Jurnal Pemikiran dan Penelitian Pendidikan Matematika (JP3M)
Journal homepage: https://journal.rekarta.co.id/index.php/jp3m/index
ISSN 2622-7673 (Online) | ISSN 2622-8246 (Print) | Vol. 9, No. 1, May 2026
https://doi.org/10.36765/jp3m.v9i1.862

A Comparative Study of Single Exponential Smoothing and Double Exponential Smoothing Methods for Forecasting Chicken Egg Prices in West Kalimantan Province

Hendri Kurniawan[1*], Yuyun Eka Pratiwi[2]
[12]Departement of Mathematics, Tanjungpura University, Indonesia.
✉ Author Corresponding: h1091221011@student.untan.ac.id*

ABSTRACT

This aims of this study is to compare the SES and Brown DES methods in forecasting chicken egg price in Kalimantan Barat Province. The data used are secondary data on chicken egg prices from January 2024 to July 2025, obtained from the National Center for Strategic Food Price Information (PIHPS). The performance of the methods was evaluated using the MAD and MAPE values. The results show that the SES method provides better forecasting performance compared to DES Brown, with MAD of 1831.03 and MAPE of 6.84%. The forecasted price of chicken eggs in August 2025 using the SES method is IDR 28,194. With a MAPE value of less than 10%, the SES method is categorized as highly accurate, making it a reliable reference for both consumers and the government in decision-making related to chicken egg prices in Kalimantan Barat Province.

Keywords: Forecasting; Chicken Egg; SES; DES Brown

Article History:
Received : 25-08-2026
Revised : 05-05-2026
Accepted : 18-05-2026
Online : 27-05-2026

How to Cite (APA style):
Kurniawan, H., & Pratiwi, Y. E. (2026). A comparative study of single exponential smoothing and double exponential smoothing methods for forecasting chicken egg prices in West Kalimantan Province. *Jurnal Pemikiran dan Penelitian Pendidikan Matematika (JP3M),* 9(1), 13–22. https://doi.org/10.36765/jp3m.v9i1.862

1. INTRODUCTION

Development in the livestock sector plays an important role as one of the solutions to meet the continuously increasing demand for animal protein in society (Mottet et al., 2017). Along with population growth, public awareness of consuming nutritious food has also increased (Tarisya & Primandari, 2023). One of the livestock products that is rich in nutrients and benefits is chicken eggs (K. Z et al., 2018).

Chicken eggs are known as a source of high-quality protein that can fulfill daily nutritional needs. One egg contains approximately 7 grams of protein, with 16.5% found in the yolk and 0.9% in the egg white. The fat content in the yolk reaches 32%, while the egg white contains only a small amount of fat. In addition, chicken eggs also contain important minerals and vitamins for the human body, such as vitamins A, B6, B12, folic acid, choline, riboflavin, phosphorus, calcium, iron, and potassium. This complete nutritional content makes eggs an ideal food choice for children's growth, pregnant and breastfeeding women, as well as individuals recovering from illness (Saputra et al., 2017).

However, egg consumption levels in Indonesia show a fluctuating pattern and tend to increase during religious holidays or national celebrations. In 2017, national egg consumption was recorded at 6.53 kg per capita per year, with a growth trend of approximately 3.57% annually. One of the reasons for high egg consumption is the relatively affordable price of chicken eggs compared to other livestock products, making them a highly preferred food commodity among the public (Destiarni, 2018).

According to data from the Central Statistics Agency (BPS, 2025), chicken egg production in West Kalimantan Province in 2022 reached 70,235.91 tons. However, in 2023, production decreased by 6,615.31 tons, resulting in a total production of 63,620.60 tons. Meanwhile, in 2024, production increased significantly to 87,479.00 tons, an increase of 23,858.40 tons compared to the previous year. This increase indicates growing consumer demand for chicken eggs. High consumer demand is one of the main factors contributing to the rise in egg prices in the market (Abbas et al., 2024). Generally, egg prices increase before major holidays such as New Year, Chinese New Year, and Eid al-Fitr. After these holidays, prices tend to decline as demand decreases.

