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A COMPARATIVE ANALYSIS OF EXPONENTIAL SMOOTHING METHODS FOR FORECASTING POVERTY DATA

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Abstract || One of the primary challenges in enhancing a nation's welfare is the prevalence of poverty. This issue is also evident in Indonesia. According to data from the Central Statistics Agency (BPS) of Central Lampung, the poverty rate in Central Lampung Regency has shown a declining trend from 2005 to 2024. In this context, poverty is defined as the population whose average monthly expenditure falls below the regional poverty line. To anticipate potential increases in the number of people living in poverty, forecasting methods such as single exponential smoothing, double exponential smoothing, and triple exponential smoothing can be employed to estimate future poverty rates. Based on a comparative analysis of these three methods, the results indicate that the triple exponential smoothing method provides the highest predictive accuracy, with a Mean Absolute Percentage Error (MAPE) of 5.431, a Mean Absolute Deviation (MAD) of 10.502, and a Mean Squared Deviation (MSD) of 256.596. The projected poverty rate for the year 2025 using this method is 158.931.

Keywords || Poverty; Exponential Smoothing; Single; Double; Triple

Abstrak || Salah satu kendala dalam meningkatkan kesejahteraan negara adalah tingkat kemiskinan di negara tersebut. Begitu juga di Negara Indonesia. Berdasarkan data yang diperoleh dari website BPS Lampung Tengah diketahui bahwa angka kemiskinan di Kabupaten Lampung Tengah dari tahun 2005 sampai 2024 cenderung mengalami penurunan. Definisi kemiskinan itu sendiri merupakan penduduk yang memiliki rata-rata tingkat pengeluaran per bulan di bawah garis kemiskinan di Lampung Tengah. Sebagai upaya untuk mengantisipasi adanya peningkatan jumlah penduduk miskin di Kabupaten Lampung Tengah, metode peramalan single exponential smoothing, double exponential smoothing, dan triple exponential smoothing dapat digunakan untuk memprediksi perkiraan angka kemiskinan ditahun berikutnya. Berdasarkan analisis yang telah dilakukan dengan membandingkan ketiga metode tersebut, diperoleh hasil bahwa metode triple exponential smoothing merupakan metode terbaik dengan nilai akurasi MAPE sebesar 5,431, MAD sebesar 10,502, dan MSD sebesar 256,596. Nilai prediksi yang diperoleh untuk tahun 2025 sebesar 158,931.

Katakunci || Kemiskinan; Exponential Smoothing; Single; Double; Triple

Introduction

A country's level of welfare can be assessed through the progress of its development process. Nations with sustainable development systems generally exhibit higher levels of welfare. However, poverty remains one of the major obstacles to improving welfare. In Indonesia, the poverty rate remains relatively high. Data from the Central Statistics Agency (BPS) show that the number of people living in poverty was 26.16 million in 2022 and decreased slightly to 25.90 million in 2023, reflecting a decline of 0.18% (Badan Pusat Statistik Republik Indonesia, 2023) This persistent poverty rate poses a significant challenge to Indonesia's development, given that poverty is a complex and multidimensional issue (Ferezegia, 2018).

In response, the government has undertaken various initiatives to reduce poverty, including meeting basic needs and providing skills training to foster greater independence. Conceptually, poverty is categorized into three types: absolute, relative, and subjective (Adawiyah, 2020). Absolute poverty is measured by the inability to meet basic living needs, relative poverty is contextual and varies over time and place, while subjective poverty is based on individuals' own perceptions of their economic condition.

Addressing poverty in Indonesia is imperative, as high poverty levels are closely linked to other critical development indicators such as income, education, and health (Sinurat, 2023). The availability of accurate data is essential in supporting government efforts to monitor and reduce poverty. Reliable data allow policymakers to assess trends over time and respond accordingly (Ferezegia, 2018). One approach to anticipate future poverty trends is through forecasting based on historical data. This enables proactive policy planning should poverty levels rise.

According to data from the Central Lampung Regency Statistics Agency, the local poverty rate has shown a generally declining trend, which is encouraging and should be sustained. In 2023, poverty in Central Lampung was defined as individuals whose average monthly expenditure fell below the regional poverty line of IDR 503,645 (Badan Pusat Statistik Lampung Tengah, 2023). The declining poverty trend in recent years suggests improved average expenditures and, by extension, an enhanced quality of life in the region.

