# STATISTICAL ANALYSIS OF FUEL CONSUMPTION IN HATCHBACK CARS IN INDONESIA FOR THE YEAR 2024 USING MATLAB

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**Abstract--** Due to their affordability and compact size, the annual rise in fuel prices has prompted Indonesian consumers to opt for more fuel-efficient vehicles, particularly hatchback models. This study analyzes the key factors influencing fuel consumption in hatchback cars produced in 2024 in Indonesia using statistical analysis with MATLAB. The data analyzed includes technical specifications from various popular hatchback models in the Indonesian market, such as vehicle weight, torque, engine capacity, and engine technology. The analysis results show that vehicle weight has a moderate positive correlation (r = 0.25) with fuel consumption, meaning heavier cars use more fuel than lighter vehicles. In contrast, engine capacity and torque show weak negative correlations with fuel consumption, with correlation values of -0.13 and -0.18, respectively, suggesting that while these factors influence performance, their effect on fuel efficiency is relatively minimal. The findings highlight the critical importance of vehicle weight reduction as a key strategy for improving overall fuel efficiency. Furthermore, this study provides essential insights for consumers to select vehicles that offer a better fuel economy. It also offers valuable guidance for manufacturers looking to design more fuel-efficient and environmentally friendly cars. The potential for vehicle weight reduction to become a primary focus for increasing fuel efficiency in hatchback cars is especially emphasized, offering hope for a more sustainable automotive market in Indonesia.

**Keywords:** Hatchback Cars, Fuel Consumption, Vehicle Weight, Engine Capacity, MATLAB

## 1. INTRODUCTIONS

Fuel efficiency has become a crucial concern in Indonesia, especially with the rising oil prices and the depletion of non-renewable oil reserves [1]. The transportation sector plays a significant role in Indonesia's fuel consumption. According to the International Energy Agency (IEA), transportation is the largest oil-consuming sector in the country, with approximately 1040 kilo barrels used per day [2]. Automobiles contribute significantly to energy consumption and carbon dioxide (CO2) emissions, making them a critical factor in the nation's environmental challenges [3,4].

Hatchback cars are among the most common vehicles in the Indonesian market. Their popularity has increased yearly, driven by their compact size and affordability, which makes them particularly attractive to the middle- and lower-income segments of society. In this competitive market, fuel efficiency and price have become a decisive factor for consumers. Several factors influence the fuel efficiency of hatchback cars, including vehicle weight, engine capacity, torque, power output, and engine type.

Vehicle weight plays a critical role in fuel efficiency, as heavier cars consume more fuel due to the increased energy required for movement. This is supported by regulatory analyses demonstrating how heavier vehicles can meet lower fuel economy standards, creating a potential incentive for manufacturers to increase vehicle weight [5]. Torque, the rotational force produced by the engine, is another factor that directly impacts fuel efficiency, as it determines the engine's capacity to perform work. Modern systems that measure and control torque can optimize fuel consumption by adjusting engine parameters in real-time [6,7].

Engine type also affects fuel efficiency. Advanced technologies, such as i-VTEC, combine two systems: VTEC (Variable Valve Timing and Lift Electronic Control) and VTC (Variable Timing Control). VTEC modifies valve lift and duration to enhance performance at high RPMs, while VTC optimizes valve timing for better fuel efficiency and reduced emissions at lower RPMs [8,9].

Several studies have analyzed factors affecting vehicle fuel efficiency. For example, Cheah et al. (2009) examined the trade-offs between acceleration performance, weight, and fuel consumption in cars, finding that increased vehicle weight negatively impacts fuel efficiency due to the higher energy demands for vehicle movement [10]. Similarly, Magnus Lewander et al. (2012) highlighted the importance of feedback control for individual cylinder efficiency in optimizing fuel consumption [5].

In this study, we use statistical analysis and mathematical modeling via MATLAB to investigate the influence of engine capacity, torque, vehicle weight, and engine technology on fuel efficiency in hatchback cars sold in Indonesia in 2024. The goal is to provide insights that will help consumers choose fuel-efficient cars and manufacturers designing vehicles that balance performance with fuel economy. Reducing vehicle weight and optimizing engine technologies are expected to improve fuel efficiency in this market.

## 2. METHOD

This study employs mathematical modeling and statistical analysis using MATLAB to examine the influence of engine capacity, torque, vehicle weight, and engine technology on fuel efficiency in hatchback cars sold in Indonesia in 2024. The object of study includes the top 10 best-selling hatchback brands in Indonesia in 2024, each with different specifications, such as engine capacity, torque, vehicle weight, and engine technology, as shown in Table 1.

