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An Analysis of Electric Vehicle Sales Forecasting in Indonesia: A Quantitative Approach to Operational Planning

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ABSTRACT

This study applies a quantitative time-series forecasting approach using three methods: moving average, exponential smoothing, and trend analysis. Secondary data on electric car sales in Indonesia were analyzed to assess the predictive accuracy of each method. Forecasting performance was evaluated using the Mean Absolute Percentage Error (MAPE), a widely recognized accuracy metric. The findings indicate that the moving average method yielded the lowest MAPE for BEV sales at 9.72%, categorized as "highly accurate" (<10%), and for HEV sales at 16.94%, categorized as "accurate" (10–20%). For PHEV sales, the trend analysis method achieved superior accuracy compared to other models. These results highlight that forecasting performance varies across EV categories, reinforcing the importance of model selection based on market characteristics and data patterns.

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INTRODUCTION

The rapid advancement of transportation technology has catalyzed the emergence of environmentally sustainable innovations, most notably electric vehicles (EVs), which have gained global traction as a viable strategy to reduce carbon emissions and mitigate dependence on fossil fuels. Electric cars, as a prominent subset of EVs, offer substantial advantages over conventional internal combustion engine (ICE) vehicles, including superior energy efficiency, reduced operational expenditures, and a significantly lower environmental footprint. Comparative analyses between electric and conventional vehicles underscore fundamental divergences in energy sourcing, exhaust emissions, and maintenance requirements, wherein electric cars present a more sustainable trajectory in the long term.

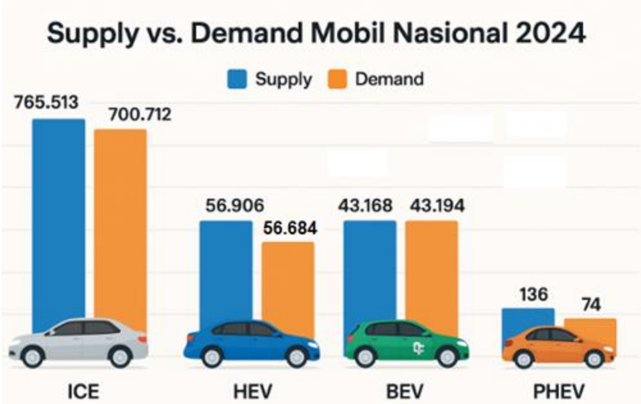

Figure 1. Supply and Demand National'S Car
Source : Indonesian Automobile Industry Data Gaikindo, 2024

In the Indonesian context, the urgency of transitioning towards electric mobility is increasingly pronounced, aligning with the government's commitment to reducing greenhouse gas emissions and fostering a clean energy transition. The adoption of EVs has demonstrated an upward trajectory in recent years, facilitated by governmental incentives, advancements in battery technology, and heightened public awareness regarding environmental sustainability. Nevertheless, the diffusion of electric cars in Indonesia continues to encounter substantial barriers, including the limited availability of charging infrastructure, comparatively high acquisition costs, and restricted diversity of available models within the domestic market. It should be noted that, one of the important factors in developing a business is carrying out good and focused business planning (Marlapa, 2023).

Within the framework of marketing and operational planning, accurate sales forecasting constitutes a pivotal component in optimizing production strategies, distribution networks, and market development. Empirical evidence from prior research by Imansyah and Imaroh (2024) employed multiple forecasting approaches—namely, trend analysis, moving average, exponential smoothing, and linear regression—wherein exponential smoothing was determined to yield the highest predictive accuracy. The present study, however, diverges from earlier investigations by conducting an in-depth quantitative analysis of Indonesia's electric car sales data, with the objective of comparatively evaluating diverse forecasting methodologies to determine the most suitable model in light of prevailing market conditions.

The scholarly significance of this research lies in its potential to furnish actionable insights for both automotive industry stakeholders and policymakers, thereby enabling more informed decision-making in anticipating future EV market dynamics. Accordingly, the primary aim of this study is to analyze the sales forecasting of electric cars in Indonesia and to identify the most accurate and contextually relevant forecasting technique to support effective and sustainable operational planning.

LITERATURE REVIEW

Definition of Forecasting

The initial stage of production control and planning is forecasting. Forecasting entails considering a number, such the future demand for one or more things (Render in Deby Natalia, 2022). According to (Rusdiana, 2014) Based on the time period, forecasting can be divided into:

1. Short-term forecasting. ≤ 1 Year
2. Medium-term forecasting. 1 to 5 Years
3. Long-term forecasting. > 5 Years

Forecasting Objectives

The goal of forecasting in production operations is to foresee uncertainty in order to produce predictions that are reasonably accurate. The findings of forecasting give planning direction, even if it will never be "perfect" (Rony et al., 2019). Forecasting aims to provide outcomes with the fewest possible mistakes, as shown by Mean Absolute Percent Error (MAPE) (Pangestu Subagyo in Rusdiana, 2014). Accuracy, affordability, and ease of use are some of the factors that make up good forecasting. (Nasution in Rusdiana, 2014). In making forecasts, some things that must be considered are:

1. Forecast are bound to contain errors,
2. Forecasting should provide information on some measure of error,
3. Short-term forecasting is more accurate than long-term forecasting.
4. Based on its nature, forecasting can be divided into two methods, namely qualitative and quantitative forecasting (Rusdiana, 2014).

