

# ANALYSIS AND DESIGN

## Analysis

PT. Kerja of the LPG gas distributor has problems regarding the availability of LPG stock. This is because the need to use LPG gas in the community continues to increase and during certain periods of usage increases, as a result of the availability of stock disturbing distribution.

The program will be created using a Linear Regression algorithm that can predict the availability of goods.

A Simple Linear Regression algorithm is a statistical method to what extent the causal relationship by the causal variable (x) to the consequent variable (y), there are several steps that must be taken.

linear regression equation model:

$$Y = a + b(X) \quad \text{equation(1)}$$

where:

Y = dependent variable (dependent)

X = causal variable (independent)

a = constant

b = regression coefficient (slope); magnitude of response caused by the causal variable.

1. Determine a constant (a) equation(2)

constant is a fixed value

$$a = \frac{\sum y - b \sum x}{n}$$

2. Determine the regression coefficient (b) equation(3)

coefficient is the value of increase or decrease

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}$$

In this section, implementation will be carried out and testing of predictions for availability of 50kg lpg. This aims to test whether with a Simple Linear Regression algorithm, we can determine predictions in the 6th month in the following data:

Table 4.1: Data Actual

Bulan (X)	Total Penjualan (Y)
1	437
2	404
3	526
4	402
5	252
6	386
7	489
8	474
9	379
10	500
11	451
12	399

From these data we look for Linear Regression calculations by looking for X, Y, X<sup>2</sup>, XY and the total of each variable.

Table 4.2: Data Perhitungan

X	Y	X <sup>2</sup>	XY
1	437	1	437
2	404	4	808
3	526	9	1578
4	402	16	1608
5	252	25	1260
<b>15</b>	<b>2021</b>	<b>55</b>	<b>5691</b>

After determining the calculation of X, Y, X<sup>2</sup>, XY and the total, then specify (a) and (b) based on the formula, so that we get a number. Value for a 515.8, value

for b -37.2, After completing calculations (a) and (b) enter into the Simple Linear Regression equation formula.

$$Y = 515.8 + -37.2 (6)$$

$$= 292.6$$

3. Calculates the accuracy of forecasting results equation(4)

Forecasting algorithms with small deviation values can be concluded that the algorithm can be used. The accuracy of forecasting results can be calculated using the Mean Absolute Percentage Error (MAPE) with the following formula.

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

Where  $X_t$  is the actual data in the  $t$  period;  $F_t$  is the value of forecasting results in the  $t$  period;  $n$  is the amount of data.

The following table forecast results based on the amount of data available.

Table 4.3: Data Percentage Error

Bulan	Actual	forecasting	Absolute error	Percentage error (%)
1	437	478	41	0,094
2	404	441	37	0,092
3	526	404	122	0,232
4	402	366	36	0,09
5	252	329	77	0,306
6	386	292	94	0,244

Based on the forecasting table, it is known that the average MAPE of the 6th month based on existing data is 17.6%. So it was concluded that Simple Linear Regression algorithms are suitable algorithms to predict availability of goods.

## Desain

This section explains the program design flow and PHP will be used as a programming language. With the following diagram:

