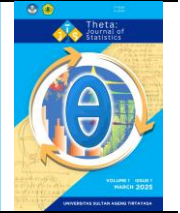




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## Analyzing of Consumer Price Index Influence on Inflation in Cilegon City for the Years 2023-2024

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### ABSTRACT

The Consumer Price Index (CPI) in Cilegon City is an important barometer for measuring the inflation rate in the region. Inflation itself is an economic phenomenon that reflects the general increase in the prices of goods and services over a certain period. As a crucial indicator, inflation affects purchasing power, the cost of living, and overall economic stability. Therefore, monitoring the CPI in Cilegon is highly relevant for understanding local economic dynamics and formulating appropriate policies. This study aims to determine whether the Consumer Price Index impacts inflation in Cilegon City. The study results indicate that the CPI has a significant and negative influence on inflation in Cilegon City for the years 2023-2024. Furthermore, the coefficient of determination shows that approximately 57.76% of the variability in the CPI in Cilegon can be explained by the inflation rate, while the remaining 42.24% comes from variables not accounted for in the model.

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## INTRODUCTION

Essentially, the welfare of a country is a fundamental desire and necessity that plays a major role in shaping and reflecting the quality of life in every nation. This condition remains a universal aspiration for all countries in their efforts to create a safe, comfortable, fair, and productive society. However, in reality, many nations face global challenges amid the rapid advancements of the modern era. One of these challenges is in the economic sector, which continues to be a primary focus for Indonesia in its efforts to achieve stability and sustainable economic growth. A country's economic stability serves as a crucial foundation that can drive sustainable development, particularly in Indonesia, by fostering an educated, prosperous society that significantly contributes to the nation's economy.

A high and stable economic growth rate is one of the key indicators of a country's success in achieving national prosperity. Fluctuations in economic growth represent a country's ability to adapt to changes in the economic well-being of its people [1]. Therefore, economic growth issues can be viewed as a macroeconomic challenge that encompasses long-term aspects. Various factors and conditions, such as

population growth, unlimited human desires, and rising prices of goods and services, require the economy to continuously adapt by providing effective economic alternatives. As a result, the availability of goods and services must be aligned with consumer demand to maintain economic stability.

As a developing country, Indonesia often faces economic instability. When analyzed in terms of the complexity and dynamics of the overall economic structure, inflation remains a major issue in Indonesia's efforts to achieve economic stability. Inflation is essentially a condition where the prices of goods and services increase simultaneously and are interrelated. This situation leads to an imbalance between supply and demand on a national economic scale.

Although some levels of inflation remain within a reasonable range, soaring commodity prices in the market can reduce consumer purchasing power, creating imbalances in the national economic framework [2]. According to data from the Badan Pusat Statistik (BPS), the inflation rate in Cilegon City, Banten Province, in January 2023 was the highest, reaching 0.88%. The main cause of this high inflation was a significant rise in prices across several expenditure groups. The largest increase was in the food, beverage, and tobacco category, which experienced inflation of 1.93%. Additionally, the housing, water, electricity, and household fuel category also saw an inflation rate of 1.15% [3].

In relation to inflation, the Consumer Price Index (CPI) is also one of the key indicators and predictors of Indonesia's economic stability. The CPI is essentially a long-term measure derived from the costs of goods and services [4]. Changes in the CPI serve as a primary macroeconomic indicator that reflects inflation levels and explains consumption patterns across different regions [5]. In its calculation, the CPI generally covers various categories of goods and services, including food, housing, transportation, and healthcare, providing a comprehensive overview of changes in the cost of living in each area. In general, when a region's CPI increases, the prices of goods and services also rise, indicating ongoing inflation. In other words, the CPI and inflation are closely related, as inflation occurs due to rising prices in major expenditure groups, which are components of the CPI. According to data from Badan Pusat Statistik (BPS) in January 2023, Cilegon City recorded a CPI of 116.86, an increase from 115.84 in December 2022. This increase was influenced by inflation in several commodities, including rice, gasoline, cigarettes, urban transportation, shallots, and chicken eggs. The highest inflation rate was recorded in the tobacco commodity group, at 0.17%. This situation should be a key concern for the government, particularly in Cilegon City, to address economic imbalances. As an industrial city, Cilegon experiences rising expenditures, further driven by population growth and an increasing number of workers from outside the region.