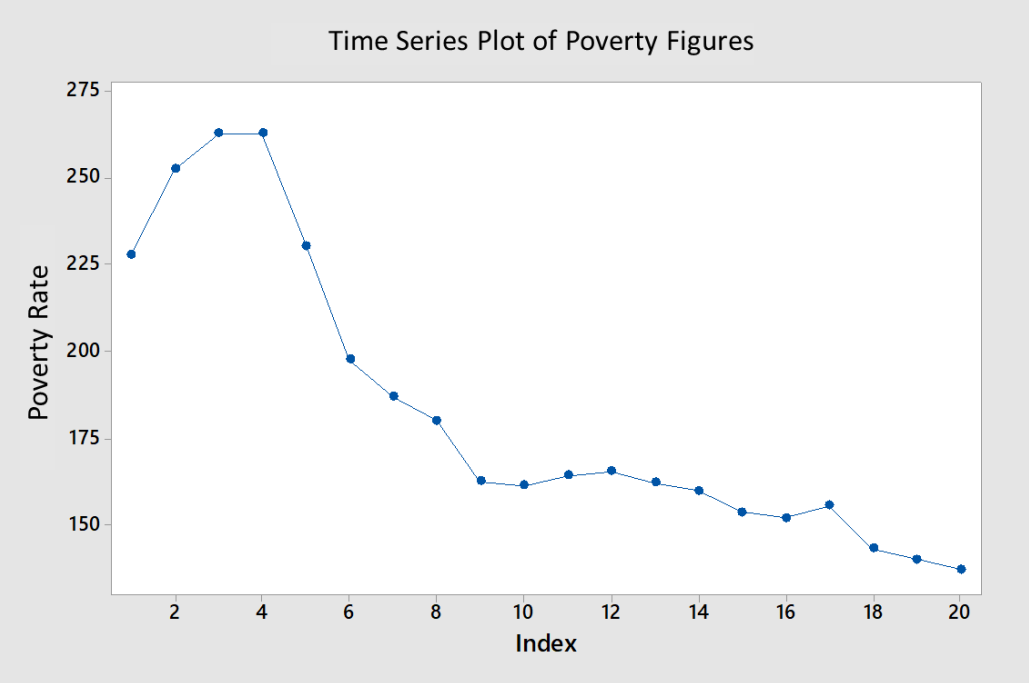

Figure 1. Poverty Rate

As illustrated in Figure 1, the poverty rate in Central Lampung Regency initially increased between 2005 and 2008, but has consistently declined from 2009 through 2024. This downward trend is a positive development that requires continued support. Forecasting plays a crucial role in identifying whether this trend is likely to persist or reverse in the coming years.

While poverty forecasting is a common analytical practice, it often relies on a single technique. Among the widely used forecasting methods is exponential smoothing, which includes three variants: single, double, and triple exponential smoothing. This method is particularly suitable for time-series data exhibiting clear trends, whether upward or downward. Its advantages include applicability to small and non-stationary datasets (Sari, 2022). To evaluate the accuracy of forecasting results, metrics such as Mean Absolute Percentage Error (MAPE), Mean Absolute Deviation (MAD), and Mean Squared Deviation (MSD) are employed. Accordingly, the aim of this study is to compare the performance of single, double, and triple exponential smoothing methods in forecasting poverty data in Central Lampung Regency.

Methodology

Single Exponential Smoothing

Single exponential smoothing is a forecasting method commonly used for short-term predictions. This method assumes that the data fluctuates around a stable or stationary mean (Lusiana & Yuliarty, 2020). The smallest allowable smoothing constant in this method is 0.1. The general form of the single exponential smoothing model is expressed as follows (Marizal, 2023):

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

Where:

- S_{t+1}: forecast value for period t+1
- α: smoothing constant ($0 < \alpha < 1$)
- X_t: actual data in period t
- S_t: forecast value in period t

Double Exponential Smoothing

Double exponential smoothing is advantageous for small datasets, requires fewer parameters, and is applicable to non-stationary data. The method involves two stages of smoothing (Sari, 2022):

a) First and second-level smoothing:

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

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

b) Forecasting equation:

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

Where:

- S'_t: first smoothed value at period *t*
- S''_t: second smoothed value at period *t*
- X_t: actual data at period *t*
- a_t: level component in period *t*
- b_t: trend component in period *t*
- m: number of periods ahead being forecast
- F_{t+m}: forecast for mmm future periods

