**FORECASTING METHODS SINGLE EXPONENTIAL SMOOTHING REQUEST GROCERIES AT THE GUNTUR STORE**

**Ahmad Aziz Irsyah 1\* , Risnawati 2 , Zulfan Effendi 3**

1,2,3 Information Systems,STMIK Royal Kisaran

*e-mail* : ahmadaziz21220@gmail.com

**Abstract:** Guntur Shop is located on Jl. Sisingamangaraja , Kisaran , Asahan Regency. Guntur Store currently still does not apply a systematic method in planning basic food stocks. Guntur Shop still uses ledgers in making reports and inputting them into Microsoft Excel. One effort to solve this problem is to carry out forecasting to find out the estimated demand for basic necessities in the future. So a forecasting method is needed to be able to solve this problem. One of them is using the Single Exponential Smoothing (SES) method. The Single Exponential Smoothing (SES) method or in Indonesian called Exponential Smoothing is a moving average forecasting method that gives exponential or graded weight to the newest data so that the newest data will receive a greater weight. In connection with the problems described above, the author wants to conduct research using a forecasting method entitled "Forecasting SES Method for Demand for Basic Food in Guntur Stores". Applying the Single Exponential Smoothing method to the system for forecasting basic food needs at the Guntur Store to produce accurate information.

**Keywords:** Basic Food Needs, Single Exponential Smoothing (SES) Method, Demand Forecasting, Guntur Store.

**Abstrak :** Toko Guntur terletak di Jl. Sisingamangaraja, Kisaran, Kabupaten Asahan. Toko Guntur saat ini masih belum menerapkan metode yang tersistematis dalam merencanakan stok sembako. Toko Guntur masih menggunakan buku besar dalam pembuatan laporan dan di input ke dalam microsoft excel. salah satu upaya untuk menyelesaikan permasalahan tersebut adalah dilakukannya peramalan untuk mengetahui perkiraan permintaan sembako pada masa yang akan datang. Maka dibutuhkan sebuah metode peramalan untuk dapat menyelesaikan permasalahan tersebut. Salah satunya adalah menggunakan metode Single Exponential Smoothing (SES). Metode Penghalusan Eksponensial Tunggal (SES), atau dikenal juga sebagai Single Exponential Smoothing, adalah suatu pendekatan peramalan rata-rata bergerak yang mengaplikasikan bobot secara eksponensial atau bertingkat pada data terkini. Dengan menggunakan metode ini, data-data terbaru diberi bobot yang lebih besar, sehingga memiliki pengaruh yang lebih signifikan dalam menghasilkan nilai rata-rata yang diprediksi. Tujuan dari penelitian ini untuk meramalkan tren atau pola perubahan dalam data dengan memberikan prioritas pada informasi terkini. Dengan menggunakan SES, proses peramalan menjadi lebih responsif terhadap perubahan terbaru, memungkinkan pengguna untuk mendapatkan perkiraan yang lebih akurat dalam mengantisipasi pola data yang sedang berkembang kebutuhan sembako pada Toko Guntur sehingga menghasilkan informasi yang akurat.

**Kata Kunci: Kebutuhan Sembako, Metode Single Exponential Smoothing (SES), Peramalan Permintaan, Toko Guntur.**

**INTRODUCTION**

The rapid development of information technology today has changed the way people behave in various daily activities, both on a personal scale and in the context of institutions, agencies and companies. Today's society tends to rely on digital aspects, a paradigm that emerged as a response to the complexity of various aspects of life which demands that all processes take place quickly, accurately, effectively and efficiently. For example, this can be observed in inventory management in a business [1].

Inventory is one of the most crucial estimates in a company's operations. For companies, inventory is not just an asset, but also a significant value. The presence of inventory in a company context has major implications, depending on its quantity and availability . If the amount of inventory is large enough, this will have an impact on increasing the costs required to maintain and manage the inventory. On the other hand, if inventory is insufficient, the impact can disrupt the production and sales process. Apart from that, the existence of inventory also has a direct influence on the company's balance sheet and profit and loss statement [2] .

