
Analysis of Demand Forecasting on CV Unggul Jaya Aki Using Naïve and Exponential Smoothing Methods

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Article Information		Abstract
Submission date	4 February 2026	Research aim: Analyse the demand forecasting calculation and determine the level of accuracy between the Naïve and Exponential Smoothing methods at CV Unggul Jaya Aki. Design/Method/Approach: A Quantitative Descriptive Approach was used in this study, and the data used were historical sales data of automotive batteries from December 2024 to November 2025. Forecasting accuracy is measured using Mean Absolute Percentage Error (MAPE). Research Finding: The Naif method yielded an estimated 460 units with a MAPE of 12.93%, while the Exponential Smoothing method produced 623.06 units with a MAPE of 14.13% based on analysis data. Thus, the Naif method has a smaller error rate and is more accurate for cases with a small business scale. Theoretical contribution/Originality: This study contributes to the literature on forecasting methods for small and medium-sized enterprises (SMEs) in the automotive sector, in particular, comparing simple quantitative methods for demand fluctuations. Practitioner/Policy implication: The results of this study provide demand forecasting for CV Unggul Jaya Aki to control inventory more effectively, minimising the risk of overstock and understock. Research limitation: This study is limited to historical sales data from one company (CV Unggul Jaya Aki) without considering other external factors, such as national inflation, natural disasters, or price competition between competitors that can cause changes in the historical sales data of this company. Keywords: Demand Forecasting, Naïve Methods, Exponential Smoothing, MAPE, Inventory Management.
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Introduction

In this modern business era, companies are expected to have good skills in analyzing consumer demand to ensure effective planning [1] Demand forecasting is an important activity for forecasting future events and minimizing errors in decision-making. Failure to accurately forecast demand can lead to two major problems: Overstock, this condition increases storage costs and the risk of damage [2]. And the second is the shortage of stock, which leads to a loss of sales potential and a decrease in customer satisfaction.

In addition, demand forecasting can also reduce high storage costs and potential losses due to declining quality of goods, and if there is a shortage of stock, customers will experience a decrease in satisfaction [3] Along with the development of the economy and increasingly sophisticated technological advancements, it must have a great influence on the industry, especially the existing industries [4]. This research was conducted at CV. Unggul Jaya Aki because Cv. Unggul Jaya Aki has not implemented demand forecasting in managing inventory, therefore it is

necessary to make forecasting so that in the future there will be no overstock or stockout of inventory in the warehouse to minimize storage and maintenance costs.

Based on the observation of forecast data at CV Unggul Jaya Aki, there are indications that the company is facing fluctuations in demand. There are periods of high demand that lead to stock shortages, and periods of low demand that lead to stock buildups. This condition shows that the demand forecasting applied by CV Unggul Jaya Aki is not optimal in controlling battery stocks.

The *naïve* and *exponential smoothing* methods are commonly used in historical data-driven demand forecasting research. The two studies also prove that the quantitative approach is the main choice in analyzing demand patterns in various types of businesses [5]. The common patterns that occurred in the past will be used as one of the inputs in making a decision model taken by the management to determine how much demand for products will come [6].

The object of research is CV. Unggul Jaya Aki has a different business scale and characteristics from previous research, such as the mining industry, which tends to have a more stable or structured demand pattern. This shows that there is a research gap, because there have not been many studies that specifically discuss forecasting in small businesses with fluctuating demand patterns such as CVs. Unggul Jaya Aki [7]

The selection of Naïve and Exponential Smoothing methods in this study was based on the data conditions and characteristics of the business studied. The Naïve method was chosen because it is easy to use and can provide a quick overview of forecasting without complex calculations. Meanwhile, Exponential Smoothing is used because it is able to adjust forecasting results to the latest data changes, making it more adaptive to unstable demand patterns. These two methods are considered the most suitable for CVs. Unggul Jaya Aki is a small-scale business with limited historical data and demand that tends to fluctuate, so the use of simple but accurate methods becomes more relevant than more complex methods.