Research Framework

The framework in this study is described as follows:

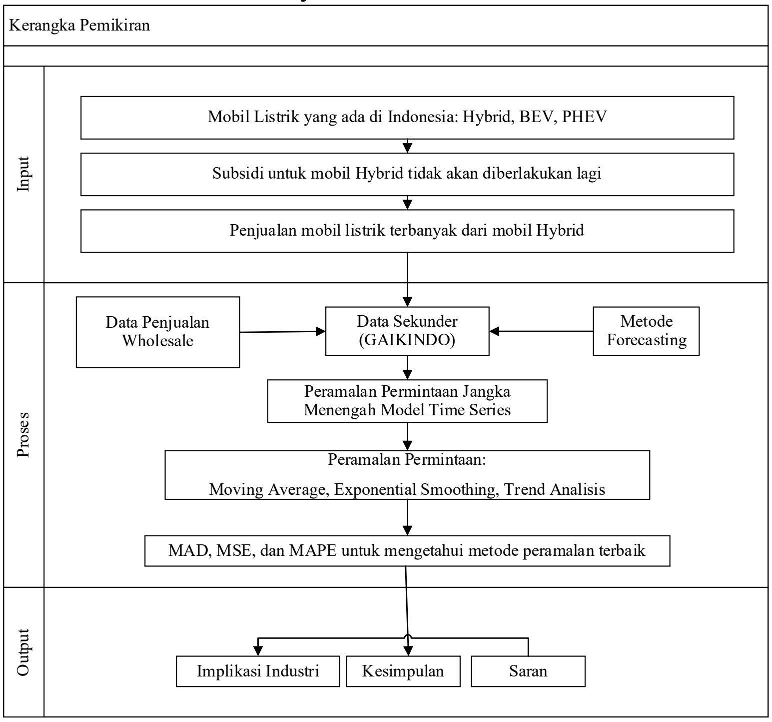

Figure 2. Research Framework

METHODOLOGY

Using time series and causal quantitative methodologies with predicting testing, this study design is a form of quantitative descriptive research.:

Moving Average Method

To predict sales in subsequent periods, the moving average approach computes a rolling average (Akhmad, 2018). Experiments or simulations that take into account actual field conditions are used to determine the value of n. As fresh data is added and older data is eliminated, the moving average computation evolves. The mathematical formula is as follows:

$$\hat{\mathrm{Y}}\mathbf{t} = \frac{\mathrm{Yt}-1\ +\ \mathrm{Yt}-2+\cdots+\mathrm{Yt}-\mathrm{n}}{n}$$

Description:

Yt = Forecasting period t demand
Y = Latest period actual forecasting
t = Most recent period
n = Number of moving average periods

Exponential Smoothing Method

Akhmad (2018) claims that as the data matures, the exponential forecasting approach gives the demand from the prior period less and less weight. As a result, more recent demand data is given weight than earlier demand data. For manufacturing and operational applications that need anticipating a high number of items, the exponential forecasting approach is very appealing. The following criteria make this technique especially appropriate:

1. The time scope of forecasting is relatively short, such as daily, weekly, or monthly demand.
2. External information on the causal relationship between the demand for a product and the independent factors that influence it is not widely available.
3. The effort required in forecasting is minimal, both in terms of the ease of application of the method and the storage time required for its application.
4. Updating the forecast with new data can be done easily by simply entering the data.
5. The forecast needs to be adjusted by incorporating elements of randomness (demand frequencies is averaged out) as well as trends and seasonality.

$$\mathbf{F1 = F\ t\text{-}1 + \alpha\ (A\ t\text{-}1 - F\ t\text{-}1)}$$

Description:

F1 = New forecast
F = Previous forecast
α = Constant
A = Previous period actual demand

Trend Analysis Method

The two forecasting techniques that make up the Trend Analysis method include utilizing the midpoint as the base year and the first year as the base year (Akhmad, 2018).

$$Y = a + bX$$

Description:

Y = The amount of sales represented by the vertical axis on the graph.
X = Sales planning year represented by the horizontal axis
a = Fixed component of sales each year
b = Sales growth rate for each year

Forecasting Error Calculation

Two different kinds of judgments employ the forecasting error calculation. First, assess the accuracy of the various forecasting techniques and choose the best one. The second is to assess the predicting findings' realism. Only by obtaining real data can the error be determined, as error testing is carried out by comparing predicting predictions with actual data (Heizer and Render, 2014).

MAD (Mean Absolute Deviation)

When error analysis is conducted in the same units as the actual demand, MAD is suitable. The mathematical model is as follows:

$$\mathbf{MAD} = \frac{\sum_{i=1}^{n}\left|Yi - \hat{Y}i\right|}{n}$$

MSE (Mean Square Error)

By using quadratic computations, this error calculation penalizes big discrepancies over minor variations. The mathematical model is as follows:

$$\mathbf{MSE} = \frac{\sum_{i=1}^{n} |\text{Y}i - \hat{\text{Y}}i|^2}{n}$$

MAPE (Mean Absolute Percent Error)

Displaying the error value as a percentage instead of in units might be more practical in some circumstances. When the forecast's accuracy depends on the magnitude of the variable being predicted, this measurement is acceptable. The mathematical model is as follows:

$$\mathbf{MAPE} = \frac{100 \sum_{i=1}^{n} |\text{Y}i - \hat{\text{Y}}i| / \text{Yi}}{n}$$

Description:

Yi = Actual demand of period i

Ŷi = Period i forecast value

i = Period -1 (1,2,3,…,n)

n = Number of periods being compared

Table 1. MAPE Value Range

MAPE Range	Description
<10%	Excellent Forecasting Model
10% - 20%	Good Forecasting Model
20% - 50%	Viable Forecasting Model
>50%	Poor Forecasting Model

Population and Sample

The scope of this study encompasses the entire population of electric vehicles (EVs) across all brands operating within the Indonesian market. As of the reference period, 23 distinct EV brands are officially distributed nationwide. The research sample consists of aggregated wholesale sales data of electric vehicles in Indonesia, as officially reported by the members of the Association of Indonesian Automotive Industries (GAIKINDO), which serves as the authoritative source for national automotive industry statistics.

