders for the number of products based on assumptions, which sometimes still makes the owner confused about determining the amount of product he will buy to make stock.

Errors in decision making in determining the number of product stocks that are not in accordance with the needs of the HNI Range can have an impact on consumers moving to other sellers because demand is not fulfilled. If low consumer demand results in unsold products and must be stored in warehouses resulting in a buildup of product stocks, decreased quality such as damaged packaging.

In order to minimize the level of product sales losses, the HNI Kisaran needs a product stock forecasting activity. One of the benefits of doing product stock forecasting is being able to estimate

the amount of product stock accurately from time to time. The purpose of this study is to apply the Single Exponential Smoothing method for forecasting product sales at HNI Kisaran based on the data obtained.

Forecasting has two approaches, namely qualitative and quantitative approaches to predict future events using past reference data [1]. Before forecasting, it is necessary to know in advance what is the root of the problem in decision making [2].

Forecasting is very important for every organization, because this will be the basis for management decision making which will certainly affect the development of the organization. The forecasting method functions to predict time series data for several future periods based on data from several previous periods [3].

The usefulness of forecasting are helps predict the future, good for customers, keeping the company current, learn from previous experience, promoting cooperation in the workplace and receiving financing [4].

Exponential smoothing forecasts past data exponentially so that the most recent data has greater weight or weight in the moving average [5]. The exponential smoothing method is carried out by repeating calculations continuously using the latest data. Each data is weighted and symbolized by  $\alpha$ . The symbol  $\alpha$  can be set freely which aims to smooth and reduce forecast errors [6].

Exponential Smoothing continuously improves forecasting by taking the smoothing average of past values from time series data in an exponential way. The exponential smoothing method is divided into 3 (three), namely: Single Exponential Smoothing Method This method assumes that the data fluctuates around a fixed mean value, without a

consistent trend or pattern of growth. Brown's Linear Exponential Smoothing Method (Double Exponential Smoothing). This method was developed by Brown's to overcome the differences that arise between the actual data and forecasted values when there is a trend in the data changes. The rationale for Brown's exponential smoothing is similar to that of a linear moving average. Winter's Exponential Smoothing Method (Triple Exponential Smoothing). One particular forecasting method for seasonally patterned data is the exponential linear and seasonal smoothing method from Winter [7].

The method used to predict sales is the Single Exponential Smoothing method, which is a model resulting from the development of a Moving Average on the basis of times series analysis and predictions, often used for production predictions, especially for short-term predictions. This model is made with the theory that the trend of the time series has the characteristics of stability and regularity [8].

Single Exponential Smoothing method is used because this forecasting method is not bound by prolonged fluctuations in the ups and downs of data trends. This is in line with the research object, namely the product, where the product does not follow the fluctuation trend.

Previous research is also a study to support the author to choose the Single Exponential Smoothing method with the title "Application of the Single Exponential Smoothing Method in Forecasting Sales of Goods." The result is that the goods sales forecasting system has been successfully implemented by displaying forecasting results using the single exponential smoothing method where this

method is in accordance with fluctuating data calculations. [9].

Research with the title "Inventory Control Using the Single Exponential Smoothing Method for Sales Forecasting". The result is that this research can be used as material for consideration for CV. Material Young Enterprises as an evaluation and making the right decision in order to minimize the risk of losses due to errors in managing venture capital [10].

## METHOD

The research method used in this research is quantitative research which is a process of finding knowledge that uses data in the form of numbers as a tool to analyze information about what you want to know. The Single Exponential Smoothing method uses the following formula:

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

Information:

$F_{t+1}$  = Forecasting on time t+1  
 $X_t$  = Registrant data on period t  
 $F_{t-1}$  = Forecasting on time t  
 $\alpha$  = The average constant between 0.1-0.9

The value of the Single Exponential Smoothing forecasting error can be found using the following formula:

$$MAD = \frac{\sum |Y_t - F_t|}{n} \quad (2)$$

Information:

$Y_t$  = Actual demand on period t  
 $F_t$  = Forecasting demand on the period t  
n = Number of forecasting periods involved

$$MSE = \frac{\sum |Y_t - F_t|^2}{n} \quad (3)$$

Information:

$Y_t$  = Actual demand on period  $t$

$F_t$  = Forecasting demand on the period  $t$

$n$  = Number of forecasting periods involved

$$MAPE = \frac{\sum |Y_t - F_t|}{\sum Y_t} (100) \quad (4)$$

information:

$Y_t$  = Actual demand on period  $t$

$F_t$  = Forecasting demand on the period  $t$

$n$  = Number of forecasting periods involved

## RESULT AND DISCUSSION

The input data for the implementation of product sales forecasting at HNI Kisaran using the Single Exponential Smoothing method are product sales data from February 2022 to January 2023. Analysis of process needs in the form of calculating input data manually using the Single Exponential Smoothing method.