Guntur Shop is shop that sells material basic foodstuffs, this shop was founded in 1990 . Address \_ on Jl. Sisingamangaraja No.113, East Kisar , Kec . East Kisaran City, Asahan Regency, North Sumatra 21221 . Guntur Store is not just a place to buy basic necessities for the community, but also creates close relationships with loyal customers. With experience and dedication for more than two decades, this shop continues to provide the best service and positive contribution in meeting the needs of the local community . But 2 years This shop thunder there is problem experienced difficulties in estimating basic food supplies because they only relied on direct observation of stock conditions in shops without *data* processing , making it difficult to predict the basic food stocks needed in the coming month period . Because In general , most business owners only restock goods based on existing goods only seen And goods whatever is empty , consequence inability For fulfil request groceries can impact on lost customer And lost potency profit And decline turnover . Inaccuracy in determining the quantity of basic necessities ordered causes consequences that result in stock running out or excess stock being stored [3] .

As for experienced goods \_ plummeted is rice on month June 2022 as much as 350 kg, oil fry on month March 2022 as much as 340 kg, sugar on month September 2022 as many as 800 kg, eggs on month September 2022 as many as 503 items , butter on month May 2022 as much as 55 kg, salt on month November 2022 as much as 45 kg and milk on month March 2022 as many as 192 cans .

Guntur Shop when This Still Not yet apply systematic method \_ in plan stock basic necessities are a must owned For can fulfil request customer . Guntur Shop still use book big in making report and input into in *Microsoft Excel* . This is what makes it sale groceries not optimal , because of the demand for basic necessities from consumer or customer which is uncertain in each period , create a shop Guntur has difficulty estimating inventory basic food supplies for the coming month period. Sometimes customers feel it too disappointed Because a number of the groceries you are looking for Already finished . Wrong \_ one attempt to resolve the issue on Guntur store is to carry out forecasting to find out the estimated demand for basic necessities in the future .

Forecasting or *forecasting* is an activity in which perpetrator efforts to carry out analysis to estimate demand groceries in the future . The purpose of forecasting is to reduce uncertainty and provide benchmarks *or* obtain predictions that can minimize forecasting errors *which are* usually measured by *Mean Absolute Deviation* (MAD) and *Mean Square Error* (MSE) to monitor actual performance [4] .

In the context of forecasting, forecasting methods are crucial for solving existing problems. One method commonly used is the *Single Exponential Smoothing* (SES) method. This method, also known as Exponential Smoothing in Indonesian, is a moving average forecasting approach that gives exponential or graduated weights to the latest data [5] . Thus, the most recent data gets greater weight, allowing the method to respond quickly to changes in the data. In other words, the newer or more recent the data, the greater the weight. This is because the latest data is considered more relevant so it is given a greater weight . SES is useful for predicting *trends* or patterns that may occur based on calculating exponential weights on historical data [6] .

The application of the Single Exponential Smoothing Method (SES) has proven to be effective as a forecasting method for the long term and medium term. The key parameter in this method is symbolized by α (alpha). The use of this symbol aims to illustrate that with the exponential smoothing method, Toko Guntur is able to predict the steps that need to be taken to meet consumer demand. By setting the α value, Toko Guntur can control the extent to which the latest data will influence predictions, so that it can be adjusted to market needs and dynamics. The suitability of the SES method for long and medium term forecasting makes it a reliable tool in planning marketing strategies and inventory. [7] .

As for study previously discussed \_ about forecasting , on study [2] , explains application method *Single Exponential Smoothing* front help in do prediction stock drug can give results real at 1 to 3 months next , with use alpha value 0.3 and can analyze part drug where I will \_ approach stock limit for do ordering . In line with study [8] The Single Exponential Smoothing method can be applied to predict demand for herbal medicines at DS Ria Sari Anggriani, enabling knowledge of the predicted value of demand in the next period. In addition, the Mean Squared Error (MSE) method can be used to evaluate the error level for each alpha value, thereby making it possible to obtain a minimal error value.

**METHOD**

Research methodology helps researchers design and conduct research in a reliable and valid manner. Research methodology refers to the systematic steps used in a study to collect, analyze and interpret data . The methodology contains a research framework to explain the flow of the problem, analyze the problem, determine the objectives of the research.

In this research, the data collected is sales data Groceries at the Guntur Shop from Month December 2021 until November 2023 , which will later be processed using the SES methodor desktop -based *Single Exponential Smoothing .* In application SES method uses formula as following :

$Ft=Ft-1+α\left(At-1-Ft-1\right)$….. (1)

Where :

*Ft* = Forecast value for period t.