## RESEARCH METHODS

The research conducted in this study is quantitative research, which involves analysis to determine the causal relationship between two variables. In this case, the researcher aims to identify and prove the influence of the independent variable on the dependent variable [6]. The causal relationship examined in this study is the effect of the Consumer Price Index (CPI) on inflation in Cilegon City from April to July 2023-2024. Simple linear regression analysis is used as the testing model to investigate the impact of the independent variable on the dependent variable. This study utilizes secondary data in the form of panel data (pooled data) on the Consumer Price Index and inflation in Cilegon City from April to July 2023-2024. The data collected is sourced from the Badan Pusat Statistik (BPS) of Cilegon City for the specified period.

## RESULTS AND DISCUSSION

The data used by the researcher to analyze the influence of the Consumer Price Index (CPI) on inflation in Cilegon City from April 2023 to July 2024 is as follows.

**Table 1.** CPI and Inflation Data for Cilegon City from April 2023 to July 2024

Months	IHK	Inflation
April	117,64	0,2
May	117,93	0,25
June	118,01	0,07
July	118,23	0,19
August	118,07	3,6
September	118,41	0,29
October	118,55	0,12
November	119,3	0,63
December	119,9	0,5
January	104,97	2,28
February	105,71	2,86
March	106,16	2,91
April	106,41	2,55
May	106,88	3,2
June	106,44	2,72
July	106,41	2,55

Source : BPS Cilegon City

## Classical Assumption Test

### Normality Test

The normality test is conducted to determine whether the residual data follows a normal distribution or not. The normality test used by the researcher is the Shapiro-Wilk test. The output is shown in the following figure.

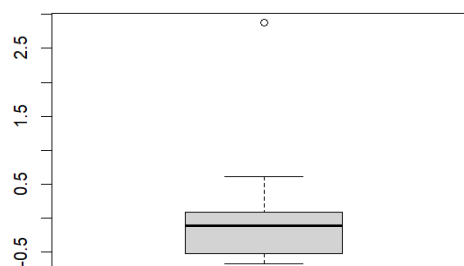
```
> #UJI NORMALITAS RESIDUAL
> shapiro.test(model_IHK$residuals)

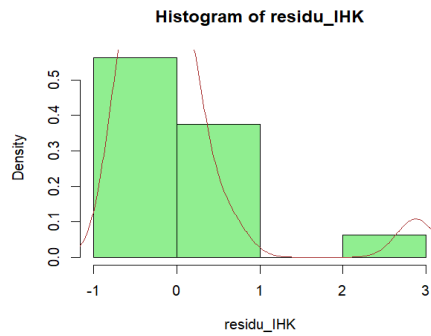
Shapiro-wilk normality test

data:  model_IHK$residuals
W = 0.66754, p-value = 7.571e-05
```

**Figure 1.** The Shapiro-Wilk Test Output

Based on the output above, it can be seen that the Shapiro-Wilk normality test yielded a p-value of 7.571e-05. This is a very small p-value. Therefore, it can be concluded from the normality test that the residual data does not follow a normal distribution, because the p-value is less than 0.05. Meanwhile, one of the requirements for a simple linear regression model is that the residuals of the data should be normally distributed. The non-normality of the residual data can also be observed through the boxplot and histogram, as shown in the following figure.

**Figure 2.** Boxplot



**Figure 3.** Histogram

Based on the boxplot visualization, it can be observed that there are outliers in the residual data. As a result, the researcher first removes the outliers and re-tests the normality of the residual data. Furthermore, based on the histogram visualization, it is evident that the line does not represent a normal distribution (skewed right). In order to fulfill the normality assumption, a data transformation is performed by applying a logarithmic transformation to the original data. The log transformation is appropriate for data with a right-skewed distribution. The output after the transformation is shown in the following figure.

```
> shapiro_result<-shapiro.test(model_dua$residuals)
> shapiro_result

Shapiro-Wilk normality test

data:  model_dua$residuals
W = 0.91008, p-value = 0.1167

> if (shapiro_result$p.value > 0.05) {
+   print("Menerima H1: Residual berdistribusi normal.")
+ } else {
+   print("Menolak Ho: Residual tidak berdistribusi normal.")
+ }
[1] "Menerima H1: Residual berdistribusi normal."
```

**Figure 4.** The Output of the Shapiro-Wilk Test After The Log Transformation

Based on the output above, the researcher then proceeded with the Shapiro-Wilk test using the reference from the newly transformed data. It can be concluded that after performing the transformation and re-testing, the p-value is 0.1167. In this case, since the p-value  $> 0.05$ , it means that the residual data distribution is now normal, as the p-value is greater than the alpha level (0.05). This indicates that the normality assumption has been satisfied after the log transformation was applied to the data.

