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Gamma Regression Approach for Determining Factors of Inflation in Indonesia

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ABSTRACT

High inflation in Indonesia poses challenges to macroeconomic stability by reducing investment, increasing the risk of financial crises, and slowing economic growth. Although inflation has been widely studied, limited research has compared the suitability of conventional multiple regression and Generalized Linear Model (GLM) gamma regression for modeling inflation data with non-normal characteristics. This study aimed to examine the effects of the Bank Indonesia policy rate, exchange rate, and export value on Indonesia's inflation rate while identifying the more appropriate analytical model. A quantitative associative research design was employed using secondary monthly data collected from the official publications of Statistics Indonesia and Bank Indonesia for the period January 2019 to December 2024, resulting in 72 observations. The data were analyzed using multiple linear regression and gamma regression based on the Generalized Linear Model framework, with model comparison performed to determine the most suitable approach. The findings showed that gamma regression provided a better fit than conventional multiple regression for explaining inflation. The gamma regression results indicated that the Bank Indonesia policy rate and export value significantly affected inflation, whereas the exchange rate had no significant effect. These findings demonstrate the importance of selecting an analytical model that matches the characteristics of the data to improve the accuracy of inflation analysis. The study contributes to the application of Generalized Linear Models in macroeconomic research and provides evidence that may support policymakers in developing more effective inflation control strategies.

1. Introduction

Inflation is generally defined as a continuous and widespread increase in the prices of goods and services over a certain period (Sukirno, 2007). An increase in the price of only one or two commodities cannot be categorized as inflation unless it spreads to the prices of most goods and services in the economy. Inflation commonly occurs due to an imbalance between the supply of goods and services and aggregate demand, which may be triggered by production constraints, inappropriate price-setting mechanisms, excessive money creation, and rising income levels (Salim et al., 2021). As one of the primary macroeconomic indicators, inflation reflects the stability of an economy and influences the effectiveness of economic policies. Persistent inflation can reduce purchasing power, distort resource allocation, discourage investment, and ultimately hinder sustainable economic growth (Pohan, 2008).

From a broader perspective, inflation has become one of the major economic challenges faced by many developing countries, including Indonesia. High inflation adversely affects several macroeconomic objectives, such as maintaining employment opportunities,

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promoting economic growth, and ensuring equitable income distribution. Moreover, inflation decreases the real income of individuals whose earnings do not adjust proportionally to rising prices and reduces the real value of financial assets such as cash savings and bank deposits. Consequently, prolonged inflation may worsen income inequality and reduce overall social welfare (Sukirno, 2007).

Indonesia has experienced fluctuating inflation rates during the last decade, reflecting changes in both domestic and global economic conditions. As illustrated in Figure 1, inflation declined from approximately 7% in 2010 to around 4% in 2011 before increasing sharply in 2013–2014 to above 8%. Afterward, inflation gradually stabilized between 2015 and 2019, declined significantly during the COVID-19 pandemic in 2020–2021, increased again in 2022 due to post-pandemic economic recovery and global commodity price shocks, and subsequently decreased to below 2% by 2024. These fluctuations indicate that inflation in Indonesia remains dynamic and is influenced by various macroeconomic factors, thereby requiring continuous monitoring and appropriate policy responses.

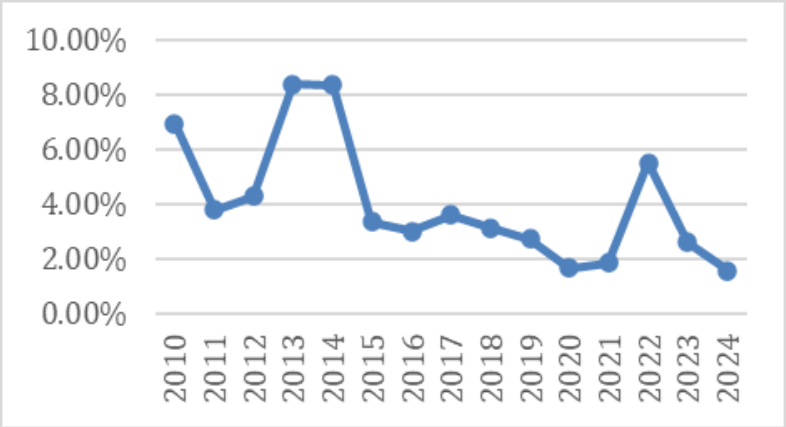

Fig. 1. Inflation in Indonesia, 2010–2024

To maintain price stability, governments generally implement monetary and fiscal policies as the primary instruments for controlling inflation. Through monetary policy, the central bank may reduce the money supply by increasing interest rates, thereby lowering aggregate demand and inflationary pressures. However, higher interest rates may also discourage investment activities. Fiscal policy complements these efforts by adjusting government expenditures and taxation to reduce excessive money circulation within the economy, thereby lowering public demand and stabilizing prices (Zakaria, 2009).