Data Collection Methods

Library research was the method employed to get the data for this study. The secondary data gathered includes the research object's history, literature, and profile; data tables on car production and sales that align with the research object; theories pertaining to research variables; and additional supporting information gleaned from the company's website, research-related articles, and prior research journals.

Data Analysis Method

The forecasting analysis of Electric Vechile production and sales (both wholesale and retail) from January 2024 to December 2025 is the main emphasis of this study. Medium-term demand forecasting using a time series model is the analysis technique employed. POM QM and SQL in Excell are the programs utilized to examine forecasting in this study, and the forecasting period will run until December 2024.

Research Flow

Based on the results of the above explanation, it can be concluded that the flow of this research is as follow:

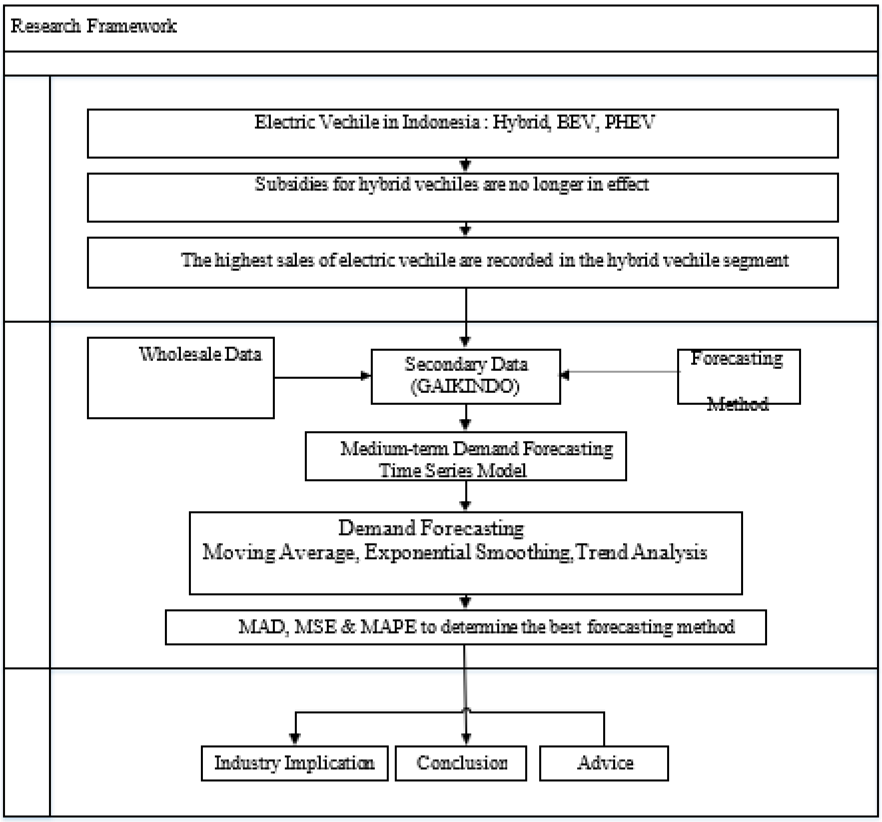

Figure 3. Research Flow Chart

RESEARCH RESULT AND DISCUSSION

Table 2. BEV Sales Calculation Using the Moving Average Method

Measure	**Value**
Error Measures	
Bias (Mean Error)	491,55
MAD (Mean Absolute Deviation)	739,85
MSE (Mean Squared Error)	976271,3
Standard Error (denom=n-2=8)	1104,69
MAPE (Mean Absolute Percent Error)	16,94%
Forecast	
next period	5271

Source: Data processed (2025)

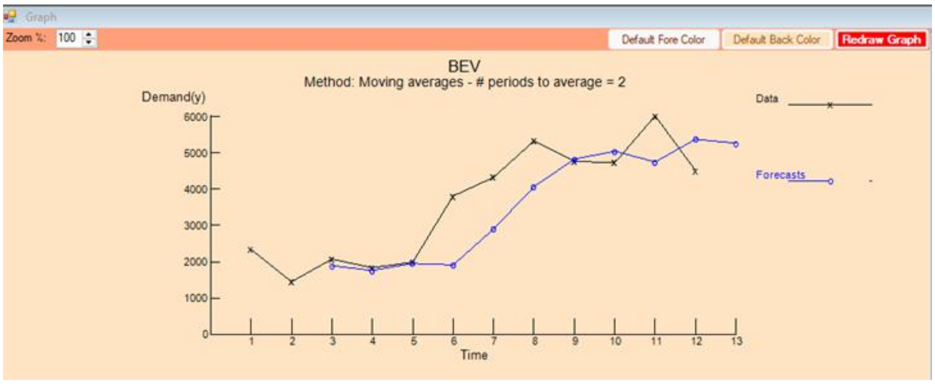

Figure 4. Graph of BEV Sales Calculation Using the Moving Average Method
Source: Data processed (2025)

Overall, the analysis indicates that although the Moving Average method provides projections for subsequent periods, there are limitations in its accuracy for BEV sales data, particularly reflected in the high MSE value and the presence of a positive bias. The MAPE value of 16.94% further suggests that there remains room for improving forecast precision. This may be attributable to the characteristics of BEV sales data, which may not fully align with the assumptions of the Moving Average method—namely, that the data are relatively stable without strong trends or seasonal patterns.