#### *Heteroskedasticity Test*

Heteroskedasticity Test is a classical assumption test conducted to check whether the variance of residuals is constant across all observations in a regression model. If the variance remains the same from one observation to another, this is called homoscedasticity, and it means there is no heteroscedasticity. However, if the variance differs across observations, it is called heteroskedasticity. A good regression model exhibits homoscedasticity, meaning the variance of residuals is constant across all levels of the independent variables. In this heteroskedasticity test, the researcher performs the **Breusch-Pagan Test**. The output is shown in the following figure.

```

> bp_result<-bptest(model_heteros, studentize = FALSE)
> bp_result

Breusch-Pagan test

data: model_heteros
BP = 3.5095, df = 1, p-value = 0.06102

> if (bp_result$p.value > 0.05) {
+   print("Menerima H1: Tidak ada heteroskedastisitas.")
+ } else {
+   print("Menolak Ho: Ada heteroskedastisitas.")
+ }
[1] "Menerima H1: Tidak ada heteroskedastisitas."

```

**Figure 5.** The Output of the Breush-Pagan Test

Based on the output of the Breusch-Pagan test, it can be seen that the p-value is 0.06102. In this case, the p-value is greater than 0.05. This means that there is no heteroskedasticity in the variation of the regression model. In other words, the variance of the simple linear regression model remains constant across the Consumer Price Index (CPI) variable, indicating that the model is homogeneous. Therefore, the classical assumption test for heteroskedasticity has been satisfied in the analysis.

#### *Autocorrelation Test*

Autocorrelation Test is conducted to examine whether there is a correlation between the residuals of period  $t$  and period  $t-1$  (previous period) in a linear regression model. In this study, the researcher used the Durbin-Watson test for autocorrelation, and the output can be seen in the following figure.

```

Durbin-Watson test

data: model_IHK
DW = 2.257, p-value = 0.612
alternative hypothesis: true autocorrelation is greater than 0

> if (dw_result$p.value > 0.05) {
+   print("Menerima H0: Tidak ada autokorelasi.")
+ } else {
+   print("Menolak H0: Ada autokorelasi.")
+ }
[1] "Menerima H0: Tidak ada autokorelasi."

```

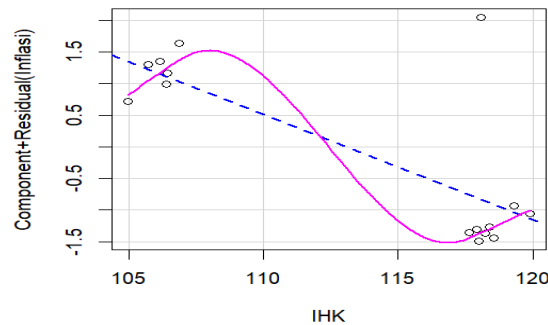
**Figure 6.** The Output of the Durbin-Watson Test

Based on the output above, it can be seen that for the correlation test, the p-value generated is 0.612. Since the p-value is greater than 0.05, we fail to reject the null hypothesis ( $H_0$ ). This means that there is no autocorrelation between the two variables, the Consumer Price Index (CPI) and Inflation. This also means that one of the basic assumptions of the linear regression model is met. This enhances the reliability of the model results and makes the interpretation of regression parameters (such as coefficients) more valid. The absence of autocorrelation indicates that the relationship between CPI and inflation is stable from period to period. In other words, changes in CPI do not show a repeating pattern that can be predicted based on past values of inflation or CPI itself.

#### *Linearity Test*

The linearity test is one of the assumptions of regression analysis, which checks whether the regression line between two variables, the dependent variable ( $Y$ ) and the independent variable ( $X$ ), forms a linear relationship. If the relationship is not linear, the regression analysis cannot be continued. It is essential to understand whether the relationship between  $X$  and  $Y$  is linear because it affects the validity of the regression model. Even if the regression model has a high R-squared value, if the data is not linear, there

is a high likelihood of estimation errors, which can impact the final results of the test. The results of the linearity test can be shown in the following figure.