The main focus of this article is to compare the accuracy between the Naïve and Exponential Smoothing approaches. The Naïve method is often used as a basis for comparison, while Exponential Smoothing is more effective for new data. The novelty of this research lies in the specific application of these two methods to find the most effective solution in minimizing inventory costs in small automotive businesses in the Sragen region.

The purpose of this article is to analyze the calculation of demand forecasting in CV Unggul Jaya Aki using the Naïve and Exponential Smoothing methods and analyze the accuracy level of these methods to determine the most appropriate method to apply.

Statement of Problem

1. How to calculate demand forecasting on CV . Unggul Jaya Aki by using a naïve, *exponential smoothing approach*?
2. How accurate is the demand forecasting method?

Research Objectives

1. To analyze the demand forecasting calculation on a CV. Unggul Jaya Aki by using a naïve, *exponential smoothing approach*.
2. To analyze the accuracy of the demand forecasting method.

Method

This study uses a Quantitative Descriptive approach, aiming to analyze the demand pattern in CV Unggul Jaya Aki using historical data. The data source used is secondary data in the form of monthly battery sales reports from December 2024 to November 2025. This research was conducted at CV Unggul Jaya Aki, Sragen, Central Java.

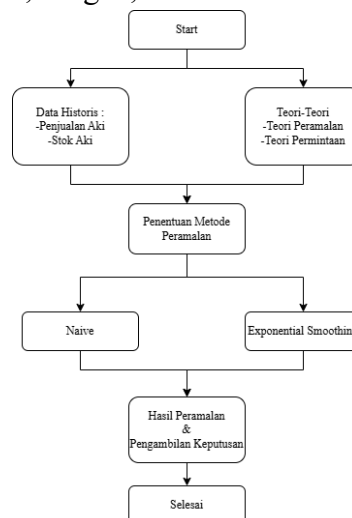


Image 1 Research Structure

The data analysis technique involves two forecasting methods. The *Naïve* method is one of the simplest and most frequently used forecasting techniques in data analysis. This method assumes that the forecast value for the next period is equal to the actual value of the previous period [8]. The formula for the *naïve* method can be assumed as follows:

$$F_{t+1} = A_t$$

Description :

F_{t+1} = Forecast result for the next period

A_t = Actual data from the previous period

Second, the *Exponential Smoothing Method*, a method in which each new forecast is based on the previous forecast plus the percentage of the difference between the forecast and the actual value of the series at that point [9]

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

Description :

F_t = Approximate for period t

F_{t-1} = Estimated result for the previous period

α = Constant is gutted

$At-1$ = Actual demand or sales for the previous period

This study uses Mean Absolute Percentage Error (MAPE) to measure the accuracy of the estimated results, MAPE calculates the average absolute percentage error of the estimate. A low MAPE value indicates that the model is considered good and has an acceptable level of accuracy. The formula used is the sum of the absolute difference between the actual and the estimated divided by the actual, then divided by the number of periods.

$$MAPE = \left| \frac{1}{n} \sum_{t=1}^n \frac{At - Ft}{At} \right| \times 100$$

Description :

MAPE = Average absolute error percentage

At = Actual value in period t

Ft = The value of the forecast results in the period t

n = Number of observation periods

$At - Ft$ = The absolute difference between the actual value and the forecast value

Results and Discussion

Sales data for CV Unggul Jaya Aki from December 2024 to November 2025 shows fluctuating conditions. For example, sales in December 2024 were 450 units, increasing to 690 units in August 2025, but dropping to 460 units in November 2025. These fluctuations confirm the need for accurate forecasting methods.