The following is a table of the calculation results of the Single Exponen-

tial Smoothing method to predict the number of Radangin product sales for the February 2023 period:

Table 1. HNI Product Sales Forecasting “Radangin” Period February 2022 to January 2023

No	Period	Actual Data	Alpha ( $\alpha$ )	1-Alpha ( $1-\alpha$ )	Forecast SES ( $F_{t+1}$ )
1	Feb-2022	41			
2	Mar-2022	50	0.1	0.9	41.00
3	Apr-2022	75	0.1	0.9	41.90
4	May-2022	55	0.1	0.9	45.21
5	Jun-2022	53	0.1	0.9	46.19
6	Jul-2022	59	0.1	0.9	46.87
7	Aug-2022	85	0.1	0.9	48.08
8	Sep-2022	53	0.1	0.9	51.77
9	Oct-2022	79	0.1	0.9	51.90
10	Nov-2022	66	0.1	0.9	54.61
11	Dec-2022	65	0.1	0.9	55.75
12	Jan-2023	74	0.1	0.9	56.67
<b>13</b>	<b>Feb-2023</b>				<b>58.40</b>

Source: Processed Data (2023)

So, based on the calculation above, the sales forecasting results for the HNI product "Radangin" in February 2023 are 58.40 (58 pcs).

Table 2. HNI Product Sales Forecasting Error Analysis “Radangin” Period February 2022 to January 2023

No	Period	Forecast SES	Error	Abs Error	Error <sup>2</sup>	APE (%)
1	Feb-2022	41.00	9.00	9.00	81.00	18.00%
2	Mar-2022	41.90	33.10	33.10	1095.61	44.13%
3	Apr-2022	45.21	9.79	9.79	95.84	17.80%
4	May-2022	46.19	6.81	6.81	46.38	12.85%
5	Jun-2022	46.87	12.13	12.13	147.14	20.56%
6	Jul-2022	48.08	36.92	36.92	1363.09	43.44%
7	Aug-2022	51.77	1.23	1.23	1.51	2.32%
8	Sep-2022	51.90	27.10	27.10	734.41	34.30%
9	Oct-2022	54.61	11.39	11.39	129.73	17.26%
10	Nov-2022	55.75	9.25	9.25	85.56	14.23%
11	Dec-2022	56.67	17.33	17.33	300.33	23.42%
12	Jan-2023	41.00	9.00	9.00	81.00	18.00%
	Total		174.05	174.05	30293.40	248.31%
	MAD				15.82	
	MSE				370.96	
	MAPE				22.57%	

Source: Processed Data (2023)

This Image shows that the results of good calculations on single exponential smoothing forecasting are alpha 0.1 with the lowest mape compared to the other alpha, namely 22.57%. This proves the results of manual calculations are the same as computerized calculations.

The following is a chart comparing actual data with forecasting results for the period February 2022 to February 2023 for "Radangin"

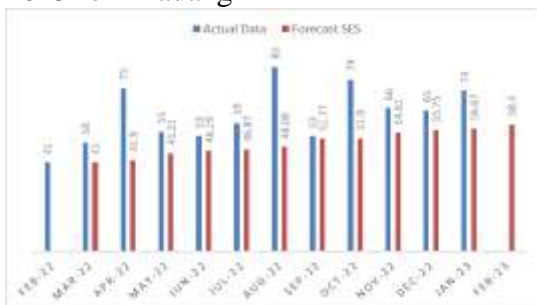


Image 1. Chart Comparing Actual Data With Forecasting Results For "Radangin"

The display of the program page on the implementation of product sales forecasting in the HNI Range using the Single Exponential Smoothing method of image 2 to image 5:



Image 2. Home Page View



Image 3. Login Page Display



Image 4. Admin Main Page Display

Date	Value	Date	Value	Date	Value
2022-02-01	12	2022-07-01	18	2022-12-01	18
2022-03-01	28	2022-08-01	18	2023-01-01	25
2022-04-01	32	2022-09-01	32	2023-02-01	24
2022-05-01	24	2022-10-01	42		
2022-06-01	22	2022-11-01	18		

Image 5. Display Forecasting Results Page

## CONCLUSION

Some of the conclusions obtained in this study are designing product sales forecasting at HNI Range using the web-based Single Exponential Smoothing method using the PHP programming language and MySQL database. The application of the Single Exponential Smoothing method for forecasting product sales at HNI Range is carried out to compare the results of manual calculations with the results of computerized calculations for product sales to see based on the calculation results of alpha 0.1 to alpha 0.9 which is the best result of forecasting. Using the Single Exponential Smoothing method can help HNI Kisaran to determine the amount of product that must be provided in order to be able to meet customer demand.

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