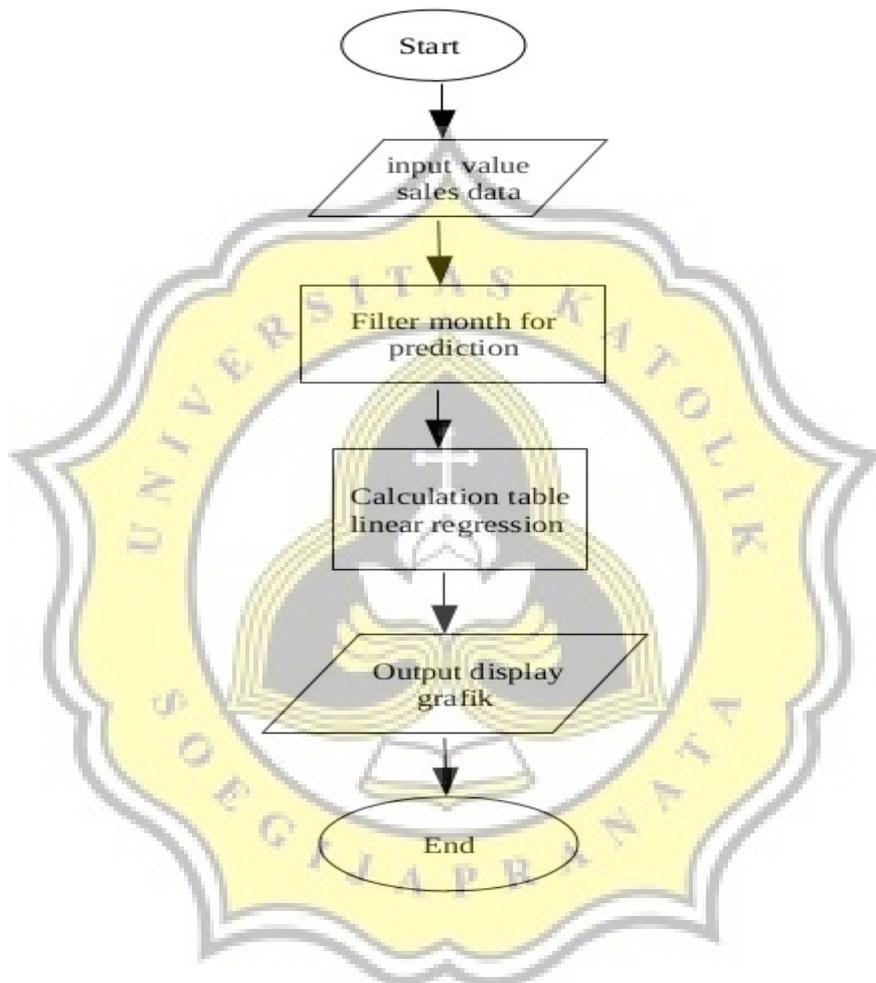


Illustration 4.1 describes the program flow it starts with changing the data to CSV then sampling the data from January to May to predict the 6th month is June. Add the total number of items each month, then process the data using linear regression to predict the availability of goods, the results will be displayed in graphical form

The following is the flowchart system:

Illustration 4.2: Alur system

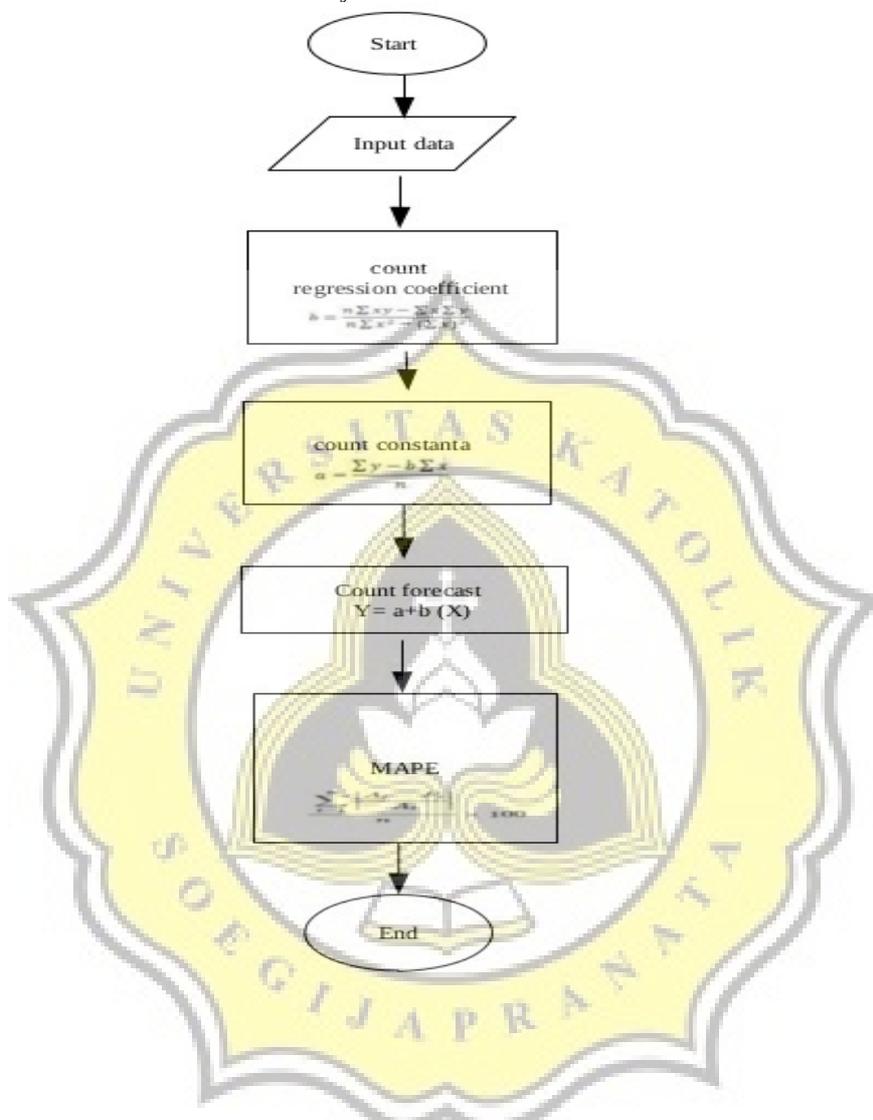


Illustration 4.2 describes the system flow from the flowchart above, the system will take the period variable and the item then filter the desired month. After the lunar filter process, the system will calculate the number of months and total items, the data generated will be calculated to determine regression coefficient and constanta after the process is complete the system will calculate the forecast availability of lpg tubes. Then the forecasting results will be displayed in the graph.