Table 1. Battery Sales Data December 2024-November 2025

No	Period	Item Name	Sale	Stock	Remarks
1	December 2024	VITRA MF	450	590	Plus
2	January 2024	VITRA MF	444	470	Plus
3	February 2024	VITRA MF	652	700	Plus
4	March 2025	VITRA MF	663	690	Plus
5	April 2025	VITRA MF	498	600	Plus
6	May 2025	VITRA MF	588	610	Plus
7	June 2025	VITRA MF	599	650	Plus
8	July 2025	VITRA MF	623	600	Minus
9	August 2025	VITRA MF	690	700	Plus
10	September 2025	VITRA MF	622	650	Plus
11	October 2025	VITRA MF	544	600	Plus
12	November 2025	VITRA MF	460	523	Plus

Source : Data Processed (2026)

The sales data of VITRA MF batteries at CV Unggul Jaya Aki during the period of December 2024 to November 2025 indicate fluctuating demand conditions. Sales began at 450 units in December 2024, decreased slightly to 444 units in January, then increased significantly

to 652 units in February and reached a peak of 690 units in August 2025 before declining to 460 units in November 2025. These fluctuations demonstrate that battery demand does not follow a stable monthly pattern, making forecasting an important managerial tool for planning inventory and preventing stock shortages or overstock situations.

From a descriptive perspective, the observed sales pattern shows several short-term increases and decreases throughout the year. A sharp increase occurred between January and March, followed by a decline in April, another upward trend until August, and a gradual decrease toward the end of the observation period. Such movement suggests that the product demand is influenced by operational and market-related factors, including purchasing behavior, stock availability, and possible seasonal buying patterns. In forecasting studies, fluctuating sales data such as these often require methods that are able to respond to recent changes while maintaining prediction consistency.

Table 1. Forecasting with the Naïve Method

Period	Item Name	Sales	Y'	MAPE
Dec 2024	VITRA MF	450		
Jan 2024	VITRA MF	444	450	0,013514
Feb 2024	VITRA MF	652	444	0,319018
Mar 2025	VITRA MF	663	652	0,016591
Apr 2025	VITRA MF	498	663	0,331325
May 2025	VITRA MF	588	498	0,153061
June 2025	VITRA MF	599	588	0,018364
July 2025	VITRA MF	623	599	0,038523
Aug 2025	VITRA MF	690	623	0,097101
Sept 2025	VITRA MF	622	690	0,109325
Oct 2025	VITRA MF	544	622	0,143382
Nov 2025	VITRA MF	460	544	0,182609
Dec 2025	VITRA MF	?	460	0,129347
				12,93467

Source : Processed data (2026)

Based on the Naïve calculation results, the forecast for December 2025 is 460 units, which is identical to the actual sales recorded in November 2025. The average forecasting error measured using Mean Absolute Percentage Error (MAPE) is 12.93467%. This error level indicates relatively good forecasting performance, since a MAPE value below 20% is generally considered acceptable for operational forecasting purposes. Therefore, the Naïve model demonstrates adequate predictive ability for short-term battery sales planning.

Although the Naïve method produces a relatively low average error, some forecasting deviations are clearly visible when sudden sales changes occur. For example, in February 2025 actual sales increased to 652 units, while the forecast remained at 444 units because it only relied on January data. A similar situation occurred in April 2025 when actual sales dropped to 498 units while the forecast still reflected the previous month's high sales value. These results

confirm that the Naïve method performs less effectively when abrupt changes occur between periods.

Table 2. Forecasting with the Exponential Smoothing Method

Period	Item Name	Sales (Y)	Y'	MAPE
Dec 2024	VITRA MF	450		
Jan 2024	VITRA MF	444	450	0,013514
Feb 2024	VITRA MF	652	460,2529	0,294091
Mar 2025	VITRA MF	663	495,3649	0,252843
April 2025	VITRA MF	498	528,3345	0,060913
May 2025	VITRA MF	588	537,4739	0,085929
Jun 2025	VITRA MF	599	556,8994	0,070285
July 2025	VITRA MF	623	575,7511	0,075841
Aug 2025	VITRA MF	690	595,7044	0,13666
Sept 2025	VITRA MF	622	622	3,14E-09
Oct 2025	VITRA MF	544	637,2039	0,171331
Nov 2025	VITRA MF	460	641,1808	0,393871
Dec 2025	VITRA MF	?	623,0627	0,141389
				14,13888