This study follows a quantitative research methodology to analyze the impact of engine capacity, vehicle weight, and engine torque on the fuel consumption of hatchback cars. The research process includes the following steps [11, 12, 13, 14, 15]:

a. Data Collection: Data were gathered from various sources, including technical specifications of Indonesia's top 10 best-selling hatchback models in 2024. The data includes engine capacity, vehicle weight, engine torque, and fuel consumption rates. The fuel consumption data were primarily sourced from existing literature and manufacturer specifications.
b. Software and Tools: MATLAB software was MATLAB software was employed for the data analysis. Specifically, the Statistical Toolbox within MATLAB was used to perform linear regression, Pearson correlation analysis, and other statistical tests to assess the relationships between the variables [16,17]. The use of MATLAB allowed for precise modeling of the relationships between fuel consumption and the technical factors under study. [16, 17,18,19].
c. Analysis Procedure: The analysis followed a systematic approach, starting with scatter plot analysis to visually examine the relationships between fuel consumption and the independent variables (engine capacity, vehicle weight, and torque). Next, linear regression models were developed to quantify the impact of these variables on fuel consumption. Pearson correlation coefficients were also calculated to determine the strength and direction of these relationships. The steps involved were as follows:

- Scatter Plot Analysis: This was performed to visualize the relationships between the independent variables and fuel consumption, providing an initial understanding of possible correlations.
- Linear Regression: Models were built to quantify the influence of engine capacity, vehicle weight, and torque on fuel consumption.
- Correlation Coefficients: These were calculated to measure the strength and direction of linear relationships between the variables [18–19].

**Table 1.** Descriptive Statistics of Fuel Consumption, Engine Capacity, Engine Torque, and Vehicle Weight of the Best-Selling Hatchback Cars in Indonesia in 2024.

| Brand | Fuel Consumption | Engine Capacity | Torque | Vehicle Weight |
|---|---|---|---|---|
| {‘Honda Brio’} | 20 | 1199 | 110 | 965 |
| {‘Toyota Yaris’} | 18.7 | 1496 | 140 | 1040 |
| {‘Daihatsu Ayla’} | 20.7 | 998 | 89 | 800 |
| {‘Suzuki Baleno’} | 18.5 | 1462 | 138 | 930 |
| {‘Mazda 2’} | 20.9 | 1496 | 144 | 1094 |
| {‘Honda City Hatchback’} | 21.3 | 1498 | 145 | 1210 |
| {‘Hyundai i20’} | 20 | 1197 | 115 | 1024 |
| {‘Kia Rio’} | 13.5 | 1348 | 133 | 945 |
| {‘MItsubishi Mirage’} | 17.8 | 1193 | 100 | 860 |
| {‘Nissan March’} | 22 | 1198 | 104 | 925 |
| {Average} | 19.34 | 1308.50 | 121.80 | 979.30 |
| {Median} | 20.0 | 1273.50 | 124.00 | 955.00 |
| {Standard Deviation} | 2.44 | 175.67 | 20.56 | 117.95 |

**3. RESULTS AND DISCUSSION**

Table 1 shows the descriptive statistics for fuel consumption, engine capacity, torque, and vehicle weight for Indonesia's ten best-selling hatchback models in 2024. The average fuel consumption is 19.34 km/l, with a median of 20.00 km/l and a standard deviation of 2.44 km/l. The median value, close to the mean, indicates a relatively symmetrical distribution of fuel consumption among the vehicles analyzed, suggesting that most cars have consistent fuel efficiency. This makes hatchback cars a stable and economical choice for consumers.

The average engine capacity is 1,308.50 cc, with a median of 1,273.50 cc and a standard deviation of 175.67 cc. Although there is significant variation in engine sizes, the distribution of engine capacity remains balanced, without any extreme outliers, reflecting consistent performance across the analyzed models.

The average torque is 121.80 Nm, with a median of 124.00 Nm and a standard deviation of 20.56 Nm, indicating moderate variation in engine performance. The slightly higher median than the average suggests that some cars have slightly lower torque, which lowers the overall mean value.

The average vehicle weight is 979.30 kg, with a median of 955.00 kg and a standard deviation of 117.95 kg. The broader distribution of vehicle weight compared to the other variables indicates a more significant variation in the design and size of the vehicles. For a more precise understanding, the data is presented in histograms in Figure 1, which shows the frequency distribution of fuel consumption, engine capacity, torque, and vehicle weight for the ten best-selling hatchback brands in Indonesia in 2024.