Triple Exponential Smoothing

Triple exponential smoothing (Holt-Winters method) incorporates seasonality in addition to level and trend. It is divided into multiplicative and additive models. The general forms of the equations are (Marizal, 2023):

a) Multiplicative model:

$$S_t' = \alpha.\frac{X_t}{I_{t-L}} + (1-\alpha)(S_{t-1} + b_{t-1})$$
$$b_t = \gamma.(S_t - S_{t-1}) + (1-\gamma)b_{t-1}$$
$$I_t = \beta.\frac{X_t}{S_t} + (1-\beta)I_{t-L}$$
$$F_{t+m} = (S_t + b_t.m)I_{t-L+m}$$

b) Multiplicative model:

$$S_t' = \alpha.(X_t - I_{t-L}) + (1-\alpha)(S_{t-1} + b_{t-1})$$
$$b_t = \gamma.(S_t - S_{t-1}) + (1-\gamma)b_{t-1}$$
$$I_t = \beta.\frac{X_t}{S_t} + (1-\beta)I_{t-L}$$
$$F_{t+m} = S_t + b_t.m + I_{t-L+m}$$

Where $\alpha, \beta,$ and γ are smoothing parameters ranging between 0 and 1.

Forecast Accuracy

Forecast accuracy is evaluated to determine the reliability of the prediction results. Three common metrics used for accuracy assessment include Mean Absolute Percentage Error (MAPE), Mean Absolute Deviation (MAD), and Mean Squared Deviation (MSD).

Mean Absolute Percentage Error (MAPE):

MAPE is calculated by averaging the absolute percentage error for each forecasted period (Syakhroni & Maulana, 2023).

$$MAPE = \frac{1}{n}\sum_{t=1}^{n}\left|\frac{Y_t - \overline{Y_t}}{Y_t}\right|.100\%$$

MAPE interpretation criteria (Ngurah Diksa, 2021).

Table 1. MAPE Criteria

MAPE Value (%)	Forecast Accuracy
<10	Very Good
10-20	Good
20-50	Fair
>50	Poor

Mean Absolute Deviation (MAD)

MAD is the average of the absolute differences between actual and forecasted values (Syakhroni & Maulana, 2023):

$$MAD = \frac{1}{n}\sum_{t=1}^{n}|Y_t - \bar{Y}_t|$$

Mean Squared Deviation (MSD)

MSD provides a more sensitive measure by squaring the forecast errors, capturing data dispersion (Syakhroni & Maulana, 2023):

$$MSD = \frac{\sum_{t=1}^{n}|Y_t - \bar{Y}_t|^2}{n}$$

Where:

n : number of data points
Y_t: actual value at period *t*
$\bar{Y}_t$: forecast value at period *t*

Analysis and Discussion

This study aims to analyze the trend of poverty rates in Central Lampung Regency over the past two decades (2005–2024) and to forecast the poverty rate for the subsequent year using three time series forecasting techniques: single exponential smoothing, double exponential smoothing, and triple exponential smoothing. These methods were selected due to their ability to capture historical data patterns and generate reliable projections for future values.

The study utilizes secondary data obtained from the official website of the Central Statistics Agency (BPS) of Central Lampung Regency, specifically the annual poverty rate data from 2005 to 2024. These data are summarized in Table 2:

Table 2. Poverty Rate in Central Lampung Regency (2005–2024)

Year	Poverty Rate
2005	228,20

Year	Poverty Rate
2006	252,72
2007	263,00
2008	263,00
2009	230,66
2010	197,80
2011	187,00
2012	180,23
2013	162,81
2014	161,55
2015	164,40
2016	165,67
2017	162,38
2018	160,12
2019	153,84
2020	152,28
2021	155,77
2022	143,34
2023	140,29
2024	137,41

An examination of poverty data from 2005 to 2024, as illustrated in Figure 1, reveals a consistent downward trend in the poverty rate in Central Lampung Regency. This indicates that the data series exhibits a declining pattern over time. The forecasting analysis was conducted using three methods: single exponential smoothing, double exponential smoothing, and triple exponential smoothing. The descriptive statistics for the observed data are presented in Table 3.