Source : Data Processed (2026)

The calculation results show that Exponential Smoothing produces a forecast of 623.0627 units for December 2025, with a MAPE value of 14.13888%. Although this method captures gradual movement in the data more systematically, its forecasting accuracy is slightly lower than the Naïve method in this study. The higher MAPE indicates that smoothing adjustments were not fully able to match the actual sales fluctuations observed during the period. A significant forecasting deviation appears in the final observation periods. In November 2025, actual sales dropped sharply to 460 units, whereas the Exponential Smoothing forecast remained high at 641.1808 units. This indicates that the model still carried the influence of relatively high sales from previous months, especially from August to October. Consequently, when sales declined rapidly, the smoothing mechanism responded more slowly, producing overestimation. The results of this study are in line with the research conducted by [10].

Accuracy rate of demand forecasting methods

These findings are consistent with previous research by Basri (2019), which concluded that the Naïve method outperformed Exponential Smoothing in short datasets with limited observations and moderate fluctuations[11]. In the present study, only twelve monthly

observations were available, which limits the ability of Exponential Smoothing to fully stabilize its adjustment mechanism. Under such conditions, the Naïve method often remains competitive because it directly reflects the most recent market condition. The accuracy test resulted in a MAPE of 12.93%. Meanwhile, calculations using the Exponential Equalization Method yielded an estimate of 623.06 units for the same period, with a MAPE of 14.13%. The results of the data analysis presented showed that the Naïve Method had a lower error rate compared to Exponential Smoothing. Sales data at CV Unggul Jaya Aki is highly volatile and uncertain due to several external factors. The Naïve method, which directly uses the latest actual data, has proven to be more effective in capturing current trends compared to Exponential Smoothing, which is still affected by old data. A lower MAPE score ($12.93\% < 14.13\%$) indicates that the Naïve method is more accurate for companies to minimize the risk of overstocking or understocking. This is because on a small micro business scale, it is recommended to use the *Naïve* method, because there are limited resources. In addition, the Naïve method is also considered quite efficient to be used to forecast sales for the next period. Because the Naïve method uses one value of the previous periodic series as the basis for the prediction. The results of this study are in line with the research conducted [12].

Conclusion

Based on research, the Naïve method is more effective for CV Unggul Jaya Aki, with an estimated 460 units and a smaller error rate (MAPE 12.93%) compared to the Exponential Smoothing method (MAPE 14.13%). Naïve methods are more relevant to implement, more accurate, and easier to use.

This research contributes to the operational efficiency of the company. Especially by applying *the Naïve* method, CV Unggul Jaya Aki can plan inventory more accurately, thereby reducing storage costs due to excess stock and preventing sales losses due to lack of stock. This supports better decision-making for business sustainability.

The limitations of this study rely only on historical sales data without including other external variables such as economic changes or competitor promotions. For further research, it is recommended to add relevant variables or compare with other methods such as Moving Averages or regressions to enrich the analysis.

Content Attribution

The authors acknowledge the use of Chat GPT version 21 in the research, writing, data analysis, etc., of this work.

The AI application served as a tool for searching journals for reference. It is important to note that the AI-generated content was not copied verbatim but was thoroughly reviewed, edited, and curated by the authors to ensure the accuracy, authenticity, and integrity of the information contained therein. Individual judgment and decisions significantly contributed to the interpretation and validation of this AI output. Therefore, the final results presented represent a collaboration between humans and AI.