Table 3. HEV Sales Calculation Using the Moving Average Method

Measure	Value
Error Measures	
Bias (Mean Error)	210,05
MAD (Mean Absolute Deviation)	451,25
MSE (Mean Squared Error)	316233,4
Standard Error (denom=n-2=8)	628,722
MAPE (Mean Absolute Percent Error)	9,72%
Forecast	
next period	5341,5

Source: Data processed (2025)

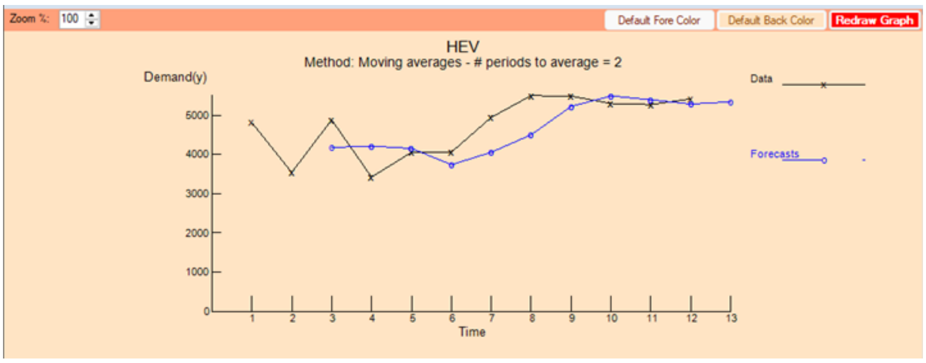

Figure 5. Graph of HEV Sales Calculation Using the Moving Average Method
Source: Data processed (2025)

Based on this analysis, the Moving Average method demonstrates relatively strong performance in forecasting HEV sales, as indicated by a relatively low MAPE value of 9.72%. This shows that, in percentage terms, the forecast errors are not substantial. However, the presence of a positive bias (210.05) suggests that the model tends to underestimate actual sales. The MSE value (316,233.4), which is considerably high, also indicates that although the average percentage error is low, there may have been a few large deviations in certain periods. This performance suggests that HEV sales data may exhibit relatively stable characteristics or limited volatility, enabling the relatively simple Moving Average method to capture the pattern effectively.

Table 4. PHEV Sales Calculation Using the Moving Average Method

Measure	Value
Error Measures	
Bias (Mean Error)	-1,15
MAD (Mean Absolute Deviation)	3,15
MSE (Mean Squared Error)	18,225
Standard Error (denom=n-2=8)	4,773
MAPE (Mean Absolute Percent Error)	140,35%
Forecast	
next period	3

Source: Data processed (2025)

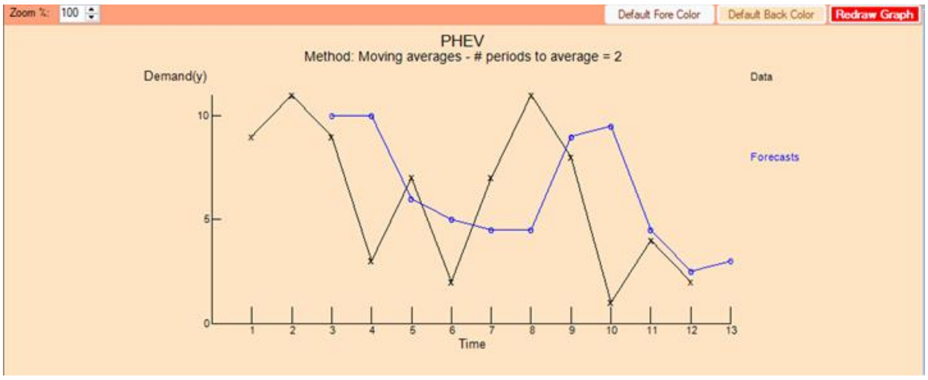

Figure 6. Graph of PHEV Sales Calculation Using the Moving Average Method

Source: Data processed (2025)

Although the MAD and MSE values appear low in absolute terms (3.15 and 18.225, respectively), the exceptionally high MAPE value of 140.35% serves as the primary indicator that the Moving Average method is unsuitable or highly inaccurate for forecasting PHEV sales. This extreme MAPE value is most likely attributable to the very low sales volume of PHEVs and/or substantial fluctuations from period to period, causing each absolute error, even when small, to constitute a very large percentage of the actual value, which is itself small. The presence of a negative bias (-1.15) further indicates a tendency toward overforecasting. This condition underscores the challenge of forecasting data with low volume and high volatility.