Table 3. Descriptive Statistics of Poverty Data (2005–2024)

Variable	Total Count	Mean	StDev	Variance	Minimum	Maximum
Poverty Rate	20	183,12	41,48	1720,61	137,41	263,00

The average poverty rate over the past two decades in Central Lampung Regency is 183.12 thousand people. The highest recorded poverty rate was 263.00 thousand people in 2007 and 2008, while the lowest rate occurred in 2024, at 137.41 thousand people. Forecast values generated using each method are summarized in Table 4.

Table 4. Forecasted Poverty Rate for 2025

	Single Exponential Smoothing	Double Exponential Smoothing	Triple Exponential Smoothing
Forecasting	138,856	132,663	133,202
Minimum	109,742	104,327	107,474
Maximum	167,988	160,998	158,931

Using the single exponential smoothing method, the forecasted poverty rate for 2025 is 138.856 thousand people, with a predicted range between 109.742 and 167.988. The double exponential smoothing method yields a forecast of 132.663, with lower and upper bounds of 104.327 and 160.998, respectively. Meanwhile, the triple exponential smoothing method produces a forecast of 133.202, with a predicted range of 107.474 to 158.931 thousand people.

To determine the most accurate forecasting method, the accuracy of each model was assessed using three commonly applied metrics: Mean Absolute Percentage Error (MAPE), Mean Absolute Deviation (MAD), and Mean Squared Deviation (MSD). The results are provided in Table 5.

Table 5. Forecast Accuracy Metrics

	Single exponential smoothing	Double exponential smoothing	Triple exponential smoothing
MAPE	6,213	5,857	5,431
MAD	11,887	11,566	10,502
MSD	257,905	276,189	256,596

Forecasting methods with lower MAPE, MAD, and MSD values are considered more accurate. As shown in Table 5, the triple exponential smoothing method yields the lowest error across all three metrics, indicating it is the most accurate model for predicting the poverty rate in Central Lampung Regency. According to the MAPE-based classification criteria (Table 1), this result falls within the "good" forecasting category.

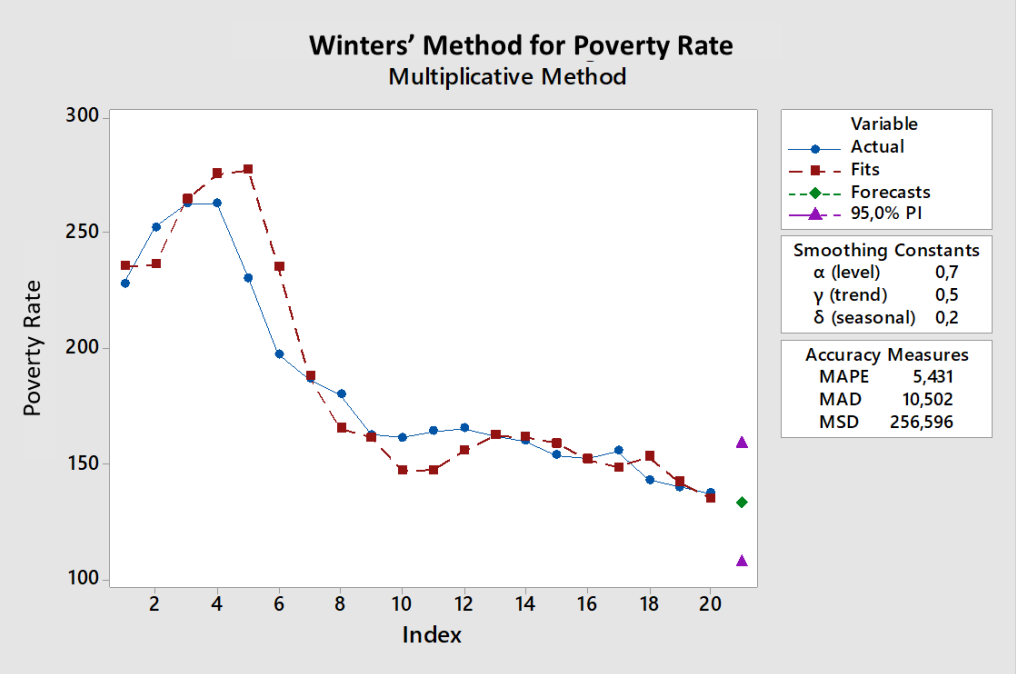

Figure 1. Forecast Graph Using Triple Exponential Smoothing

The forecast graph generated using the triple exponential smoothing method demonstrates a close alignment between the actual and predicted values. The resulting prediction pattern closely mirrors the observed data, affirming the model's reliability. With smoothing parameters set at $\alpha = 0.7$, $\beta = 0.5$, and $\gamma = 0.2$, the predicted poverty rate for Central Lampung Regency in 2025 is estimated at 158.931 thousand people.