References

- [1] Hilalia N, Jumriani. Optimalikan Pengelolaan Persediaan Untuk Mengurangi Kerugian: Strategi Menghadapi Permasalahan Persediaan Rusak. *As-Syirkah Islam Econ Financ J* 2025;3:664–75. <https://doi.org/10.56672/gqq22409>.
- [2] Purnomoaji A, Fauji DAS, Kurniawan R. ANALISIS PERSEDIAAN BAHAN BAKU KAYU LAPIS DENGAN METODE EOQ DAN ROP PADA PT. XYZ. *Simp. Manaj. dan Bisnis II*, vol. 2, Kediri: Fakultas Ekonomi dan Bisnis Universitas Nusantara PGRI Kediri; 2023, p. 1202–9. <https://doi.org/10.29407>.
- [3] Asrul A, Windayani W, Putra A, Bahar H, Baihaqi B, Ladianto AJ, et al. Pemanfaatan Big Data Analytics dalam Proses Manajemen Teknologi untuk Prediksi Permintaan Pasar. *J Minfo Polgan* 2025;13:2433–8. <https://doi.org/10.33395/jmp.v13i2.14516>.
- [4] Ramdani DA, Azizah FN. ANALISIS PERBANDINGAN PERAMALAN PERMINTAAN PELUMAS PT XYZ DENGAN METODE MOVING AVERAGE , EXPONENTIAL SMOOTHING DAN. *Semin. Nas. Off. Stat. 2*, Jakarta: Politeknik Statistika STIS; 2019, p. 1000–10. <https://doi.org/https://doi.org/10.34123/semnasoffstat.v2020i1.576>.
- [5] Rupisiay P, Pelletimu VN, Nyawikuhy AM. ANALISIS PERAMALAN PERMINTAAN PADA DEPOT AIR MINUM ISI ULANG. *J Tagalaya Pengabdi Kpd Masy* 2024;1:257–62. <https://doi.org/https://doi.org/10.71315/jtpkm.v1i3.59>.
- [6] Gea F, Zebua S, Surya M, Mendrofa D, Harefa P. Analisis Peramalan Permintaan Produk Popok Bayi Merek Merries pada Caritas Market Kota Gunungsitoli. *J Soc Sci Res* 2024;4:4117–30.
- [7] Kurniyawan A, Dwi Febryanto I. JUTIN : Jurnal Teknik Industri Terintegrasi Analisis Peramalan Persediaan Batu Bara dengan Pendekatan Time Series : Studi Kasus pada PT . X. *J Tek Ind Terintegrasi* 2025;8:3354–64. <https://doi.org/10.31004/jutin.v8i3.47535>.
- [8] Safitri NH, Badi'ah R, Mu'ah. JSMA (Jurnal Sains Manajemen & Akuntansi) Volume 17 No. 1 / Mei / 2025. *J Sains Manaj Akunt* 2025;17:30–49.
- [9] Nurlela W, Pratiwi AI, Yulianti HT. Analisis Metode Moving Average , Exponential Smoothing , dan Arima dalam Peramalan Permintaan untuk Pengendalian Stok Floor Rear. *J Teknol Dan Manaj Ind Terap* 2025;4:1066–75.
- [10] Sari YN, Akbarita R, Robby RR. Perbandingan Metode Moving Average dan Metode Naive dalam Meramalkan Nilai Tukar Petani (NTP) di Provinsi Jawa Timur. *Pros Semin Nas Sains Dan Terap* 2023;1:16–23.
- [11] K IB, Sumitra ID. Comparison of Forecasting the Number of Outpatients Visitors Based on Naïve Method and Exponential Smoothing Comparison of Forecasting the Number of Outpatients Visitors Based on Naïve Method and Exponential Smoothing. *IOP Conf. Ser. Mater. Sci. Eng. Pap.*, 2019, p. 662. <https://doi.org/10.1088/1757-899X/662/4/042002>.
- [12] Wulan NC, Riani LP. Perbandingan Pendekatan Metode Peramalan Naive Approach , Simple Moving Average dan Weighted Moving Average dalam Upaya Meningkatkan Prediksi Penjualan JNE Kopma UNY. *J Ilm Tek Dan Manaj Ind* 2024;7:149–60. <https://doi.org/10.30737/jatiunik.v7i2.5495>.