Several macroeconomic variables have been identified as determinants of inflation. One important factor is export performance. Export activities influence domestic commodity availability and aggregate demand, creating interactions between domestic production and international markets. Excessive export growth may affect domestic price levels through supply shortages, whereas declining exports may reduce inflationary pressure under certain economic conditions (Sukirno, 2016). Likewise, international trade conditions, including export and import activities, play an important role in determining inflation dynamics in an open economy such as Indonesia (Maulana et al., 2020).

Another important determinant is the interest rate represented by the BI Rate. According to Fisher's theory, differences between domestic and foreign interest rates influence exchange rate movements. Higher domestic interest rates generally affect capital flows and may influence currency depreciation or appreciation. Bank Indonesia utilizes monetary policy by adjusting interest rates and

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managing foreign exchange reserves to stabilize inflation. Conversely, lower interest rates increase money circulation, which may stimulate inflationary pressures (Madura, 2006). Exchange rate movements also influence inflation through the purchasing power parity theory, which explains that exchange rates adjust to reflect inflation differentials between countries. Because Indonesia relies heavily on imported goods and services, depreciation of the rupiah increases import prices and production costs, thereby contributing to higher inflation (Deliarnov, 2006).

Although numerous studies have examined the determinants of inflation, previous research has generally analyzed the effects of interest rates, exchange rates, or exports separately using conventional econometric approaches. Limited attention has been given to investigating these three macroeconomic variables simultaneously within a single analytical framework using recent Indonesian data. Furthermore, previous studies rarely employ the Generalized Linear Model (GLM), despite its flexibility in modeling data that do not necessarily satisfy the assumptions of classical linear regression. Consequently, empirical evidence regarding the combined effects of the BI Rate, exchange rate, and export value on inflation using the GLM approach remains limited.

Based on these gaps, the research problem addressed in this study is whether the BI Rate, exchange rate, and export value significantly influence Indonesia's inflation rate, both individually and simultaneously, when analyzed using the Generalized Linear Model (GLM). Addressing this problem is important to provide a more comprehensive understanding of the macroeconomic factors influencing inflation and to evaluate the suitability of the GLM approach for inflation modeling.

Accordingly, this study aims to analyze the influence of the BI Rate, exchange rate, and export value on Indonesia's inflation rate using annual data for the 2019–2024 period. Specifically, the study seeks to obtain empirical evidence regarding the individual and simultaneous effects of these macroeconomic variables on inflation through the application of the Generalized Linear Model.

Theoretically, this study contributes to the literature on inflation by extending empirical evidence regarding the relationship between monetary policy, exchange rate dynamics, international trade, and inflation using the GLM approach, which provides greater flexibility in analyzing macroeconomic data. Practically, the findings are expected to provide useful information for Bank Indonesia and government policymakers in designing more effective monetary and fiscal policies to maintain price stability. The novelty of this research lies in the simultaneous examination of the BI Rate, exchange rate, and export value using the Generalized Linear Model with the most recent Indonesian data for the 2019–2024 period, offering a more comprehensive perspective on inflation determinants than previous studies.

2. Literature Review

2.1 Conceptual and Theoretical Foundations

2.1.1 Inflation

The inflation rate is the percentage increase in the prices of goods and services in a given year compared to the previous year (Sukirno et al., 2004). Inflation occurs when the prices of goods and services increase more often than their supply. Inflation is classified into three categories: inflation by nature, inflation by cause, and inflation by origin (Idris, 2018). Although inflation has a significant impact on the stability of the economy, there are still methods to stop it.

a. Monetary policy with the main person in charge is the central bank which usually raises the minimum reserves of commercial banks which will reduce the desire of commercial banks to lend money, so that the amount of money in circulation can be reduced.
b. Fiscal policy with Tax regulations made by

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the government has a direct impact on total demand, which in turn affects prices. Lowering government spending as well as raising taxes will impact demand. Inflation can be curbed when demand decreases. Output Policy, reduction of import duty taxes will allow cheap imports. The pricing and table policy, which sets a price ceiling based on a certain price index for wages, will result in a gradual increase in the prices of goods and wages as a result of falling inflation (Nopirin, 2008).

2.1.2 BI Rate

The benchmark interest rate, or BI rate, is a policy rate that reflects the monetary policy stance of Bank Indonesia, which is set and announced to the public (Bank Indonesia, 2013). The BI-Rate consists of two categories:

a. Nominal interest rate, which is the total of the interest rate components, such as the "pure" interest rate, risk premium, transaction costs, and the premium for expected inflation. The nominal interest rate is the interest rate commonly reported and offered by banks to their depositors.
b. The real interest rate-which already takes into account changes in the value or purchasing power of money over time-is the nominal interest rate minus the rate of inflation that occurred during the same period (Yoopi, 2004).