The poverty data for Central Lampung Regency over the 2005–2024 period consistently reflect a declining trend. In 2005, the poverty rate stood at 228.20 thousand people, rising to a peak of 263.00 thousand in 2007 and 2008. However, this was followed by a sustained decline, reaching its lowest point in 2024 at 137.41 thousand people. The average poverty rate throughout the 20-year period was 183.12 thousand people. This consistent decrease suggests that various poverty alleviation programs initiated by the central and regional governments have had a meaningful and likely positive impact on reducing poverty in the region.

In addition, the decline in poverty rates may also be attributed to external factors such as regional economic growth, increased access to education and healthcare, and social and political stability. In the context of development planning, the ability to accurately forecast future poverty rates is essential for formulating evidence-based policies.

To this end, this study applies three exponential smoothing forecasting models to evaluate and compare their respective accuracies in estimating future poverty levels.

Single Exponential Smoothing

The single exponential smoothing model yielded a forecast of 138.856 thousand people, with a predicted range between 109.742 and 167.988 thousand people. This model is most appropriate for data with no clear trend or seasonality. However, since the observed poverty data demonstrates a distinct downward trend, the model's inability to account for trends limits its forecasting precision in this context.

Double Exponential Smoothing

The double exponential smoothing model, which incorporates a trend component, produced a forecast value of 132.663 thousand people, with a lower bound of 104.327 thousand and an upper bound of 160.998 thousand. This method demonstrates improved performance over the single smoothing model by more effectively capturing the consistent downward trend observed since 2008.

Triple Exponential Smoothing

The triple exponential smoothing model (Holt-Winters), the most complex of the three, accounts for both trend and seasonality components. Although the poverty data in this study does not explicitly exhibit seasonality, this method remains advantageous due to its enhanced smoothing capabilities. Using optimized smoothing constants $\alpha = 0.7$, $\beta = 0.5$, and $\gamma = 0.2$, the model generated a forecast of 133.202 thousand people, with a prediction interval ranging from 107.474 to 158.931 thousand people.

Comparison of Forecast Accuracy

The performance of each forecasting method was assessed using three statistical accuracy metrics: Mean Absolute Percentage Error (MAPE), Mean Absolute Deviation (MAD), and Mean Squared Deviation (MSD). The results are summarized as follows:

a) Single Exponential Smoothing: MAPE = 6.213, MAD = 11.887, MSD = 257.905

b) Double Exponential Smoothing: MAPE = 5.857, MAD = 11.566, MSD = 276.189
c) Triple Exponential Smoothing: MAPE = 5.431, MAD = 10.502, MSD = 256.596

Based on these values, the triple exponential smoothing method demonstrates the highest level of accuracy, as indicated by the lowest MAPE, MAD, and MSD scores. A MAPE value below 10% is generally regarded as indicative of good forecasting performance, and the value of 5.431 confirms that the forecast closely approximates the actual data. Furthermore, the forecast graph produced by the triple exponential smoothing model reveals a pattern that closely mirrors the actual trend, reflecting the model's strong adaptability to the data's structural characteristics.

The findings of this study confirm that poverty in Central Lampung Regency has experienced a significant decline over the past two decades. If this trend continues and is supported by well-targeted policy interventions, the poverty rate is expected to decrease further in the coming years. The projected poverty rate of 133.202 thousand people for the following year—generated by the most accurate forecasting model—underscores the importance of sustained, evidence-based policy efforts in the economic, social, and public welfare sectors. This prediction offers critical insights for local governments in designing budget allocations, implementing social assistance programs, and formulating regional development strategies. Given that the poverty rate serves as a key indicator of societal well-being, continued reduction in this figure represents a tangible measure of developmental progress.