As one of the essential food commodities, fluctuations in chicken egg prices receive special attention from the government. Monitoring this commodity aims to maintain the stability of national staple food prices, as price stability greatly affects people's ability to meet their daily basic needs. Extreme price fluctuations, especially for staple foods, can have negative impacts on both microeconomic and macroeconomic conditions (Destiarni, 2018). Therefore, to anticipate extreme increases in egg prices in the future, particularly in West Kalimantan Province, forecasting of chicken egg prices is required. Forecasting is a method used to estimate possible future conditions (Petropoulos et al., 2022). Forecasting is important due to the time lag between the awareness of the need for a new policy and its implementation. The longer the time gap, the greater the importance of forecasting, especially in determining when an event will occur so that appropriate actions can be taken in a timely manner (Rosa et al., 2019).

Egg price forecasting is conducted to provide consumers with estimates of price fluctuations and possible price ranges in the future. This is highly beneficial for consumers as it provides information regarding the appropriate time to stock up on chicken eggs. In addition, egg price forecasting can also serve as a reference for the government in formulating policies related to consumer price limits. The importance of forecasting in supporting decision-making can help the government maintain price stability and support food security through predictions of strategic commodity prices in the future (Z et al., 2024).

The forecasting methods used in this study are Single Exponential Smoothing (SES) and Double Exponential Smoothing (DES). Single Exponential Smoothing (SES) is a forecasting method that applies exponentially decreasing weights to observations. This method assigns greater weight to more recent data compared to older data, making it more responsive to recent changes. SES is generally used for data that does not exhibit trend or seasonal patterns (Kristanti & Darsyah, 2018).

Meanwhile, Double Exponential Smoothing (DES) is an extension of SES that applies a double smoothing process. DES is used to handle data with trend patterns because its calculation is similar to a linear moving average. Therefore, this method is suitable for data that shows an increasing or decreasing trend over time (Azhar et al., 2019). DES consists of Brown's DES and Holt's DES (Sari et al., 2021). In this study, the DES method used for data analysis is Brown's DES.

A study conducted by Purwanti & Purwadi (2019) showed that Brown's DES can be used to forecast inflation rates in Indonesia with good results for data with trend patterns. In addition, Syahdan & Aisyah (2020) found that Brown's DES produces low forecasting error values for the

Consumer Price Index (CPI) data in Tarakan City, which has a trend pattern. Meanwhile, Budiman (2021) stated that Single Exponential Smoothing (SES) is effective for data without trend patterns and can produce relatively small error values.

However, research comparing SES and Brown's DES in forecasting chicken egg prices in West Kalimantan Province is still limited. Most previous studies have focused on general commodities, inflation, or consumer price indices, and there has been no specific study on chicken egg price forecasting in West Kalimantan using both methods. In addition, the selection of SES and Brown's DES in this study is based on the characteristics of chicken egg price data, which is a time series with fluctuating patterns. Both methods are also simple, easy to implement, and widely used in commodity price forecasting. Therefore, this study aims to compare SES and Brown's DES methods in forecasting chicken egg prices in West Kalimantan Province. The novelty of this study lies in the use of chicken egg price data in West Kalimantan Province and the comparison of forecasting accuracy between SES and Brown's DES to determine the most appropriate forecasting method as a reference for future decision-making.

2. METHODS

The study was conducted using a quantitative approach to forecast chicken egg prices in West Kalimantan Province. The data used in this study are secondary data obtained from the official website of the National Center for Strategic Food Price Information (PIHPS), which is managed by Bank Indonesia. The data include information on chicken egg prices in West Kalimantan Province for the period January 2024 to July 2025 and are presented in **Table 1**.

Table 1. Chicken Egg Prices in West Kalimantan Province

Period	Egg Price (IDR/Kg)
Jan-24	25,000
Feb-24	26,250
Mar-24	28,000
Apr-24	31,250
May-24	28,500
Jun-24	23,500
Jul-24	26,500
Aug-24	28,000
Sep-24	25,000
Oct-24	23,750
Nov-24	24,250
Dec-24	25,250
Jan-25	28,000
Feb-25	27,000
Mar-25	27,500
Apr-25	29,000
May-25	26,000
Jun-25	26,750
Jul-25	29,500

Forecasting was carried out using Single Exponential Smoothing and Brown's Double Exponential Smoothing on the chicken egg price data presented in **Table 1**.