Some of the functions of the BI-Rate are as follows: attract investors to invest, help control investment in some sectors of the economy, serve as a reference for monetary policy by controlling the amount of money circulating in the economy, and help the government increase production and control inflation by changing the deposit interest rate (Sunariyah, 2013).

According to the fisher effect theory, a foreign currency will appreciate if the foreign interest rate is lower than the home country's interest rate. The monetary policy taken by the Bank Indonesia authorities is contractionary, which means reducing the money supply, either by raising interest rates or increasing foreign exchange reserves, used to control inflation (Madura, 2006).

2.1.3 Exchange Rate

The exchange rate is the value of money exchanged between one currency and another (Ismanthono, 2015). Three different systems control currency exchange rates. The first is a fixed rate system, where the country's central bank determines the foreign exchange rate at the risk of being willing to buy or sell any amount of foreign currency (Haryadi, 2015). The second is a floating rate system, where the foreign exchange rate can move freely according to market demand and supply. An exchange rate set by linking a country's currency to another country is known as a tied exchange rate system (Arifin & Giana, 2007).

The effect of exchange rates can be divided into two parts: demand and supply. If the exchange rate falls, foreign goods will be more expensive than domestic goods, which will increase demand for domestic goods for export, both at home and abroad. If the exchange rate falls, the cost of imported raw materials will increase, which may lead to a decrease (Mishkin, 2001). According to the purchasing power parity theory, the exchange rate always changes to reflect the inflation differential between two countries, so that the purchasing power of consumers to buy domestic goods will be equal to the purchasing power of consumers to buy foreign goods. This suggests directly that changes in currency exchange rates are related to the inflation differential prevailing between countries (Madura, 2006).

2.1.4 Exports Value

All goods and services sold by a country to another country, including goods, insurance, and services, are called exports. Exports fall into two categories:

a. Direct exports: goods or services are sold through intermediaries or exporters in other countries or export destination countries. The company's distributors and

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sales representatives are responsible for sales.

b. Indirect exports: a method in which goods are sold through an intermediary or exporter in the country of origin and then sold by the intermediary through an export management company and the exporting company (Susilo, 2008).

One important way for developing countries to increase their economic growth is by increasing their exports and investment (Salvator, 1990). This increase in exports can generate foreign exchange that can be used to finance the import of raw materials and capital goods needed in the production process, which in turn will create value-added. The aggregation of value added generated by all units of production in a developing country as a whole is known as exports (Pujoalwanto, 2014).

The theory of country exports is related to the country's inflation rate, is that exports of goods will increase if inflation in the region falls, and vice versa (Sukirno, 2007). A high inflation rate in a region will be directly related to the economic conditions in the region, which indicates that the economic conditions in the region are experiencing excess demand for goods (Amanatagama, 2017).

2.1.5 Relationship Between Research Variable

An increase in the money growth rate raises the inflation rate but leaves real variables unaffected, since the real interest rate is simply the nominal interest rate minus the rate of inflation. This relationship can be rearranged to show that the nominal interest rate is the sum of the real interest rate and the inflation rate; for the real interest rate to remain unaffected, the nominal interest rate must adjust one-for-one with changes in inflation. Accordingly, when a central bank, such as the Fed, raises the money growth rate, the long-run outcome is both a higher inflation rate and a higher nominal interest rate.

This inflation differential, in turn, is transmitted to the exchange rate, which adjusts over time to reflect differences in inflation between two countries so that consumers' purchasing power for domestic products remains equivalent to their purchasing power for foreign products. In other words, a currency's exchange rate changes in response to inflation differentials between countries, ensuring that the purchasing power of consumers buying domestic goods is equal to that of consumers importing goods from abroad. Because Indonesia consistently imports goods and services from other countries, an appreciation of the domestic currency tends to raise the prices of these goods and services, whereas a depreciation of the rupiah tends to drive inflation upward.

These dynamics ultimately reflect broader conditions in the domestic economy: a high inflation rate in a given region is directly linked to its economic conditions, indicating a state of excess demand for goods. When a country's or region's inflation rate rises, the prices of goods in that country become relatively more expensive, which in turn is directly associated with the level of export activity taking place in that country.