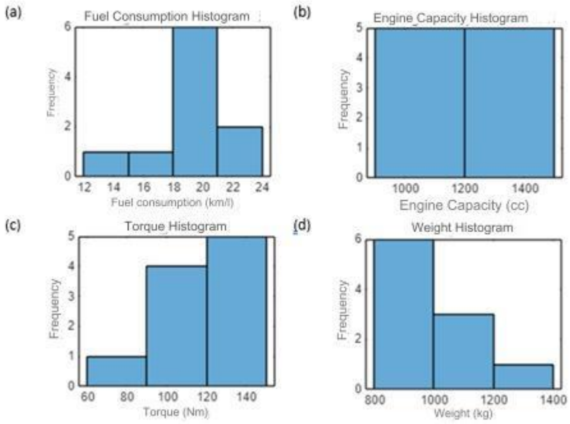


**Figure 1**. Histogram Distribution (a) Fuel Consumption, (b) Engine Capacity, (c) Torque, and (d) Vehicle Weight.

Figure 1(a) shows that fuel consumption is distributed within a relatively narrow range, with the highest frequency around 20 km/l. Most vehicles have fuel consumption between 18 and 22 km/l, indicating that most hatchback models have excellent and consistent fuel efficiency. The slight variation in fuel consumption suggests that hatchbacks are a reliable choice for consumers prioritizing fuel efficiency. Figure 1(b) illustrates the distribution of engine capacities, most of which fall within the 1000 to 1500 cc range. This indicates that hatchback cars generally have uniform engine capacities, consistent with the classification of small or compact cars. Figure 1(c) shows a broader variation in torque, with the highest concentration between 100 and 140 Nm, suggesting that this is the typical performance range for engines in hatchback cars. Figure 1(d) depicts vehicle weight distribution, which ranges from 800 kg to 1000 kg, with most cars falling within the lower weight category.

Anomalies or deviations in the histogram can be observed in some models that exhibit significantly different fuel consumption or torque compared to the majority. This may be attributed to differences in engine technology or more/less efficient aerodynamic designs.

In Figure 2, the box plot diagrams for fuel consumption, engine capacity, torque, and vehicle weight identify outliers and provide insights into how the data is distributed, as well as the variation among the 10 hatchback car brands in Indonesia.

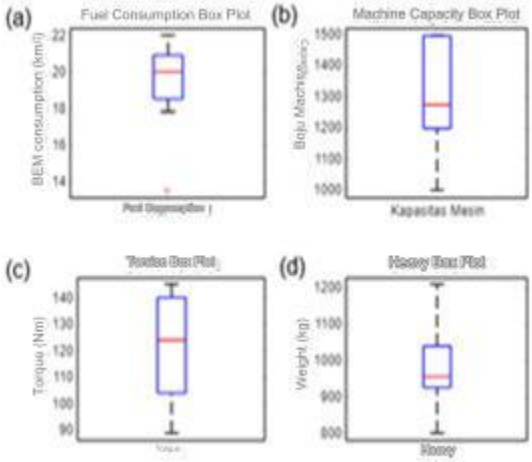


**Figure 2.** Box Plot Diagrams (a) Fuel Consumption, (b) Engine Capacity, (c) Engine Torque, and (d) Vehicle Weight.

Figure 2(a) shows a box plot of fuel consumption with a median of approximately 20 km/l. Half of the cars analyzed have fuel consumption above 20 km/l, while the other half fall below this value. The narrow interquartile range indicates that most cars have relatively consistent fuel efficiency. The absence of significant outliers suggests that none of the vehicles exhibit drastically different fuel consumption than the majority.

Figure 2(b) illustrates the distribution of engine capacity, with a median of around 1300 cc. The variation in engine capacity is relatively small, indicating that most cars have engine capacities within a uniform range. There are no significant outliers in engine capacity, showing that all the analyzed cars have reasonable engine sizes that fit within the hatchback category.

Figure 2(c) displays a box plot of torque, with a median of approximately 124 Nm, indicating that most cars have consistent torque levels with relatively small variation. The absence of significant outliers in torque suggests that the engine performance of these cars is consistent.

Figure 2(d) shows vehicle weight distribution, with a median of approximately 965 kg. The interquartile range reveals that half of the cars weigh approximately 860 kg and 1040 kg, indicating that most vehicles in this dataset have relatively uniform weight. However, a few anomalies or outliers in the weight distribution suggest that some cars are significantly heavier or lighter than the average. Cars with significantly higher weight tend to have higher fuel consumption, which could negatively impact overall fuel efficiency. A correlation analysis was conducted to understand further the relationship between various technical variables and fuel consumption in hatchback cars, and the results are presented in Table 2.2. correlation analysis was used to measure the strength and direction of the linear relationship between fuel consumption and independent variables.

Correlation Coefficient (r): The Pearson correlation coefficient, denoted as r, ranges from -1 to 1. An r value of -1 indicates a perfect negative linear relationship, 0 indicates no linear relationship, and 1 indicates a perfect positive linear relationship. Calculation and Interpretation: The correlation coefficient was calculated using the formula [20, 21]:

$$r = \frac{\Sigma(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\Sigma(X_i - X)^2 \Sigma(Y_i - Y)^2}} \qquad (1)$$

$X_i$ and $Y_i$ are the individual sample points, and $\bar{X}$ $\bar{Y}$ are the means of the variables X and Y. The sign of r indicates the direction of the relationship, while the magnitude indicates strength. The result of the correlation is summary in Table 2.

**Table 2.** Correlation Between Fuel Consumption and Engine Capacity, Engine Torque, and Vehicle Weight.

| | Fuel Capacity |
|---|---|
| Engine Capacity | -0.13 |
| Engine Torque | -0.18 |
| Vehicle Weight | 0.25 |

The correlation between engine capacity and fuel consumption is -0.13, indicating a weak negative correlation. This suggests that, in general, an increase in engine capacity is slightly associated with a decrease in fuel consumption, although the impact is not significant. This may be due to more advanced engine technology in larger capacity engines, compensating for increased fuel consumption. For example, cars with larger engines and fuel efficiency technology may still maintain low fuel consumption.