2.1 Single Exponential Smoothing

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

Where S_{t+1} represent the forecast for period $t+1$; α is the smoothing constant with a value ranging between $0 < \alpha < 1$; X_t denotes the actual data at time t; and S_t is the smoothed value (moving average) up to period $t-1$. (Hayuningtyas, 2019).

2.2 Brown's Double Exponential Smoothing

$$S'_t = \alpha X_t + (1-\alpha)S'_{t-1} \quad (2)$$

$$S''_t = \alpha S'_t + (1-\alpha)S''_{t-1} \quad (3)$$

$$a_t = 2S'_t - S''_t \quad (4)$$

$$b_t = \frac{\alpha}{1-\alpha}(S'_t - S''_t) \quad (5)$$

$$S_{t+1} = a_t + b_t m \quad (6)$$

Lets S'_t denote the value obtained from Single Exponential Smoothing; S''_t denote the value obtained from Double Exponential Smoothing; X_t represent the actual data at time t; a_t and b_t are smoothing constants; S_{t+1} represent the forecast for the next period; and m is the forecasting horixon (where $m = 1$) (Hayuningtyas, 2019).

To evaluate the accuracy of the forecasting results, error measures are used. These parameters are applied to assess the degree of discrepancy between the forecasted values and the actual data. The parameters used in this study are the Mean Absolute Deviation (MAD) and the Mean Absolute Percentage Error (MAPE).

2.3 Mean Absolute Deviation (MAD)

The MAD measure is applied by calculating the average magnitude of the absolute differences between the actual data and the forecasted values. The MAD formula is expressed in Equation (7):

$$MAD = \frac{1}{n}\sum_{t=1}^{n} |X_t - X'_t| \quad (7)$$

Where X_t denotes the actual data at time t; X'_t represent the forecasted value at time t; and n is the number of actual data observations. A lower MAD value indicates higher forecasting accuracy (Bakarbessy & Laamena, 2023).

2.4 Mean Absolute Percentage Error (MAPE)

The MAPE calculation is carried out by computing the absolute difference between each actual data value and the forecasted value, dividing it by the actual data value, and then multiplying the result by 100%, as shown in Equation (8) (Bakarbessy & Laamena, 2023):

$$MAPE = \frac{1}{n}\sum_{t=1}^{n}\left(\frac{|X_t - X'_t|}{X_t}\right)100\% \quad (8)$$

Where n is the number of actual data observations; X_t is the actual data value at time t; and X'_t is the forecasted value at time t. The MAPE value itself has a classification system used to determine whether the forecasting result are good or not (Marlim & Hajjah, 2021). The MAPE criteria are presented in **Table 2**.

Table 2. MAPE Classification Criteria

Criteria	Forecasting Categories
MAPE < 10%	Very Good
10% ≤ MAPE < 20%	Good
20% ≤ MAPE < 50%	Fair
MAPE ≥ 50%	Poor

The data analysis steps for forecasting chicken egg prices in West Kalimantan Province are carried out systematically as shown in **Figure 1.**