Ft-1 = Estimated forecast for the previous period.

At-1= Observation Data for period t -1.

α = smoothing constant

 To measure the forecasting error value, it can be searched using MSE ( *Mean Square Error)*is an alternative method in a forecasting method. The smaller the MSE value, the more accurate the prediction.

$MSE=\frac{\sum\_{}^{}\left(Yt-Ft\right)^{2}}{n}$……………(2)

Where

Yt = Actual valuein period t

Ft = Value Forecasting in period t

n = Number of data for the forecasting period

**RESULTS AND DISCUSSION**

Input requirements analysis involves collecting and assessing input data that will be processed through calculations using the Single Exponential Refinement Method (SES). In the context of this research, basic food sales data from the Guntur Store during the period January 2022 to December 2023 is the main input. The analysis process will lead to understanding sales patterns, trends and fluctuations contained in the data. By using the Single Exponential Smoothing method, it is hoped that it can produce accurate predictions related to consumer demand to help Guntur Stores in stock planning, marketing strategies and more informational decision making. ( table 1), then the input data will be processed using the *Single Exponential Smoothing method* , with equality formula (1).

Table 1 Sales Data Groceries on the Moon January 2022 until December 2023 \_ \_ \_

| **Month** | **Sales Data Groceries** |
| --- | --- |
| **Rice (Kg)** | **Oil Fried (Kg)** | **Sugar Sand (Kg)** | **Eggs ( Grains )** | **Butter (Kg)** | **Salt ( Bgks )** | **Milk ( Canned )** |
| January 2022 | 398 | 375 | 810 | 540 | 82 | 57 | 215 |
| February 2022 | 376 | 362 | 805 | 512 | 61 | 49 | 197 |
| March 2022 | 362 | 354 | 808 | 530 | 74 | 55 | 206 |
| April 2022 | 388 | 340 | 803 | 508 | 59 | 48 | 192 |
| May 2022 | 354 | 361 | 802 | 522 | 67 | 52 | 203 |
| June 2022 | 369 | 359 | 804 | 505 | 55 | 47 | 195 |
| July 2022 | 350 | 363 | 801 | 525 | 76 | 54 | 210 |
| August 2022 | 355 | 345 | 806 | 514 | 65 | 46 | 198 |
| September 2022 | 370 | 349 | 807 | 518 | 72 | 50 | 201 |
| October 2022 | 364 | 355 | 800 | 503 | 60 | 53 | 194 |
| November 2022 | 358 | 346 | 809 | 520 | 78 | 51 | 212 |
| December 2022 | 361 | 348 | 812 | 510 | 69 | 45 | 200 |
| January 2023 | 554 | 542 | 1210 | 768 | 201 | 190 | 348 |
| February 2023 | 627 | 598 | 1285 | 789 | 245 | 225 | 392 |
| March 2023 | 490 | 677 | 1255 | 789 | 165 | 175 | 298 |
| April 2023 | 579 | 504 | 1230 | 848 | 225 | 210 | 375 |
| May 2023 | 612 | 628 | 1225 | 9 03 | 185 | 165 | 312 |
| June 2023 | 542 | 569 | 1278 | 860 | 273 | 240 | 420 |
| July 2023 | 596 | 459 | 1 41 0 | 780 | 155 | 155 | 255 |
| August 2023 | 567 | 711 | 1290 | 865 | 280 | 220 | 408 |
| September 2023 | 7 33 | 525 | 1260 | 6 15 | 210 | 185 | 350 |
| October 2023 | 602 | 490 | 1 3 45 | 845 | 255 | 205 | 382 |
| November 2023 | 519 | 609 | 9 35 | 9 05 | 195 | 160 | 335 |
| December 2023 | 501 | 497 | 1268 | 825 | 240 | 235 | 410 |

Calculation Request Rice Method *Single Exponential Smoothing* With Alpha 0 , 4

Ft = Ft-1+ α (At-1 -Ft-1)

 = 580.75 + 0.4 ( 501 – 580.75 )

 = 580.75 + 0.4 (- 79.75 )

 = 580.75 + (- 31.9 )

 = 548.85

MAD = ∑|Yt – Ft|

n

= 1138 .50

 23

= 49 .50

MSE = ∑|Yt – Ft| 2

 n

= 134454 .77

23

= 5845 .86

MAPE = ∑|Yt – Ft| / |Yt| \* 100 %

 n

= 2.08 \* 100%

 23

= 9 .0 3 %

With the *single exponential smoothing* method in the following period uses **an alpha of 0.4** with the smallest MAPE error rate **of 9.03%,** which is **549 Kg , with a Very Good** forecasting ability category .