**Figure 7.** Linearity Test Plot

Based on the linearity test visualized through the graph, it can be observed that the blue dashed line represents the simple linear regression model, which shows a tendency of linear decline between the Consumer Price Index (CPI) and Inflation in Cilegon. Meanwhile, the purple line illustrates a more complex non-linear trend. At CPI values around 105 to 110, inflation initially increases. However, after that, inflation decreases significantly, reaching the lowest point around CPI 115. Once the CPI value approaches 120, inflation starts to rise again. In other words, the purple line represents the residual effects that do not fit into the linear model. This suggests that while a simple linear regression model may capture the general trend, there are more complex patterns that the linear model doesn't fully account for, as indicated by the purple line.

### Hypothesis Test

The hypothesis test used in this study is the **t-test**. Essentially, a t-test is conducted to determine whether there is a significant effect of an independent variable on a dependent variable. The output of the t-test from this study is shown in the following figure.

```
Call:
lm(formula = IHK ~ Inflasi, data = data_cilegon)

Residuals:
    Min       1Q   Median       3Q      Max
-5.4617 -2.4437 -0.2846  0.3692 12.4471

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 118.7378    1.5994   74.241 < 2e-16 ***
Inflasi      -3.6430     0.7855  -4.638 0.000384 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 4.121 on 14 degrees of freedom
Multiple R-squared:  0.6058,    Adjusted R-squared:  0.5776 
F-statistic: 21.51 on 1 and 14 DF,  p-value: 0.0003836
```

**Figure 8.** The Output of the Hypothesis Test

Based on the hypothesis test output above, it can be seen that the t-value from the regression model is 74.241. In this case, the p-value is greater than 0.05. Therefore, it can be concluded that there is a significant effect of the independent variable, CPI (Consumer Price Index), on the dependent variable, Inflation in Cilegon.

### *The Linear Regression Equation*

From the hypothesis test output, the equation of the simple linear regression model in this study is derived. Using data processing in R Studio, it can be concluded that the simple linear regression model formed by the effect of the Consumer Price Index (CPI) on Inflation has the following equation.

$$Y = 20,35786 - 0,16628 X$$

This regression equation can be interpreted as follows: For every 1-unit increase in the independent variable X (CPI), the dependent variable Y (Inflation) will decrease by 0.16628 units. The negative coefficient (-0.16628) indicates a negative relationship between X and Y, meaning that when X increases, Y decreases. This also means that if the CPI increases by 1 unit, inflation will decrease by 0.16628 units. If the CPI remains constant, inflation is predicted to be at a level of 20.35786 (based on the intercept value).

### *Coefficient of Determination ( $R^2$ )*

The coefficient of Determination ( $R^2$ ) is used to measure how well the regression model fits the data. It indicates the percentage of the variation in the dependent variable Y that can be explained by the independent variable X. The value of the coefficient of determination,  $R^2$ , helps to evaluate the strength of the relationship between X and Y. A higher  $R^2$  value indicates that the model explains a greater portion of the variance in Y. From the data processing using R Studio, the value of  $R^2$  can be obtained, and the output is shown in the following figure.

Residual standard error: 0.8804 on 14 degrees of freedom  
Multiple R-squared: 0.6058, Adjusted R-squared: 0.5776  
F-statistic: 21.51 on 1 and 14 DF, p-value: 0.0003836

**Figure 9.** The output of the Coefficient of Determination

Based on the coefficient of determination output above, it can be seen that the adjusted R-squared value is 0.57765. This means that 57.76% of the variation in the dependent variable (Inflation) is influenced by the Consumer Price Index (CPI), which is part of the independent variables. The remaining 42.24% is influenced by other factors not explained in this simple linear regression model.