Moreover, these results reinforce the conclusions of prior research. For instance, studies by Ensafi et al. (2022), Rasyid et al. (2025), and Wawo et al. (2025) have shown that time series forecasting models—particularly the triple exponential smoothing method—yield more accurate estimates in socioeconomic contexts due to their ability to capture medium- and long-term trends. Similarly, findings by Israwati et al. (2024), Mahariani & Arifianti (2025), Rosidah et al. (2024), and Syuhada & Setyawan (2023) validate the suitability of the triple exponential smoothing model for datasets exhibiting consistent downward trends, such as poverty and unemployment rates. This study also aligns with national and regional BPS reports, which indicate that poverty alleviation initiatives—including cash transfer programs, national health insurance, and the Family Hope Program—have

significantly contributed to poverty reduction, although disparities between urban and rural areas persist.

The study provides robust evidence that the poverty trend in Central Lampung Regency has followed a steady downward trajectory over the past 20 years. These findings are not only descriptive but also predictive, as demonstrated by the application of the triple exponential smoothing model, which generated the most accurate forecast based on MAPE, MAD, and MSD performance metrics. The strength of this method lies in its ability to account for underlying trend components and to produce estimates closely aligned with observed values.

In practical terms, these findings offer substantial contributions to regional policy formulation. Local governments can utilize the forecasting results as a foundation for determining resource allocations for poverty reduction programs, economic empowerment initiatives for low-income groups, and efforts to expand access to education and healthcare services. Furthermore, this study can serve as a reference point for future research applying similar forecasting models in different regional settings or integrating more advanced approaches, such as ARIMA or machine learning-based techniques. As such, continuous poverty data analysis becomes a critical component of inclusive, data-driven, and equitable development planning.

Conclusion

This study aims to analyze the trend of poverty rates in Central Lampung Regency over the past two decades (2005–2024) and to forecast the poverty rate for the subsequent year using three time series forecasting methods: single exponential smoothing, double exponential smoothing, and triple exponential smoothing. The analysis is based on secondary data obtained from the Central Statistics Agency (BPS) of Central Lampung Regency. The findings reveal a consistent downward trend in poverty rates, declining from a peak of 263 thousand individuals in 2007–2008 to 137.41 thousand in 2024. The average poverty rate during this period was recorded at 183.12 thousand people.

Among the three forecasting methods employed, the triple exponential smoothing model demonstrated the highest predictive accuracy, with a Mean Absolute Percentage Error (MAPE) of 5.431, a Mean Absolute Deviation (MAD) of 10.502, and a Mean Squared Deviation (MSD) of 256.596. This model projects a poverty rate of 133.202 thousand people for the upcoming year, confirming its superior

ability to capture the existing downward trend more effectively than the other methods.

The study offers valuable insights for policymakers and can serve as a reference for evidence-based planning, particularly in designing poverty alleviation strategies, allocating social budgets, and evaluating regional development outcomes. Nonetheless, a key limitation of this study lies in its reliance on univariate quantitative data, without accounting for other macroeconomic variables such as inflation, unemployment, or fiscal policy measures. Therefore, it is recommended that local governments develop a more comprehensive poverty forecasting system that integrates both statistical and macroeconomic indicators. Future research is encouraged to enhance the model's predictive capability by incorporating multivariate or machine learning approaches, thereby broadening the analytical scope to include other relevant socio-economic dimensions.

References

Journals

Adawiyah, S. El. (2020). Kemiskinan dan Fakor-Faktor Penyebabnya. *Khidmat Sosial: Journal of Social Work and Social Services*, *1*(1), 43–50. https://jurnal.umj.ac.id/index.php/khidmatsosial/article/view/6336

Ensafi, Y., Amin, S. H., Zhang, G., & Shah, B. (2022). Time-Series Forecasting of Seasonal Items Sales Using Machine Learning: A Comparative Analysis. *International Journal of Information Management Data Insights*, *2*(1), 1–16. https://doi.org/10.1016/j.jjimei.2022.100058

Ferezegia, D. V. (2018). Analisis Tingkat Kemiskinan di Indonesia. *Jurnal Sosial Humaniora Terapan*, *1*(1), 1–6. https://scholarhub.ui.ac.id/jsht/vol1/iss1/1/

Israwati, W. O., Ruslan, R., & Djafar, M. K. (2024). Penerapan Metode Triple Exponential Smoothing Winter's dalam Meramalkan Laju Inflasi: Metode Triple Exponential Smoothing Winter's. *Jurnal Matematika Komputasi Dan Statistika*, *4*(2), 719–728. https://doi.org/10.33772/jmks.v4i2.89