Table 5. BEV Sales Calculation Using the Exponential Smoothing

Measure	Value
Error Measures	
Bias (Mean Error)	376,654
MAD (Mean Absolute Deviation)	756,175
MSE (Mean Squared Error)	975154,2
Standard Error (denom=n-2=9)	1091,721
MAPE (Mean Absolute Percent Error)	21,59%
Forecast	
next period	4904,781

Source: Data processed (2025)

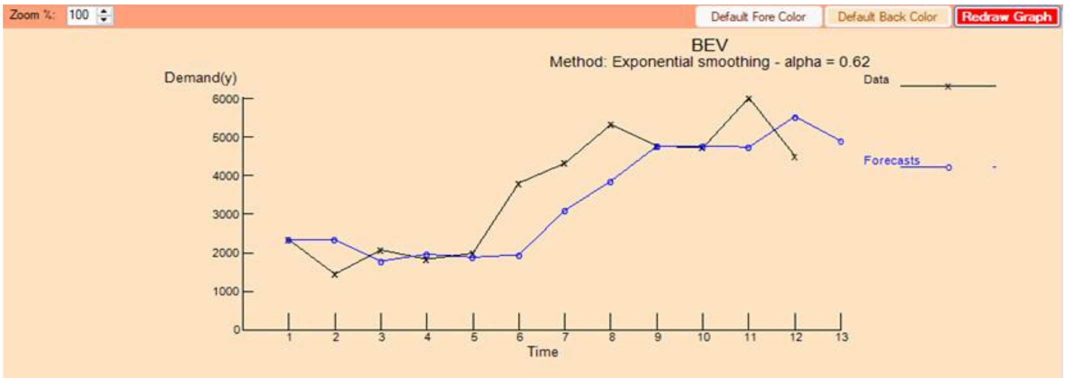

Figure 7. Graph of BEV Sales Calculation Using the Exponential Smoothing
Source: Data processed (2025)

Overall, the analysis indicates that the Exponential Smoothing method for forecasting BEV sales still presents certain limitations in terms of accuracy. Although the MSE is slightly lower compared to the Moving Average method (975,154.2 vs. 976,271.3), the MAD (756.175) and MAPE (21.59%) values indicate that forecast errors remain relatively high. The presence of a positive bias (376.654) also suggests a systematic tendency toward underforecasting. Compared to the Moving Average results (MAD 739.85 and MAPE 16.94%), Exponential Smoothing in this case demonstrates slightly lower accuracy for BEV in terms of MAD and MAPE, despite having a marginally better MSE. This outcome may be due to the weights assigned to the most recent data by the Exponential Smoothing method not fully capturing existing patterns or trends, or to the smoothing parameter (α) being suboptimal.

Table 6. HEV Sales Calculation Using the Exponential Smoothing

Measure	Value
Error Measures	
Bias (Mean Error)	89,685
MAD (Mean Absolute Deviation)	528,516
MSE (Mean Squared Error)	494329,6
Standard Error (denom=n-2=9)	777,291
MAPE (Mean Absolute Percent Error)	12,34%
Forecast	
next period	5354,592

Source: Data processed (2025)

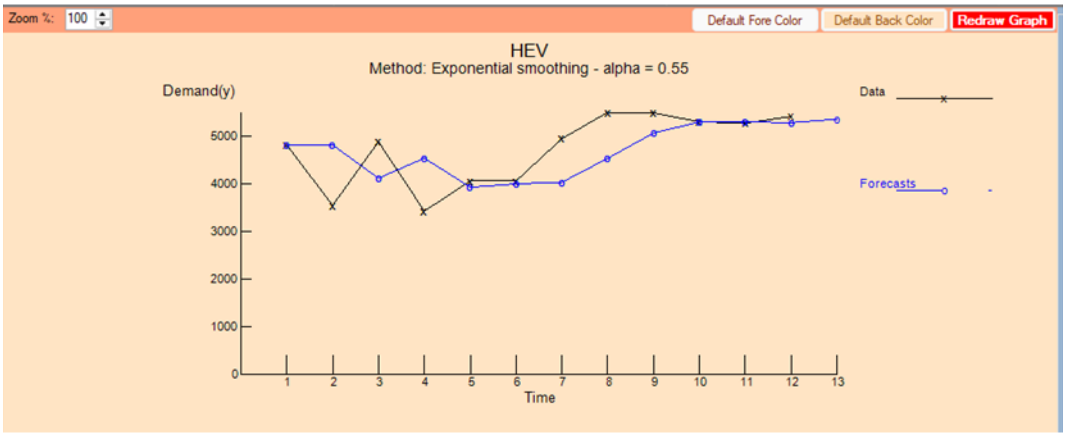

Figure 8. Graph of HEV Sales Calculation Using the Exponential Smoothing
Source: Data processed (2025)

Based on this analysis, the Exponential Smoothing method shows reasonably relevant performance in forecasting HEV sales. Although there is a small positive bias (indicating a tendency to underforecast), the MAPE value of 12.34% reflects a moderate level of accuracy, which may be acceptable for preliminary planning purposes. However, when compared to the earlier Moving Average results for HEV (MAD 451.25; MSE 316,233.4; MAPE 9.72%), it is evident that Moving Average performs slightly better in terms of accuracy (lower MAD and MAPE values) for the HEV category. This difference suggests that, in the case of HEV, a method that assigns equal weight to a certain number of most recent periods (Moving Average) may be more effective than one that applies exponentially decreasing weights to older data (Exponential Smoothing), or that the smoothing parameter (α) used may not be optimal.