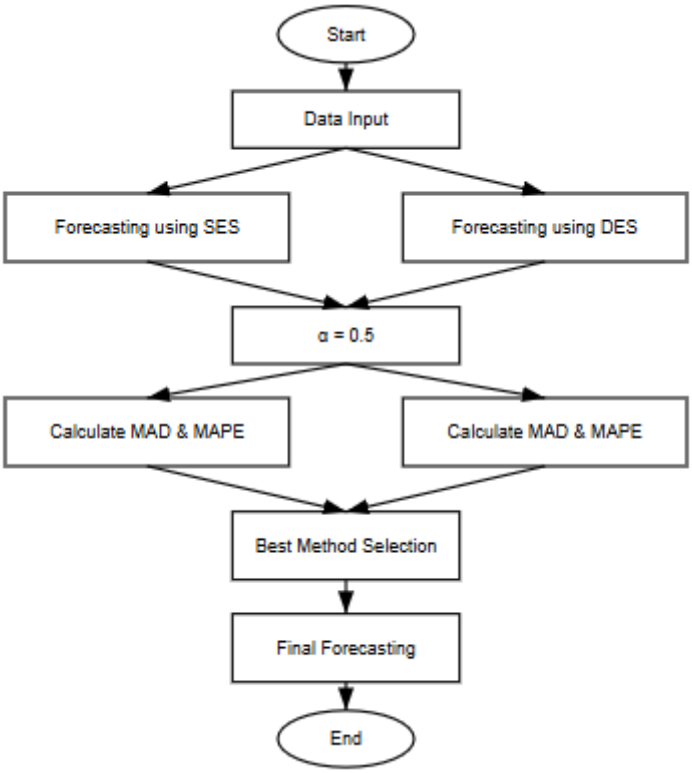

Figure 1. Research Procedures

The initial stage of this study begins with inputting chicken egg price data in West Kalimantan Province. The next step involves applying the Single Exponential Smoothing (SES) method and Brown's Double Exponential Smoothing (DES) method with a smoothing parameter of $\alpha = 0.5$. The selection of $\alpha = 0.5$ is based on the researcher's assumption in order to conduct a comparative analysis, thus requiring the same α value for both the SES and Brown's DES methods. This is followed by selecting the best method based on the smallest MAD and MAPE values between the SES and Brown's DES methods. Finally, forecasting is performed using the selected best method.

3. RESULT AND DISCUSSION

Forecasting and error calculations using the Single Exponential Smoothing (SES) method and Brown's Double Exponential Smoothing (DES) method are applied to chicken egg price data from January 2024 to June 2025.

1.1 Single Exponential Smoothing (SES)

The results of the calculations using the Single Exponential Smoothing (SES) method with the assistance of Microsoft Excel are presented in **Table 3** below:

Table 3. SES Forecasting Parameters

α	MAD	MAPE
0.5	1831.03	6.84%

Based on **Table 3**, the MAD and MAPE values obtained at $\alpha = 0.5$ are 1831.03 and 6.84%, respectively. The following are the results of the chicken egg price forecasting calculations in West Kalimantan Province using the SES method with $\alpha = 0.5$, as presented in **Table 4** below:

Table 4. Forecasting Results of Chicken Egg Prices Using SES

Period	Egg Price (IDR/Kg)	Forecast (IDR/Kg)
Jan-24	25,000	
Feb-24	26,250	25,000
Mar-24	28,000	25,625
Apr-24	31,250	26,812
May-24	28,500	29,031
Jun-24	23,500	28,766
Jul-24	26,500	26,133
Aug-24	28,000	26,316
Sep-24	25,000	27,158
Oct-24	23,750	26,079
Nov-24	24,250	24,914
Dec-24	25,250	24,582
Jan-25	28,000	24,916
Feb-25	27,000	26,458
Mar-25	27,500	26,729
Apr-25	29,000	27,114
May-25	26,000	28,057
Jun-25	26,750	27,029
Jul-25	29,500	26,889
Aug-25		28,194

Based on **Table 4**, the forecasting result for chicken egg prices in West Kalimantan Province for August 2025 using the SES method with α=0.5 is IDR 28,194.

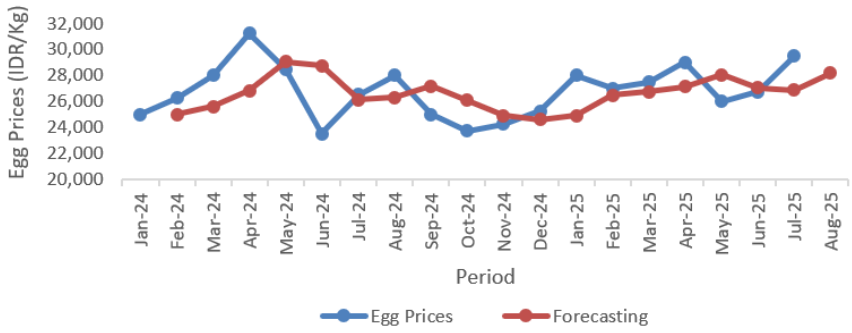

Figure 2. Comparison of actual values and forecasted chicken egg prices using the SES method with $\boldsymbol{\alpha = 0.5}$.