Lusiana, A., & Yuliarty, P. (2020). Penerapan Metode Peramalan (Forecasting) Pada Permintaan Atap di PT X. *Industri Inovatif: Jurnal Teknik Industri*, *10*(1), 11–20. https://doi.org/10.36040/industri.v10i1.2530

Mahariani, Y. R., & Arifianti, E. R. (2025). Prediksi Harga Beras di Jawa Timur Menggunakan Metode Triple Eksponensial Smoothing. *Multiple: Journal of Global and Multidisciplinary*, *3*(1), 4650–4657. https://journal.institercom-edu.org/index.php/multiple/article/view/893

Marizal, M. (2023). Analisis Anggaran Pendapatan dan Belanja Daerah Provinsi Riau. *Kutubkhanah: Jurnal Penelitian Sosial Keagamaan*, *23*(1), 71–81. https://doi.org/10.24014/kutubkhanah.v23i1.18353

Ngurah Diksa, I. G. B. (2021). Peramalan Gelombang Covid 19 Menggunakan Hybrid Nonlinear Regression Logistic – Double Exponential Smoothing di Indonesia dan Prancis. *Jambura Journal of Mathematics*, *3*(1), 37–51. https://doi.org/10.34312/jjom.v3i1.7771

Rasyid, R. M. A. K., Pambudi, A., & Santoso, B. (2025). Penerapan Metode Triple Exponential Smoothing Untuk Prediksi Harga Emas: Studi Kasus Pada PT. Aneka Tambang. *Journal of Information System Management*, *6*(2), 118–123. https://doi.org/10.24076/joism.2025v6i2.1793

Rosidah, K., Alfan, A., & Isro'il, A. (2024). Peramalan Tingkat Pengangguran di Kota Lamongan Menggunakan Metode Pemulusan Eksponensial Ganda Brown. *Mathunesa: Jurnal Ilmiah Matematika*, *12*(3), 569–578. https://doi.org/10.26740/mathunesa.v12n3.p569-578

Sari, D. R. P. (2022). Penerapan Metode Double Exponential Smoothing Pada Data Inflasi Bulanan Tahun 2021. *Jurnal Matematika Dan Statistika Serta Aplikasinya*, *10*(2), 26–31. https://doi.org/10.24252/msa.v10i2.27272

Sinurat, R. P. P. (2023). Analisis Faktor-Faktor Penyebab Kemiskinan Sebagai Upaya Penanggulangan Kemiskinan di Indonesia. *Jurnal Registratie*, *5*(2), 87–103. https://doi.org/10.33701/jurnalregistratie.v5i2.3554

Syakhroni, A., & Maulana, M. S. J. (2023). Peramalan Permintaan Gula Bulk dan Gula Kemas Menggunakan Metode Winter's Exponential Smoothing di PT. XYZ. *Jurnal Logistica*, *2*(1), 1–6. https://journal.iteba.ac.id/index.php/logistica/article/view/157

Syuhada, E. G., & Setyawan, M. Y. H. (2023). Analisis Komparasi Metode Prophet dan Metode Exponential Smoothing dalam Peramalan Jumlah Pengangguran di Jawa Barat: Systematic Literature Review. *Jurnal Mahasiswa Teknik Informatika*, *7*(2), 1369–1377. https://doi.org/10.36040/jati.v7i2.6827

Wawo, R. Y., Salaki, D. T., Komalig, H. A. H., Hatidja, D., & Marline Sofiana Paendong, T. M. (2025). Perbandingan Metode Triple Exponential Smoothing Additive dan Additive Parameter Damped untuk Peramalan Indeks Harga Konsumen. *Euler: Jurnal Ilmiah Matematika, Sains Dan Teknologi*, *13*(1), 77–83. https://doi.org/10.37905/euler.v13i1.30928

Reports

Badan Pusat Statistik Lampung Tengah. (2023). *Kondisi Kemiskinan Lampung Tengah Tahun 2023*. https://lampungtengahkab.bps.go.id/id/news/2023/10/18/123/kondisi-kemiskinan-lampung-tengah-tahun-2023--bukadatayuk-.html

Badan Pusat Statistik Republik Indonesia. (2023). *Indikator Kesejahteraan Rakyat 2023*.