The correlation between engine torque and fuel consumption is -0.18, indicating a weak negative correlation. This means that an increase in engine torque is slightly related to a decrease in fuel consumption, although the effect remains insignificant. Higher torque typically indicates better engine performance, which can reduce the engine's need to work harder. Still, the weak correlation suggests that other factors may play a more dominant role in influencing fuel efficiency than torque.

On the other hand, the correlation between vehicle weight and fuel consumption is 0.25, showing a more robust, though still weak to moderate, positive correlation. This indicates that heavier vehicles tend to have higher fuel consumption. Heavier vehicles require more energy to move, increasing fuel consumption. These findings suggest that reducing vehicle weight could be an effective strategy for improving fuel efficiency in hatchback cars.

A linear regression analysis was conducted to simultaneously understand the effects of engine capacity, engine torque, and vehicle weight on fuel consumption. Linear regression analysis examined the relationship between the independent variables (engine capacity, vehicle weight, and engine torque) and the dependent variable (fuel consumption). The goal was to quantify how much each independent variable influences fuel consumption.

Model Specification: A simple linear regression model was developed for each independent variable with fuel consumption as the dependent variable. The general form of the regression equation is [20, 21]:

$$Y = \beta_0 + \beta_1 X + \epsilon \quad (2)$$

where Y represents the fuel consumption, X represents the independent variable (e.g., engine capacity, vehicle weight, or torque), β0 is the intercept, β1 is the slope of the regression line, and ϵ\epsilonϵ is the error term. The slope β1 indicates the rate of change in fuel consumption

for a unit change in the independent variable.

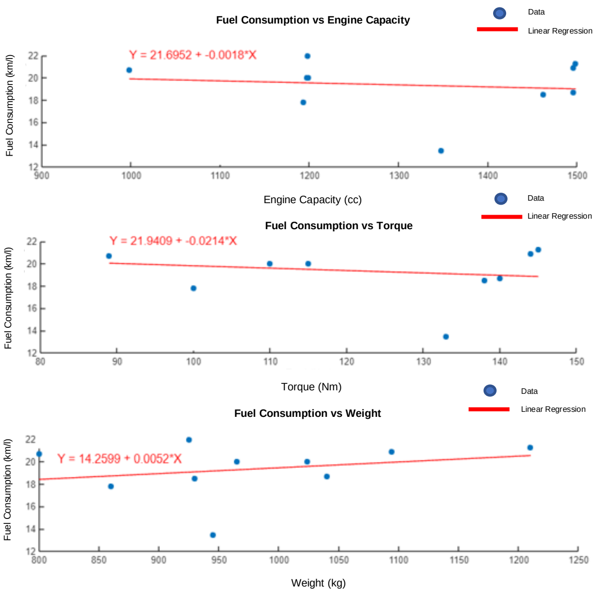


**Figure 3.** Linear Regression Graphs (a) Fuel Consumption vs. Engine Capacity, (b) Fuel Consumption vs. Engine Torque, and (c) Fuel Consumption vs. Vehicle Weight.

**Table 3.** Linear Regression Results of Fuel Consumption with Engine Capacity, Engine Torque, and Vehicle Weight.

| Linear Regression Result | Fuel Consumption VS Engine Capacity | Fuel Consumption VS Torque | Fuel Consumption VS Weight |
|---|---|---|---|
| Number of Observation | 10 | 10 | 10 |
| Regression Formula | Y=21.6952-0.0018*X | Y=21.9489-0.0214*X | Y=14.2599+0.0052*X |
| Intercept | 21.695 | 21.941 | 14.26 |
| Coefficients | -0.0018 | -0.0214 | 0.0052 |
| p-value | 0.72145 | 0.619 | 0.485 |
| R-squared | 0.0168 | 0.0323 | 0.0628 |
| Adjusted R-Squared | -0.106 | -0.0886 | -0.0544 |
| F-statistic vs constant model | 0.136 | 0.267 | 0.536 |

The linear regression equation for the relationship between engine capacity and fuel consumption is Y=21.6952−0.0018X, where Y represents fuel consumption (km/l), and X represents engine capacity. The regression coefficient of -0.0018 indicates that fuel consumption decreases by approximately 0.0018 km/l for an increase in engine capacity. However, the p-value of 0.72145 is more significant than 0.05, indicating that engine capacity does not have a statistically significant effect on fuel consumption. Additionally, the R-squared value of 0.0168 suggests that only 1.68% of the variation in fuel consumption can be explained by engine capacity, signifying that engine capacity is not a major factor influencing fuel consumption.