Table 7. PHEV Sales Calculation Using the Exponential Smoothing

Measure	Value
Error Measures	
Bias (Mean Error)	-1,262
MAD (Mean Absolute Deviation)	2,949
MSE (Mean Squared Error)	14,407
Standard Error (denom=n-2=9)	4,196
MAPE (Mean Absolute Percent Error)	129,75%
Forecast	
next period	3,724

Source: Data processed (2025)

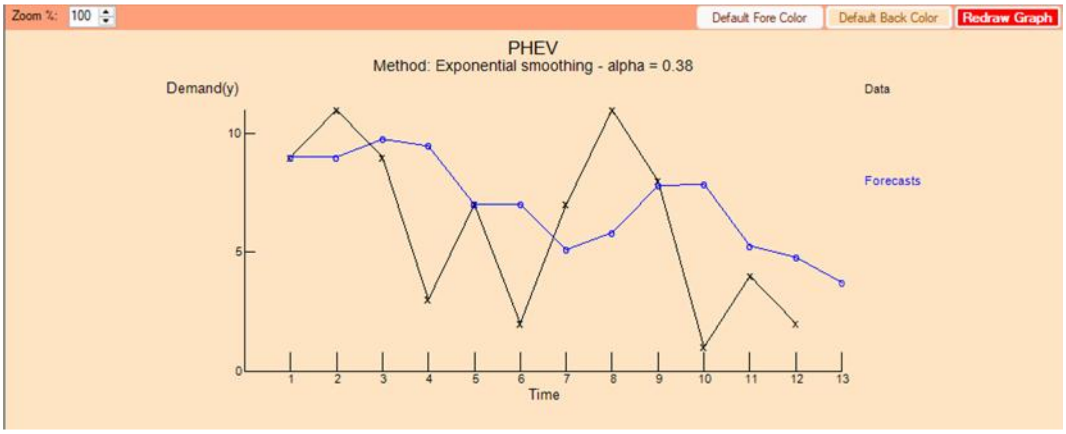

Figure 9. Graph of PHEV Sales Calculation Using the Exponential Smoothing

Source: Data processed (2025)

Although the MAD and MSE values appear low in absolute terms (2.949 and 14.407, respectively), the exceptionally high MAPE value of 129.75% is the primary indicator that the Exponential Smoothing method, similar to Moving Average, is unsuitable or highly inaccurate for forecasting PHEV sales. This extreme MAPE once again highlights that the very low sales volume of PHEVs and/or substantial fluctuations from period to period pose significant forecasting challenges. Each absolute error, even if small, constitutes a very large percentage of the actual value, which is itself small. The presence of a negative bias (-1.262) further indicates a tendency toward overforecasting. When compared to the Moving Average results (MAPE 140.35%), Exponential Smoothing shows a slight improvement in terms of MAPE; however, the difference is not substantive enough to address the underlying accuracy issue. This condition underscores once more the inherent difficulty of forecasting data with low volume and high volatility.

Table 8. BEV Sales Calculation Using the Trend Analysis

Measure	Value	Future Period	Forecast
Error Measures		13	6078
Bias (Mean Error)	0	14	6459,308
MAD (Mean Absolute Deviation)	644,346	15	6840,615
MSE (Mean Squared Error)	537788,3	16	7221,923
Standard Error (denom=n-2=10)	803,334	17	7603,23
MAPE (Mean Absolute Percent Error)	21,96%	18	7984,538
Regression line		19	8365,846
Demand(y) = 1121		20	8747,153
+ 381,308 * TIME		21	9128,461
Statistics		22	9509,769
Correlation coefficient	0,874	23	9891,076
Coefficient of determination (r^2)	0,763	24	10272,38
		25	10653,69
		26	11035

Source: Data processed (2025)

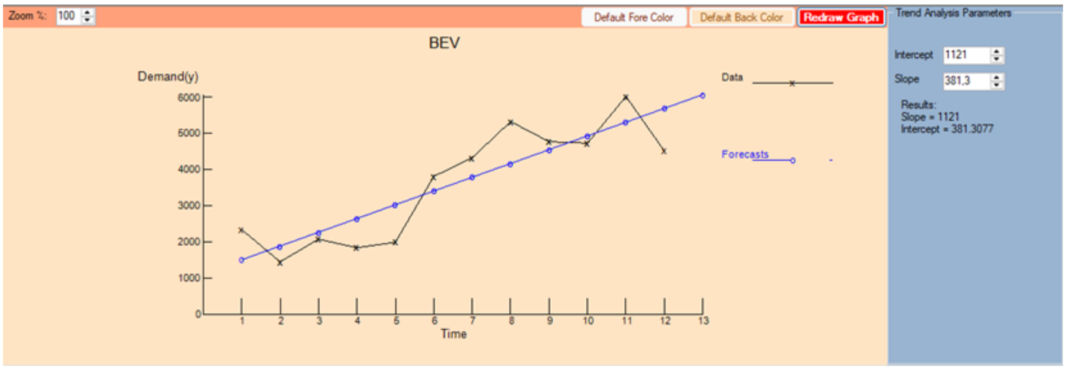

Figure 10. Graph of BEV Sales Calculation Using the Trend Analysis

Source: Data processed (2025)

Based on a comprehensive analysis of error metrics and regression statistics, the Trend Analysis method demonstrates the most superior forecasting performance for BEV sales. A zero-bias value, the lowest MAD (644.346), and the lowest MSE (537,788.3) clearly outperform both the Moving Average and Exponential Smoothing methods. Furthermore, the very strong correlation coefficient (0.874) and high coefficient of determination (0.763) confirm the presence of a clear and significant linear trend in BEV sales data, which the model successfully captures. The sales projections generated by this model indicate strong growth potential for BEVs in Indonesia, which could serve as a strategic basis for the government in formulating incentive policies and developing infrastructure, as well as for automotive industry players in production and marketing planning.