Based on **Figure 2**, it can be observed that chicken egg prices in West Kalimantan Province exhibit a fluctuating pattern with several periods of price increases and decreases. Price increases occur during certain periods, indicating higher demand or limited supply, whereas price decreases occur when supply conditions are relatively stable. These fluctuations indicate that price changes occur dynamically over time. The forecasting results using the Single Exponential

Smoothing (SES) method are able to closely follow the pattern of the actual data. The forecasted values appear to be close to the actual data.

1.2 Brown Double Exponential Smoothing (Brown's DES)

The results of the calculations using Brown's Double Exponential Smoothing (DES) method with the assistance of Microsoft Excel are presented in **Table 5** below:

Table 5. Brown DES Forecasting Parameters

α	MAD	MAPE
0.5	2265.02	8.52%

Based on **Table 5**, the MAD and MAPE values obtained at α=0.5 are 2265.02 and 8.52%, respectively. The following are the results of the chicken egg price forecasting calculations in West Kalimantan Province using Brown's DES method with α=0.5, as presented in **Table 6** below:

Table 6. Forecasting Results of Chicken Egg Prices Using Brown's DES

Period	Egg Prices (IDR/Kg)	Forecast (Rp/Kg)
Jan-24	25,000	
Feb-24	26,250	
Mar-24	28,000	25,938
Apr-24	31,250	28,312
May-24	28,500	32,000
Jun-24	23,500	29,984
Jul-24	26,500	24,109
Aug-24	28,000	25,488
Sep-24	25,000	27,586
Oct-24	23,750	25,214
Nov-24	24,250	23,317
Dec-24	25,250	23,451
Jan-25	28,000	24,684
Feb-25	27,000	27,884
Mar-25	27,500	27,713
Apr-25	29,000	27,992
May-25	26,000	29,439
Jun-25	26,750	26,691
Jul-25	29,500	26,581
Aug-25		29,346

Based on **Table 6**, the forecasting result for chicken egg prices in West Kalimantan Province for August 2025 using Brown's DES method with $\alpha = 0.5$ is IDR 29,346.

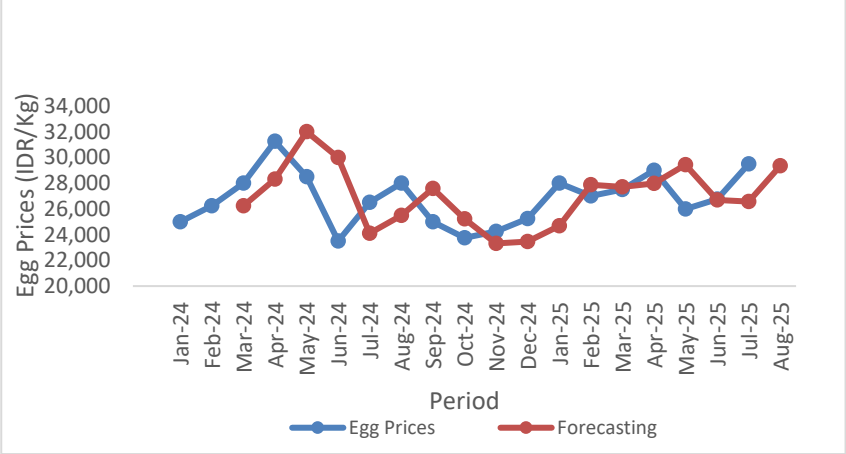

Figure 3. Comparison of actual values and forecasted chicken egg prices using the Brown's DES method with $\alpha = 0.5$.

Based on **Figure 3**, it can be observed that the price of chicken eggs in West Kalimantan Province exhibits a fluctuating pattern, characterized by several periods of price increases and decreases. Price increases occur during certain periods, which are presumed to be influenced by rising market demand and distribution supply conditions, whereas price decreases occur when the supply remains relatively stable. This fluctuation pattern indicates a tendency for price changes over time. The forecasting results using the Brown Double Exponential Smoothing (DES) method with α = 0.5 are able to follow the pattern of the actual data movement reasonably well. This is evident from the forecast values, which move closely in line with the actual data, both during periods of price increases and decreases.

3.3 Best Method Selection

The best method is determined by comparing the lowest MAD and MAPE values. The results of the comparison for selecting the best method between Simple Exponential Smoothing (SES) and Brown's Double Exponential Smoothing (DES) are presented in **Table 7** below.