### **Discussion of Research Results**

Inflation remains a topic of significant interest for research. The issues that arise due to uncontrolled inflation can greatly affect various economic aspects of human life. In recent years, inflation in Indonesia has been highly fluctuating, especially during the COVID-19 pandemic, which led to unstable domestic demand. In 2021, inflation showed a declining trend. The highest inflation occurred in 2022, particularly in September, mainly due to the increase in fuel prices and a rise in consumer consumption [7]. The results of data processing using R Studio in this study conclude that there is a significant effect between the independent variable Consumer Price Index (CPI) and the dependent variable Inflation in the city of Cilegon for the years 2023-2024. The CPI is considered an important economic indicator because it reflects the changes in retail prices of certain goods and services at the consumer level. Studies related to the effect of the Consumer Price Index (CPI) on inflation have been widely conducted by other researchers. For instance, [8] their research stated that the CPI negatively affected inflation but was not significant in Medan City, using EViews 10 for data analysis. In contrast, [9] stated that there was no effect of the CPI on inflation in Cilacap Regency in 2023, using SPSS for data analysis. Inflation affects Indonesia's economic growth [10], so the results of this study are important to obtain.

## CONCLUSION

Based on the research results, it can be concluded that from the hypothesis test results, specifically the t-test, the t-value obtained is 74.241 which is greater than 0.05, indicating a significant effect between the independent variable CPI (Consumer Price Index) and the dependent variable Inflation in Cilegon City for the years 2023-2024. Furthermore, from the hypothesis test, the regression equation is also obtained, which is  $Y = 20.35786 - 0.16628 X$ . This equation shows a negative relationship between X and Y, meaning that when X (CPI) increases, Y (Inflation) decreases. Additionally, for the coefficient of determination, based on the adjusted R-squared value of 0.57765, it means that 57.76% of the variation in the dependent variable (Inflation) is influenced by the independent variable (CPI). The remaining 42.24% is influenced by other factors that are not explained in this linear regression model.

## REFERENCES

- [1] A. H. Gunawan, *Anggaran Pemerintah dan Inflasi di Indonesia*. Jakarta: Gramedia Pustaka Utama, 2014.
- [2] A. Salim, Fadilla, and A. Purnamasari, "Pengaruh Inflasi Terhadap Pertumbuhan Ekonomi Indonesia Anggun Purnamasari," 2021. [Online]. Available: [www.bps.go.id](http://www.bps.go.id),
- [3] BPS, "Berita Resmi Statistik," 2023. [Online]. Available: <https://cilegonkota.bps.go.id/id/pressrelease/2023/02/02/152/januari-2023-kota-cilegon-mengalami-inflasi-sebesar-0-88-persen-dengan-indeks-harga-konsumen--ihk--sebesar-116-86.html>
- [4] V. Kristinae, "Analisis Pengaruh Indeks Harga Konsumen Terhadap Inflasi (Studi Kasus Pada Inflasi Kota Palangka Raya dan Kab. Sampit di Kalimantan Tengah)," *J. Apl. Manajemen, Ekon. Dan Bisnis*, vol. 3, no. 1, pp. 1–11, 2018.
- [5] N. Nafisah and R. Respatiwan, "Analisis Faktor Indeks Harga Konsumen Kota Semarang," *Indones. J. Appl. Stat.*, vol. 2, no. 2, p. 113, 2019, doi: 10.13057/ijas.v2i2.34903.
- [6] Z. Arifin, *Penelitian Pendidikan Metode dan Paradigma Baru*. Bandung: Remaja Rosda Karya, 2012.
- [7] R. Putri Divania, A. Kharismatun Nikmah, M. Misbahul Munir, and N. Sayyid Ali Rahmatullah Tulungagung, "PENGARUH INDEKS HARGA KONSUMEN TERHADAP TINGKAT INFLASI DI INDONESIA," vol. 2, 2023, doi: 10.8734/mnmae.v1i2.359.
- [8] S. Wulandari and M. D. Habra, "PENGARUH INDEKS HARGA KONSUMEN TERHADAP INFLASI DI KOTA MEDAN."
- [9] Q. Salsabila and N. I. Hasni, "Analisis Pengaruh Indeks Harga Konsumen Bulanan Terhadap Inflasi Makanan Bulanan melalui Metode Analisis Regresi Sederhana," *CiDEA J.*, vol. 2, no. 2, pp. 111–116, Dec. 2023, doi: 10.56444/cideajournal.v2i2.1311.
- [10] A. Salim, F. Fadilla, and A. Purnamasari, "Pengaruh Inflasi Terhadap Pertumbuhan Ekonomi Indonesia", *esha*, vol. 7, no. 1, pp. 17-28, Aug. 2021.