Table 9. HEV Sales Calculation Using the Trend Analysis

Measure	Value	Future Period	Forecast
Error Measures		13	5646,895
Bias (Mean Error)	0	14	5788,93
MAD (Mean Absolute Deviation)	454,339	15	5930,964
MSE (Mean Squared Error)	289084,8	16	6073
Standard Error (denom=n-2=10)	588,984	17	6215,035
MAPE (Mean Absolute Percent Error)	10,51%	18	6357,069
Regression line		19	6499,104
Demand(y) = 3800,439		20	6641,14
+ 142,035 * TIME		21	6783,175
Statistics		22	6925,21
Correlation coefficient	0,674	23	7067,245
Coefficient of determination (r^2)	0,454	24	7209,28
		25	7351,315
		26	7493,35

Source: Data processed (2025)

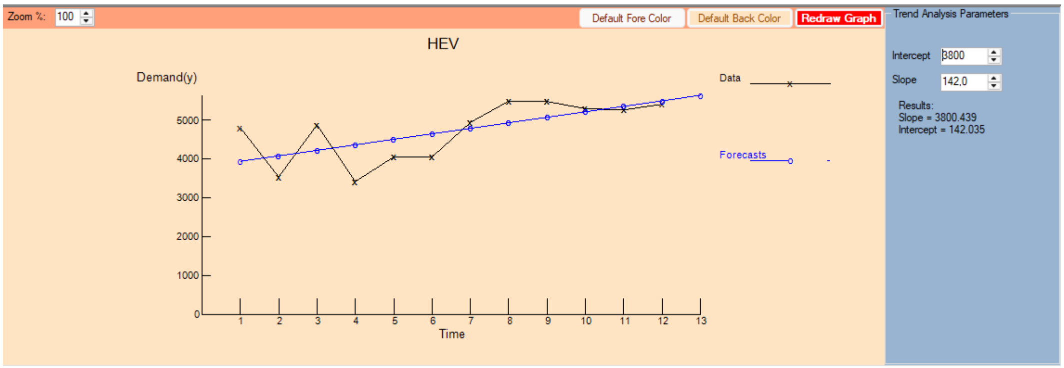

Figure 11. Graph of HEV Sales Calculation Using the Trend Analysis
Source: Data processed (2025)

Based on a comprehensive analysis of error metrics and regression statistics, the Trend Analysis method also demonstrates excellent forecasting performance and represents a strong choice for HEV sales. A zero-bias value, the lowest MAD (454.339), and the lowest MSE (289,084.8) clearly surpass the Exponential Smoothing method and are highly competitive with the Moving Average method (even outperforming it in terms of MSE). Although the coefficient of determination (R^2) is lower compared to BEV, this suggests that other factors, beyond the time trend, influence HEV sales. Nevertheless, the model's ability to produce unbiased forecasts and minimize squared errors demonstrates that Trend Analysis is a reliable tool for projecting HEV sales growth in Indonesia. These findings can serve as an important foundation for both government and industry stakeholders in planning strategies related to incentives, production, and HEV market development in the future.

Table 10. PHEV Sales Calculation Using the Trend Analysis

Measure	Value	Future Period	Forecast
Error Measures		13	2,667
Bias (Mean Error)	0	14	2,128
MAD (Mean Absolute Deviation)	2,261	15	1,59
MSE (Mean Squared Error)	8,517	16	1,051
Standard Error (denom=n-2=10)	3,197	17	0,513
MAPE (Mean Absolute Percent Error)	75,68%	18	-0,026
Regression line		19	-0,564
Demand(y) = 9,667		20	-1,103
-0,538 * TIME		21	-1,641
Statistics		22	-2,179
Correlation coefficient	-0,537	23	-2,718
Coefficient of determination (r^2)	0,289	24	-3,256
		25	-3,795
		26	-4,333

Source: Data processed (2025)

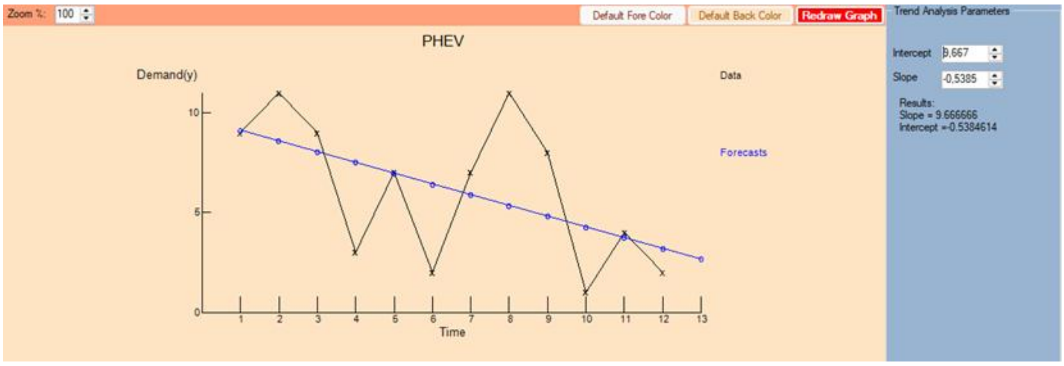

Figure 12. Graph of PHEV Sales Calculation Using the Trend Analysis
Source: Data processed (2025)

Based on a comprehensive analysis of error metrics and regression statistics, the Trend Analysis method achieves the best performance in minimizing both absolute and squared errors for PHEV sales, with the lowest MAD (2.261) and MSE (8.517). The zero bias value is also a positive indicator. However, the still exceptionally high MAPE value (75.68%) underscores the fundamental challenges of forecasting PHEV sales data, which are characterized by very low volumes and high volatility.