Calculation Request Oil Fry Method *Single Exponential Smoothing* With Alpha 0 , 3

Ft = Ft-1+ α (At-1 -Ft-1)

 = 562.78 + 0.3 ( 497 – 562.78 )

 = 562.78 + 0.3 ( -65.78 )

 = 562.78 + (-19.734)

 = 543.04

MAD = ∑|Yt – Ft|

n

= 1385 .68

23

= 60 .25

MSE = ∑|Yt – Ft| 2

 n

= 192449 .66

23

= 8367 .38

MAPE = ∑|Yt – Ft| / |Yt| \* 100 %

 n

= 2.49 \* 100%

 23

 = 10 , 82 %

With the *single exponential smoothing* method in the following period using **an alpha of 0.3 with the smallest MAPE** error rate of 10.82%, it is **543 Packs , with the Good** forecasting ability category .

Calculation Request Sugar Sand Method *Single Exponential Smoothing* With Alpha 0 , 6

Ft = Ft-1+ α (At-1 -Ft-1)

 = 1,088.83 + 0.6 ( 1,268 – 1,088.83 )

 = 1,088.83 + 0.6 ( 179.17 )

 = 1,088.83 + ( 107.502 )

 = 1,196.33

MAD = ∑|Yt – Ft|

n

= 1689 .95

23

= 73 .48

MSE = ∑|Yt – Ft| 2

 n

= 436048 .06

 23

= 18958 .61

MAPE = ∑|Yt – Ft| / |Yt| \* 100 %

 n

= 1.46 \* 100%

 11

 = 6 , 34 %

With the *single exponential smoothing method* in the following period using **an alpha of 0.6** with the smallest MAPE error rate **of 6.34% ,** it is **1,196 Kg , with a Very Good** forecasting ability category .

Calculation Request Egg Method *Single Exponential Smoothing* With Alpha 0 , 6

Ft = Ft-1+ α (At-1 -Ft-1)

 = 858.88 + 0.6 ( 825 – 858.88 )

 = 858.88 + 0.6 (- 33.88 )

 = 858.88 + (- 20.328 )

 = 838.55

MAD = ∑|Yt – Ft|

n

= 1381 .17

23

= 60 .05

MSE = ∑|Yt – Ft| 2

 n

= 194649 .20

23

= 8463 .01

MAPE = ∑|Yt – Ft| / |Yt| \* 100 %

 n

= 1.87 \* 100%

 23

 = 8 , 13 %

With the *single exponential smoothing method* in the following period using **an alpha of 0.6 with the smallest MAPE** error rate of 8.13%, it is **839 items , with a very good** forecasting ability category .

Calculation Request Butter Method *Single Exponential Smoothing* With Alpha 0 , 4

Ft = Ft-1+ α (At-1 -Ft-1)

 = 218.97 + 0.4 ( 240 – 218.97 )

 = 218.97 + 0.4 (21.03 )

 = 218.97 + ( 8.412 )

 = 227.38

MAD = ∑|Yt – Ft|

n

= 766 .73

23

= 33 .34

MSE = ∑|Yt – Ft| 2

 n

= 59088 .55

 23

= 2569 .07

MAPE = ∑|Yt – Ft| / |Yt| \* 100 %

 n

= 4 .50 \* 100%

 23

 = 19 , 58 %

Using the *single exponential smoothing method* in the following period using **an alpha of 0.4 with the smallest MAPE** error rate of 19.58% is **227 Kg , with the Good** forecasting ability category

Request Salt Method *Single Exponential Smoothing* With Use Alpha 0.5 \_

Ft = Ft-1+ α (At-1 -Ft-1)

 = 179.51 + 0.5 ( 235 – 179.51 )

 = 179.51 + 0.5 ( 55.49 )

 = 179.51 + ( 27.745 )

 = 207.25

MAD = ∑|Yt – Ft|

n

= 651 .37

23

= 28 .32

MSE = ∑|Yt – Ft| 2

 n

= 49891 .89

23

= 2169 .21

MAPE = ∑|Yt – Ft| / |Yt| \* 100 %

 n

= 3.88 \* 100%

 23

= 16 , 89 %

Using the *single exponential smoothing* method in the following period using **an alpha of 0.5 with the smallest MAPE** error rate of 16.76% is **207 Packs , with the Good** forecasting ability category .