Table 7. Comparison Result of SES and Brown's DES Methods

Method	α	MAD	MAPE
SES	0.5	1831.03	6.84%
Brown DES	0.5	2265.02	8.52%

Based on **Table 7**, the best forecasting method for chicken egg prices in West Kalimantan is Simple Exponential Smoothing (SES), which yields the smallest MAD and MAPE values, namely 1831.03 and 6.84%, respectively. A MAPE value of less than 10% indicates that the forecasting results using the SES method are categorized as very good. This is consistent with the characteristics of the actual data, which is stationary, making SES more suitable compared to Brown's Double Exponential Smoothing (DES) method.

These findings are in line with the study conducted by Kristianti and Darsyah (2018), which stated that the Single Exponential Smoothing (SES) method is more effectively applied to stationary data or data that do not exhibit trend or seasonal patterns. Similarly, Budiman (2021) found that the SES method is capable of producing a low forecasting error rate for relatively stable data. In this study, chicken egg price data in West Kalimantan shows a generally stationary pattern despite experiencing fluctuations in several periods; therefore, the SES method produces smaller error values compared to Brown's DES method. This is also consistent with the findings of

Purwanti and Purwadi (2019), which indicate that Brown's Double Exponential Smoothing (DES) method performs better when applied to data with a trend pattern.

This study contributes to the selection of appropriate forecasting methods for food commodities, particularly chicken egg prices in West Kalimantan Province. In addition, the results are expected to serve as a consideration for business actors, distributors, and consumers in making decisions related to purchasing and egg inventory control.

4. CONCLUSION

Based on the Result and Discussion section, it can be concluded that, in forecasting chicken egg prices in West Kalimantan using the SES and Brown's DES methods with $\alpha = 0.5$, the best method obtained is the SES method, which produces the smallest MAD and MAPE values, namely 1831.03 and 6.84%, respectively. The forecasting result using the SES method for the August 2025 period is IDR 28,194. The SES forecasting method is categorized as very good because the MAPE value obtained is less than 10%, and the forecasting results are able to follow the fluctuation pattern of the actual data.

Therefore, the findings of this study can be used as a basis for consideration by consumers in determining purchasing timing and managing chicken egg inventories, as well as assisting distributors in stock and distribution planning. In addition, these forecasting results may also serve as a consideration for local governments in monitoring price stability and formulating food price control policies to maintain affordability in West Kalimantan Province.

ACKNOWLEDGEMENT

The authors would like to express their appreciation and gratitude to all parties who contributed to the conduct of this research as well as to the preparation of this manuscript. The authors also extend their sincere thanks to the editor and reviewers of the *Jurnal Pemikiran dan Penelitian Pendidikan Matematika* (JP3M) for their valuable comments, suggestions, and support in improving this scientific work.

REFERENCES

Abbas, G., Arshad, M., Imran, M., Qamar, S., Bukhari, S. G., & Imran, M. M. (2024). Consumer preferences and market trends : customizing poultry products for customer-based poultry markets. 76(2), 396–415.

Azhar, M., Widagdo, P. pamilih, & Krisma, A. (2019). *Perbandingan metode* double exponential smoothing *dan* triple exponential smoothing *dalam parameter tingkat* error mean absolute percentage error (MAPE) *dan* Means Absolute Deviation (MAD). *Prosiding Seminar Nasional Ilmu Komputer Dan Teknologi Informasi*, 4(2), 81–87.

Bakarbessy, L., & Laamena, N. S. (2023). *Peramalan indeks pembangunan manusia menggunakan metode* double eksponential smoothing. *VARIANCE: Journal of Statistics and Its Applications*, 5(1), 67–78. https://doi.org/10.30598/variancevol5iss1page67-78BPS. (2025). *Produksi telur ayam petelur menurut provinsi (ton*). *Badan Pusat Statistik*. https://www.bps.go.id/id/statistics-table/2/NDkxIzI=/produksi-*telur-ayam-petelur-menurut-provinsi.html.*

Budiman, S. N. (2021). *Peramalan stock barang dagangan menggunakan metode* Single Exponential Smoothing. JTMI: *Jurnal Teknologi Dan Manajemn Informatika*, 7(2), 113–121. http://http//jurnal.unmer.ac.id/index.php/jtmi.