The linear regression equation for the relationship between torque and fuel consumption is Y=21.9409−0.0214X. The regression coefficient of -0.0214 indicates that for every 1 Nm increase in torque, fuel consumption decreases by approximately 0.0214 km/l. However, the p-value of 0.61921 is more significant than 0.05, suggesting that the relationship between torque and fuel consumption is not statistically significant. The R-squared value of 0.0323 shows that only 3.23% of the variation in fuel consumption can be explained by torque, reaffirming that torque is also not a primary factor affecting fuel consumption in the analyzed hatchback cars.

The linear regression equation for the relationship between vehicle weight and fuel consumption is Y=14.2599+0.0052X. The regression coefficient of 0.0052 indicates that for every 1 kg increase in vehicle weight, fuel consumption increases by approximately 0.0052 km/l. Although the p-value of 0.48503 is still greater than 0.05, meaning the relationship is not statistically significant, the R-squared value of 0.0628 shows that 6.28% of the variation in fuel consumption can be explained by vehicle weight.

These results are consistent with several previous studies that indicate that vehicle weight is one of the dominant factors influencing fuel consumption. For example, the survey by Cheah et al. (2009) demonstrated that increasing vehicle weight significantly raises fuel consumption, especially in smaller vehicles like hatchbacks [10]. Additionally, the theory of energy efficiency supports these findings. The heavier the vehicle, the more energy is required to move it, ultimately leading to higher fuel consumption. This theory is further reinforced by the study of Lewander et al. (2012), which found that vehicle weight directly impacts fuel performance through the mechanism of torque control in the engine [5]. However, our findings regarding the weak negative correlation between engine capacity and torque with fuel consumption contradict other studies, showing that larger engines typically consume more fuel. One possible explanation for this difference is using more advanced engine technology in the latest hatchback models, such as i-VTEC and Variable Timing Control (VTC), which can improve fuel efficiency despite the larger engine capacity [9].

## 4. CONCLUSION

Based on the data analysis and statistical results, several important conclusions can be drawn regarding the factors affecting fuel consumption in hatchback cars in Indonesia in 2024. Vehicle weight has been shown to significantly impact fuel consumption, with a positive correlation of 0.25.

This indicates that heavier cars tend to consume more fuel. In contrast, engine capacity and torque exhibit weak negative correlations with fuel consumption, at -0.13 and -0.18, respectively, suggesting that increases in engine capacity and torque have only a small effect on fuel efficiency.

Linear regression analysis also supports these findings, although the effects of vehicle weight, engine capacity, and torque were not statistically significant. The higher R-squared value for vehicle weight (0.0628) compared to engine capacity (0.0168) and torque (0.0323) indicates that vehicle weight is a more critical factor in influencing fuel consumption

## REFERENCES


[1] Rahmayanti L, Rahmah DM, Larashati L. (2021). Analisis Pemanfaatan Sumber Daya Energi Minyak Dan Gas Bumi Di Indonesia. J. Sains Edukatika Indonesia. 3(2): 9-16.

[2] Wibowo AH. (2021). Penggunaan Minyak Di Berbagai Sektor Industri Di Indonesia 2021. Data Dari International Energy Agency (IEA).

[3] Santika EF. (2023). Ketenagalistrikan, Sektor Penyumbang Emisi Terbesar Di RI 2021. Databox Katadata.

[4] Sofaniadi S, Purwanto P, Riyanto B. (2021). Potential For CO2 Emissions In Transportation Sector And Reduction Strategies Analysis Related To Greenhouse Gas In Semarang. Ecodevelopment Journal. 4(2): 32-34.

[5] Lewander M, Widd A, Johansson B, Tunestål P. (2012). Steady State Fuel Consumption Optimization Through Feedback Control Of Estimated Cylinder Individual Efficiency. IEEE. 4210(5): 4210-4214. DOI: 10.1109/ACC.2012.6315075.

[6] Park C, Kim Y, Oh S, Oh J, Choi Y, Baek H, Lee SW, Lee K. (2022). Effect Of Fuel Injection Timing And Injection Pressure On Performance In A Hydrogen Direct Injection Engine. Int. J. Hydrog. Energy. 47(50): 21552-21564. DOI: 10.1016/J.Ijhydene.2022.04.274.

[7] Birrell S, Taylor J, Mcgordon A, Son J, Jennings P. (2014). Analysis Of Three Independent Real-World Driving Studies: A Data-Driven And Expert Analysis Approach To Determining Parameters Affecting Fuel Economy. Transp. Res. Part D: Transp. Environ. 33: 74-86.

[8] Tanaka H, Ito A, Nakada H. (2015). Development Of New I-VTEC For 1.5-Liter Four-Cylinder Engine For New FIT. SAE Technical Paper. 2015-01-2201. DOI: 10.4271/2015-01-2201

[9] Kato M, Kawase T, Tsujimura T, Takarada S. (2007). Development Of I-VTEC Gasoline Engine Applied In The New 2007 Honda Fit. SAE Technical Paper. 2007-01-3553. DOI: 10.4271/2007-01-3553.