The most critical finding from this trend analysis is the negative slope coefficient (-0.538) in the regression equation and the negative correlation coefficient (-0.537). This clearly indicates a downward trend in PHEV sales over time. The forward projections yielding negative values further reinforce the conclusion that PHEV sales are in decline, potentially leading to extremely low sales levels or even market exit in the future if no significant policy intervention or market shift occurs.

Although Trend Analysis delivers the best error metrics among the three methods, overall forecast accuracy for PHEVs remains a major challenge due to unstable data characteristics and low sales volumes. These results highlight the need for a deeper understanding of the factors driving this declining trend and their implications for Indonesia's electric vehicle strategy.

Table 11. Recapitulation Table MAD, MSE, MAPE

	BEV	HEV	PHEV
MAD			
Moving Average	739,85	451,25	3,15
Exponential Smoothing	756,175	528,516	2,949
Analysis Trend	644,346	454,339	2,261
MSE			
Moving Average	976271,3	316233,4	18,225
Exponential Smoothing	975154,2	494329,6	14,407
Analysis Trend	537788,3	289084,8	8,517
MAPE			
Moving Average	16,94%	9,72%	140,35%
Exponential Smoothing	21,59%	12,34%	129,75%
Analysis Trend	21,96%	10,51%	75,68%

Source: Data processed (2025)

For the BEV category, the lowest MAD value is observed in the Trend Analysis method at 644.346, followed by Moving Average at 739.85 and Exponential Smoothing at 756.175. This indicates that Trend Analysis has the smallest average absolute error. In terms of MSE, Trend Analysis also performs best with a value of 537,788.3, lower than that of Moving Average (976,271.3) and Exponential Smoothing (975,154.2), indicating more stable prediction errors. Meanwhile, for MAPE, the lowest value is recorded by the Moving Average method at 16.94%, slightly better than Trend Analysis (21.96%) and Exponential Smoothing (21.59%). However, this difference is not significant when compared to the advantages in MAD and MSE. These results suggest that BEV sales exhibit a relatively clear trend, making the Trend Analysis method effective in capturing such patterns.

For the HEV category, as shown in Table 4.11, the lowest MAD value is recorded by the Moving Average method at 451.25, followed by Trend Analysis at 454.339 and Exponential Smoothing at 528.516. In terms of MSE, the Trend Analysis method leads with a value of 289,084.8, lower than Moving Average (316,233.4) and Exponential Smoothing (494,329.6). For MAPE, the Moving Average method again records the lowest value at 9.72%, followed by Trend Analysis at 10.51% and Exponential Smoothing at 12.34%. Nevertheless, overall, Trend Analysis remains a strong choice for forecasting HEV sales, indicating the presence of patterns or tendencies within the sales data.

For the PHEV category, as shown in Table 4.11, all methods exhibit high MAPE values. However, Trend Analysis consistently outperforms the others across all indicators. For MAD, Trend Analysis records the lowest value at 2.261, compared with Moving Average at 3.15 and Exponential Smoothing at 2.949. In terms of MSE, Trend Analysis also performs best with a value of 8.517, lower than Moving Average (18.225) and Exponential Smoothing (14.407). For MAPE, Trend Analysis achieves 75.68%, which is substantially lower than Moving Average (140.35%) and Exponential Smoothing (129.75%). This is particularly notable given the generally high MAPE values for PHEVs across all methods (ranging from 75.68% to 140.35%), indicating significant volatility or fluctuations in PHEV sales data, making it challenging to forecast accurately. Nevertheless, Trend Analysis is able to minimize forecasting errors relatively better than the other methods.

CONCLUSIONS AND RECOMMENDATIONS

Based on the forecasting results calculated using POM QM software for wholesale sales, the lowest MAPE values were obtained using the Moving Average method. The results indicate a MAPE of 9.72% for HEV sales and 16.94% for BEV sales, while for PHEV sales, the lowest MAPE was achieved using the Trend Analysis method. Referring to the MAPE classification range—where a value of less than 10% indicates an excellent forecasting model and a value between 10% and 20% indicates a good forecasting model—these findings place the HEV forecast in the excellent category and the BEV forecast in the good category.

The findings of this study are expected to serve as a consideration for policymakers or the government in making decisions that impact the automotive sub-sector in Indonesia. By taking into account the results of this research, the government can evaluate existing policies related to the performance of the automotive industry in Indonesia. The results of this study are expected to be useful as one of the bases for consideration in the decision-making process of company management teams within the automotive sub-sector, particularly in planning to meet market demands. This research fulfills one of the requirements for completing the master's degree program. Through the findings of this study, it is expected to contribute to scientific knowledge and serve as a reference for further research in the field of management.

ADVANCED RESEARCH

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