Calculation Request Milk Method *Single Exponential Smoothing* With Alpha 0 , 3

Ft = Ft-1+ α (At-1 -Ft-1)

 = 350.82 + 0.3 ( 410 – 350.82 )

 = 350.82 + 0.3 ( 59.18 )

 = 350.82 + 17.754

 = 368.57

With the error percentage as follows:

MAD = ∑|Yt – Ft|

n

= 879 .85

23

= 38 .25

MSE = ∑|Yt – Ft| 2

 n

= 83020 .19

 23

= 3609 .57

MAPE = ∑|Yt – Ft| / |Yt| \* 100 %

 n

= 2.63 \* 100%

 23

 = 11 , 43 %

Using the *single exponential smoothing method* in the following period using **an alpha of 0.3 with the smallest MAPE** error rate of 11.43% is **369 Cans , with the Good** forecasting ability category **.**

**CONCLUSION**

*forecasting* system using *the single exponential smoothing* method for basic food demand at the Guntur Store provides benefits for the store . With this system, forecasting can be more accurate request groceries . The *single exponential smoothing (SES)* forecasting method is an important method in helping Guntur Shop to predict the number of requests basic necessities in the coming period. This method can be used as evaluation material and help in making more appropriate decisions regarding inventory goods For for sale .

BIBLIOGRAPHY

[1] K. Komariah, E. Kurniawan, and M. Handayani, “Penerapan Metode Single Exponential Smoothing Untuk Prediksi Penjualan Bahan Bangunan,” *Build. Informatics, Technol. Sci.*, vol. 4, no. 2, pp. 896–905, 2022, doi: 10.47065/bits.v4i2.2140.

[2] A. B. Santoso, M. S. Rumetna, and K. Isnaningtyas, “Penerapan Metode Single Exponential Smoothing Untuk Analisa Peramalan Penjualan,” *J. Media Inform. Budidarma*, vol. 5, no. 2, p. 756, 2021, doi: 10.30865/mib.v5i2.2951.

[3] H. Hendrik and W. J. Kurniawan, “Perbandingan Metode Ses Dan Sma Dalam Peramalan Data Covid,” *J. Mhs. …*, vol. 3, no. 3, pp. 102–109, 2023, [Online]. Available: https://www.ejournal.pelitaindonesia.ac.id/ojs32/index.php/jmapteksi/article/view/3344

[4] Kurnia Nia, “Penerapan Peramalan Penjualan Sembako Menggunakan Metode Single Moving Average (Studi Kasus Toko Kelontong Dedeh Retail),” *J. Ilm. Wahana Pendidik.*, vol. 8, no. 17, pp. 307–316, 2022.

[5] M. Fitri, J. Jamalludin, and C. WM Vermila, “Analisis Kepuasan Konsumen Terhadap Produk Sembako Pada Minimarket Juan Di Kecamatan Benai Kabupaten Kuantan Singingi,” *Optima*, vol. 3, no. 1, 2019, doi: 10.33366/optima.v3i1.1251.

[6] M. K. Syifa and D. M. Kusumawardani, “Implementasi Metode Time Series Dalam Forecasting Penggunaan Satusehat,” *J. Pengemb. Sist. Inf. dan Inform.*, vol. 4, no. 4, pp. 14–25, 2023, doi: 10.47747/jpsii.v4i4.1223.

[7] E. Indriastiningsih and S. Darmawan, “Analisa Pengendalian Persediaan Sparepart Motor Honda Beat Fi dengan Metode EOQ Menggunakan Peramalan Penjualan Di Graha Karyaahass XY,” *Din. Tek.*, vol. 12, no. 2, pp. 24–43, 2019, [Online]. Available: https://www.unisbank.ac.id/ojs/index.php/ft1/issue/view/408

[8] N. Zannah, N. Irawati, S. Andriyani, and S. Informasi, “Implementation of single exponential smoothing method demand for herbal medicine to dc ria sari anggriani,” vol. X, no. 1, pp. 29–36, 2023.