[10] Cheah LW, Bandivadekar AP, Bodek KM, Kasseris EP, Heywood JB. (2009). The Trade-Off Between Automobile Acceleration Performance, Weight, And Fuel Consumption. SAE Int. J. Fuels Lubr. 1(1): 771-777.


ISSN 2549-2888

[11] Cheah LW, Bandivadekar AP, Bodek KM, Kasseris EP, Heywood JB. (2009). The Trade-Off Between Automobile Acceleration Performance, Weight, And Fuel Consumption. SAE Int. J. Fuels Lubr. 1(1): 771-777. DOI: 10.4271/2009-01-2201.

[12] Lewander M, Widd A, Johansson B, Tunestål P. (2012). Steady State Fuel Consumption Optimization Through Feedback Control Of Estimated Cylinder Individual Efficiency. IEEE. 4210(5):4210-4214. DOI:10.1109/ACC.2012.6315075.

[13] Tanaka H, Ito A, Nakada H. (2015). Development Of New I-VTEC For 1.5-Liter Four-Cylinder Engine For New FIT. SAE Technical Paper. 2015-01-2201. DOI: 10.4271/2015-01-2201.

[14] Park C, Kim Y, Oh S, Oh J, Choi Y, Baek H, Lee SW, Lee K. (2022). Effect Of Fuel Injection Timing And Injection Pressure On Performance In A Hydrogen Direct Injection Engine. Int. J. Hydrog. Energy. 47(50): 21552-21564. DOI: 10.1016/J.Ijhydene.2022.04.274.

[15] Birrell S, Taylor J, Mcgordon A, Son J, Jennings P. (2014). Analysis Of Three Independent Real-World Driving Studies: A Data-Driven And Expert Analysis Approach To Determining Parameters Affecting Fuel Economy. Transp. Res. Part D: Transp. Environ. 33: 74-86.

[16] Mathworks Inc. (2023). MATLAB And Statistics Toolbox Release 2023a. Natick, Massachusetts, United States.

[17] Hahn J, Valentine T. (2012). Essential MATLAB For Engineers And Scientists. 5th Ed. Elsevier.

[18] Downey AB. (2012). Think Stats: Probability And Statistics For Programmers. 2nd Ed. O'Reilly Media.

[19] Otto S, Denier JP. (2005). An Introduction To Programming And Numerical Methods In MATLAB. Springer.

[20] Montgomery DC, Runger GC. (2014). Applied Statistics And Probability For Engineers. 6th Ed. Hoboken, NJ: Wiley.

[21] Kutner MH, Nachtsheim CJ, Neter J, Li W. (2005). Applied Linear Statistical Models. 5th Ed. New York, NY: Mcgraw-Hill/Irwin.

**Appendix**

**Script Tabel 2.1 & Gambar 2.1**

```
% Data input
data =
{
'Honda Brio', 20.0, 1199, 110, 965;
'Toyota Yaris', 18.7, 1496, 140, 1040;
'Daihatsu Ayla', 20.7, 998, 89, 800;
'Suzuki Baleno', 18.5, 1462, 138, 930;
'Mazda 2', 20.9, 1496, 144, 1094;
'Honda City Hatchback', 21.3, 1498, 145, 1210;
'Hyundai i20', 20.0, 1197, 115, 1024;
'Kia Rio', 13.5, 1348, 133, 945;
'Mitsubishi Mirage', 17.8, 1193, 100, 860;
'Nissan March', 22.0, 1198, 104, 925;
};
% Membuat tabel
varNames = {'Merk', 'Konsumsi_BBM',
'Kapasitas_Mesin', 'Torsi', 'Berat'};
T = cell2table(data, 'VariableNames', varNames);
% Menampilkan tabel
disp(T);
% Scatter Plot
figure;
subplot(2,2,1);
scatter([T.Kapasitas_Mesin], [T.Konsumsi_BBM],
'filled');
xlabel('Kapasitas Mesin (cc)');
ylabel('Konsumsi BBM (km/l)');
title('Konsumsi BBM vs Kapasitas Mesin');
subplot(2,2,2);
scatter([T.Torsi], [T.Konsumsi_BBM], 'filled');
xlabel('Torsi (Nm)');
ylabel('Konsumsi BBM (km/l)');
title('Konsumsi BBM vs Torsi');
subplot(2,2,3);
scatter([T.Berat], [T.Konsumsi_BBM], 'filled');
xlabel('Berat (kg)');
ylabel('Konsumsi BBM (km/l)');
title('Konsumsi BBM vs Berat');
% Histogram
figure;
subplot(2,2,1);
histogram([T.Konsumsi_BBM]);
xlabel('Konsumsi BBM (km/l)');
ylabel('Frekuensi');
title('Histogram Konsumsi BBM');
subplot(2,2,2);
histogram([T.Kapasitas_Mesin]);
xlabel('Kapasitas Mesin (cc)');
ylabel('Frekuensi');
title('Histogram Kapasitas Mesin');
subplot(2,2,3);
histogram([T.Torsi]);
xlabel('Torsi (Nm)');
ylabel('Frekuensi');
title('Histogram Torsi');
subplot(2,2,4);
histogram([T.Berat]);
xlabel('Berat (kg)');
ylabel('Frekuensi');
title('Histogram Berat');
% Box Plot
figure;
subplot(2,2,1);
boxplot([T.Konsumsi_BBM], 'Labels', {'Konsumsi
BBM'});
ylabel('Konsumsi BBM (km/l)');
title('Box Plot Konsumsi BBM');
subplot(2,2,2);
boxplot([T.Kapasitas_Mesin], 'Labels',
{'Kapasitas Mesin'});
ylabel('Kapasitas Mesin (cc)');
title('Box Plot Kapasitas Mesin');
subplot(2,2,3);
boxplot([T.Torsi], 'Labels', {'Torsi'});
ylabel('Torsi (Nm)');
title('Box Plot Torsi');
subplot(2,2,4);
boxplot([T.Berat], 'Labels', {'Berat'});
ylabel('Berat (kg)');
title('Box Plot Berat');
% Menampilkan plot
sgtitle('Visualisasi Data Konsumsi BBM
Kendaraan');
```