Destiarni, R. P. (2018). *Peramalan harga telur ayam ras pada hari besar keagamaan di pasar jawa timur*. *Berkala Ilmiah AGRIDEVINA*, 7(1), 62–76. https://doi.org/10.33005/adv.v7i1.1131Hayuningtyas, R. Y. (2019). S*istem informasi*

peramalan persediaan barang menggunakan metode SES *dan* DES. *Indonesian Journal on Software Engineering (IJSE)*, 4(1), 1–6. https://doi.org/10.31294/ijse.v4i1.6228

Kristanti, N., & Darsyah, M. Y. (2018). *Perbandingan peramalan metode* single exponential smoothing *dan* double exsponential smoothing p*ada karakteristik penduduk bekerja di Indonesia tahun* 2017. *Prosiding Seminar Nasional Mahasiswa Unimus*, 1(1), 368–374.

Marlim, Y. N., & Hajjah, A. (2021). *Sistem peramalan persediaan barang menggunakan metode* Brown Exponential Smoothing. *JOISIE (Journal Of Information Systems And Informatics Engineering)*, 5(2), 146–152. https://doi.org/10.35145/joisie.v5i2.1738

Mottet, A., Haan, C. de, Falcucci, A., Tempio, G., & Opio, C. (2017). Livestock: on our plates or eating at our table? A new analysis of the feed/food debate.

Petropoulos, F., Apiletti, D., Assimakopoulos, V., Babai, M. Z., Barrow, D. K., Taieb, S. Ben, Bergmeir, C., Bessa, R. J., Bijak, J., Boylan, J. E., Browell, J., Carnevale, C., Castle, J. L., Cirillo, P., Clements, M. P., Cordeiro, C., Luiz, F., Oliveira, C., Baets, S. De, … Ziel, F. (2022). *Forecasting : theory and practice. International Journal of Forecasting,* 38(3), 705–871. https://doi.org/10.1016/j.ijforecast.2021.11.001

Purwanti, D., & Purwadi, J. (2019). *Metode* brown ' s double exponential smoothing *dalam peramalan laju inflasi di Indonesia*. *Jurnal Ilmiah Matematika*, 6(2), 54–61.

Rosa, D. U., Alan, M. S., Nurhidayah, Wulandari, H., Rosana, & Ramadhan, S. (2019). *Metode* Exponential Smoothing *dalam memproyeksikan jumlah penduduk miskin di nusa tenggara barat*. *Jurnal Pemikiran Dan Penelitian Pendidikan Matematika*, 2(1), 42–53.

Saputra, A. A., S, M., & D, S. (2017). *Analisis faktor-faktor yang mempengaruhi permintaan telur ayam ras di kecamatan semarang tengah*. *Jurnal Program Studi Agribisnis, Fakultas Peternakan dan Pertanian Universitas Diponegoro Semarang*, 2013–2015.

Sari, S., Sari, N. L., Moza, J. R., Wahyudi, D., & Hutami, M. S. (2021). *Peramalan permintaan dalam menentukan penjualan produk menggunakan metode* DES brown *dan* DES holt *di PT. XYZ*. Jurnal Optimalisasi, 7(2), 269. https://doi.org/10.35308/jopt.v7i2.3980

Syahdan, S., & Aisyah, S. (2020). *Tarakan dengan metod*e double exponential. *Jurnal Matematika Dan Pendidikan Matematika*, 5(1), 54–64.

Tarisya, T. P. J., & Arum Handini Primandari. (2023). *perbandingan metode* double exponential smoothing *dan* metode triple exponential smoothing *untuk harga telur pada produsen di kabupaten sukabumi. Emerging Statistics and Data Science Journal*, 1(2), 204–214. https://doi.org/10.20885/esds.vol1.iss.2.art21

Z, K., F, K., M, G., I, K., & V, G. (2018). Physical-chemical characteristics of designer and conventional eggs. *Brazilian Journal of Poultry Science*.

Z, R. W. P., Maududi, R. Al, & Hartuti, P. M. (2024). *Peramalan harga bahan pangan menggunakan* Fuzzy Times Series. JOSTECH:Journal of Science and Tecknology, 4(2), 177–188.