**Script Tabel 2.1 & Gambar 2.2**

```
% Data input
data = {
'Honda Brio', 20.0, 1199, 110, 965;
'Toyota Yaris', 18.7, 1496, 140, 1040;
'Daihatsu Ayla', 20.7, 998, 89, 800;
'Suzuki Baleno', 18.5, 1462, 138, 930;
'Mazda 2', 20.9, 1496, 144, 1094;
'Honda City Hatchback', 21.3, 1498, 145, 1210;
'Hyundai i20', 20.0, 1197, 115, 1024;
'Kia Rio', 13.5, 1348, 133, 945;
'Mitsubishi Mirage', 17.8, 1193, 100, 860;
'Nissan March', 22.0, 1198, 104, 925;
};
% Extract numerical data
consumption = cell2mat(data(:, 2));
engine_capacity = cell2mat(data(:, 3));
torque = cell2mat(data(:, 4));
weight = cell2mat(data(:, 5));


% Calculate averages
avg_consumption = mean(consumption);
avg_engine_capacity =
mean(engine_capacity);
avg_torque = mean(torque);
avg_weight = mean(weight);


% Calculate medians
```

```
median_consumption =
median(consumption);
median_engine_capacity =
median(engine_capacity);
median_torque = median(torque);
median_weight = median(weight);


% Calculate standard deviations
std_consumption = std(consumption);
std_engine_capacity =
std(engine_capacity);
std_torque = std(torque);
std_weight = std(weight);

% Display the results
fprintf('Rata-rata Konsumsi BBM:
%.2f\n', avg_consumption);
fprintf('Rata-rata Kapasitas Mesin:
%.2f\n', avg_engine_capacity);
fprintf('Rata-rata Torsi: %.2f\n',
avg_torque);
fprintf('Rata-rata Berat: %.2f\n',
avg_weight);


fprintf('Median Konsumsi BBM: %.2f\n',
median_consumption);
fprintf('Median Kapasitas Mesin:
%.2f\n', median_engine_capacity);
fprintf('Median Torsi: %.2f\n',
median_torque);
fprintf('Median Berat: %.2f\n',
median_weight);


fprintf('Standar Deviasi Konsumsi BBM:
%.2f\n', std_consumption);
fprintf('Standar Deviasi Kapasitas
Mesin: %.2f\n', std_engine_capacity);
fprintf('Standar Deviasi Torsi:
%.2f\n', std_torque);
fprintf('Standar Deviasi Berat:
%.2f\n', std_weight);
```

**Script Tabel 2.2**

```
% Data input
data = {
'Honda Brio', 20.0, 1199, 110, 965;
'Toyota Yaris', 18.7, 1496, 140, 1040;
'Daihatsu Ayla', 20.7, 998, 89, 800;
'Suzuki Baleno', 18.5, 1462, 138, 930;
'Mazda 2', 20.9, 1496, 144, 1094;
'Honda City Hatchback', 21.3, 1498, 145, 1210;
'Hyundai i20', 20.0, 1197, 115, 1024;
'Kia Rio', 13.5, 1348, 133, 945;
'Mitsubishi Mirage', 17.8, 1193, 100, 860;
'Nissan March', 22.0, 1198, 104, 925;
};
% Membuat tabel
varNames = {'Merk', 'Konsumsi_BBM',
'Kapasitas_Mesin', 'Torsi', 'Berat'};
T = cell2table(data, 'VariableNames',
varNames);
% Menghitung korelasi
corr_KonsumsiBBM_KapasitasMesin =
corr(T.Konsumsi_BBM,
T.Kapasitas_Mesin);
corr_KonsumsiBBM_Torsi =
corr(T.Konsumsi_BBM, T.Torsi);
corr_KonsumsiBBM_Berat =
corr(T.Konsumsi_BBM, T.Berat);
% Menampilkan hasil korelasi
fprintf('Korelasi antara Konsumsi BBM
dan Kapasitas Mesin: %.2f\n',
corr_KonsumsiBBM_KapasitasMesin);
fprintf('Korelasi antara Konsumsi BBM
dan Torsi: %.2f\n',
corr_KonsumsiBBM_Torsi);
fprintf('Korelasi antara Konsumsi BBM
dan Berat: %.2f\n',
corr_KonsumsiBBM_Berat);
```

**Script Tabel 2.3 & Gambar 2.3**

```
% Data input
data = {
'Honda Brio', 20.0, 1199, 110, 965;
'Toyota Yaris', 18.7, 1496, 140, 1040;
'Daihatsu Ayla', 20.7, 998, 89, 800;
'Suzuki Baleno', 18.5, 1462, 138, 930;
'Mazda 2', 20.9, 1496, 144, 1094;
'Honda City Hatchback', 21.3, 1498, 145, 1210;
'Hyundai i20', 20.0, 1197, 115, 1024;
'Kia Rio', 13.5, 1348, 133, 945;
'Mitsubishi Mirage', 17.8, 1193, 100, 860;
'Nissan March', 22.0, 1198, 104, 925;
};
% Membuat tabel
varNames = {'Merk', 'Konsumsi_BBM',
'Kapasitas_Mesin', 'Torsi', 'Berat'};
T = cell2table(data, 'VariableNames',
varNames);
% Regresi linear untuk setiap variabel
independen terhadap konsumsi BBM
mdl_KapasitasMesin =
fitlm(T.Kapasitas_Mesin,
T.Konsumsi_BBM);
mdl_Torsi = fitlm(T.Torsi,
T.Konsumsi_BBM);
mdl_Berat = fitlm(T.Berat,
T.Konsumsi_BBM);
```

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```
% Menampilkan hasil regresi linear dan formula regresi
disp('Hasil Regresi Linear (Konsumsi BBM vs Kapasitas Mesin):');
disp(mdl_KapasitasMesin);
fprintf('Formula Regresi: Y = %.4f + %.4f*X\n', mdl_KapasitasMesin.Coefficients.Estimate);
disp('Hasil Regresi Linear (Konsumsi BBM vs Torsi):');
disp(mdl_Torsi);
fprintf('Formula Regresi: Y = %.4f + %.4f*X\n', mdl_Torsi.Coefficients.Estimate);
disp('Hasil Regresi Linear (Konsumsi BBM vs Berat):');
disp(mdl_Berat);
fprintf('Formula Regresi: Y = %.4f + %.4f*X\n', mdl_Berat.Coefficients.Estimate);
% Plot hasil regresi
figure;
% Plot Kapasitas Mesin
subplot(3,1,1);
scatter(T.Kapasitas_Mesin, T.Konsumsi_BBM, 'filled');
hold on;
plot(T.Kapasitas_Mesin, mdl_KapasitasMesin.Fitted, '-r');
title('Konsumsi BBM vs Kapasitas Mesin');
xlabel('Kapasitas Mesin (cc)');
ylabel('Konsumsi BBM (km/l)');
legend('Data', 'Regresi Linear', 'Location', 'best');
% Menambahkan formula regresi ke dalam plot
text(min(T.Kapasitas_Mesin), max(T.Konsumsi_BBM), sprintf('Y = %.4f + %.4f*X', mdl_KapasitasMesin.Coefficients.Estimate), 'FontSize', 12, 'Color', 'r', 'BackgroundColor', 'w');
hold off;
% Plot hasil regresi
figure;
% Plot Torsi
subplot(3,1,2);
scatter(T.Torsi, T.Konsumsi_BBM, 'filled');
hold on;
plot(T.Torsi, mdl_Torsi.Fitted, '-r');
title('Konsumsi BBM vs Torsi');
xlabel('Torsi (Nm)');
ylabel('Konsumsi BBM (km/l)');
legend('Data', 'Regresi Linear', 'Location', 'best');
% Menambahkan formula regresi ke dalam plot
text(min(T.Torsi), max(T.Konsumsi_BBM), sprintf('Y = %.4f + %.4f*X', mdl_Torsi.Coefficients.Estimate), 'FontSize', 12, 'Color', 'r', 'BackgroundColor', 'w');
hold off;
% Plot hasil regresi
figure;
% Plot Berat
subplot(3,1,3);
scatter(T.Berat, T.Konsumsi_BBM, 'filled');
hold on;
plot(T.Berat, mdl_Berat.Fitted, '-r');
title('Konsumsi BBM vs Berat');
xlabel('Berat (kg)');
ylabel('Konsumsi BBM (km/l)');
legend('Data', 'Regresi Linear', 'Location', 'best');
% Menambahkan formula regresi ke dalam plot
text(min(T.Berat), max(T.Konsumsi_BBM), sprintf('Y = %.4f + %.4f*X', mdl_Berat.Coefficients.Estimate), 'FontSize', 12, 'Color', 'r', 'BackgroundColor', 'w');
hold off;
```