2.1.6 Generalized Linear Models

The Generalized Linear Model is a method developed from the concept of regression analysis, which relates dependent and independent variables, with the distinguishing feature being that the data pattern follows a specific distribution. Any increase or decrease in the independent variables affects the magnitude of the dependent variable. Conceptually, the dependent variable in GLMs belongs to the exponential family, and a transformation of its mean has a linear relationship with the independent variables. GLMs accommodate not only data patterns that follow a continuous distribution but also discrete variables

2.2 Review of Empirical Studies

The original manuscript does not provide a separate review of empirical studies. Instead, the literature review primarily emphasizes

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theoretical foundations explaining the relationships among inflation, BI Rate, exchange rate, and export value based on established economic theories and supporting references. Therefore, no dedicated synthesis of previous empirical research is presented in this study.

2.3 Identification of the Research Gap

The original manuscript does not explicitly identify a research gap. The study is motivated by the need to examine the influence of the BI Rate, exchange rate, and export value on inflation using the Generalized Linear Model (GLM). Accordingly, no separate discussion regarding theoretical, methodological, or contextual research gaps is provided.

2.4 Development of the Conceptual Framework

The manuscript discusses the theoretical relationships among the research variables under the section entitled "Relationship Between Research Variable." The discussion explains that changes in money growth affect inflation through adjustments in nominal interest rates, consistent with the Fisher Effect. Inflation differentials subsequently influence exchange rate movements according to Purchasing Power Parity theory, while exchange rate fluctuations affect domestic prices through imported goods and services. Furthermore, inflation influences export performance because higher domestic prices reduce international competitiveness and reflect excess demand within the domestic economy.

However, the original manuscript does not present a conceptual framework in the form of a figure or diagram. Therefore, no conceptual framework illustration is included in this study.

2.5 Hypotheses or Research Propositions

The original manuscript does not explicitly formulate research hypotheses or research propositions. Although the theoretical review discusses the relationships among the BI Rate, exchange rate, export value, and inflation, no formal hypotheses are presented. Consequently, this study proceeds directly to the research methodology without including a separate hypotheses section.

3. Research Methods

3.1 Research Design

This study employed a quantitative approach with an associative research design to examine the relationship between the BI Rate, exchange rate, export value, and inflation in Indonesia. The quantitative approach was selected because it enables objective measurement of the relationships among variables using statistical analysis. The associative design is appropriate for identifying the influence of multiple independent variables on the dependent variable through econometric modeling.

3.2 Research Context and Setting

The research was conducted within the context of the Indonesian economy by analyzing macroeconomic indicators that influence inflation. The study focuses on national-level monthly observations covering the period from January 2019 to December 2024. This period was selected to capture recent macroeconomic dynamics, including fluctuations in monetary policy, exchange rates, export performance, and inflation.

3.3 Population and Sample / Research Participants

The population of this study consisted of monthly Indonesian macroeconomic data. The sample was selected using a purposive sampling technique based on the availability and completeness of data for all research variables. Monthly observations from January 2019 to December 2024 were included, resulting in a total of 72 observations. The sample comprised data on the BI Rate (X1), exchange rate (X2), export value (X3), and inflation (Y).

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3.4 Data Sources and Data Collection

This study utilized secondary data obtained from the Central Bureau of Statistics Indonesia (BPS) and Bank Indonesia (BI). Data collection was conducted using the documentation method by compiling official documents and statistical publications related to the research variables. The collected data consist of monthly time-series observations covering the study period from January 2019 to December 2024.

3.5 Measurement of Variables and Research Instruments

The study employed four macroeconomic variables. Inflation served as the dependent variable (Y), while the BI Rate (X1), exchange rate (X2), and export value (X3) were treated as independent variables. All variables were measured using monthly secondary data published by BPS and Bank Indonesia. Since this research relied exclusively on official macroeconomic statistics, no questionnaire or primary research instrument was used.

3.6 Data Analysis Techniques

The study applied multiple regression analysis and gamma regression to identify the most appropriate model for explaining inflation and its determining factors. In addition to estimating both regression models, multicollinearity testing, simultaneous significance testing (F-test), and partial significance testing (t-test) were conducted. The performance of the regression models was subsequently compared using the Akaike Information Criterion (AIC) and the Hannan–Quinn (HQ) criterion to determine the best-fitting model.

Gamma regression is part of the Generalized Linear Models (GLMs) framework that models the relationship between independent and dependent variables when the dependent variable follows a gamma distribution (McCullagh & Nelder, 1989). The gamma distribution is a continuous probability distribution characterized by an asymmetric and positively skewed pattern. Based on the analysis results, the inflation data exhibit positive skewness (Otok, Rini, & Fadhilah, 2025). Therefore, the gamma regression model with the natural logarithm link function is formulated as follows:

$$\mu_j = \exp\left(\beta_0 + \beta_1 X_{j1} + \beta_2 X_{j2} + \beta_3 X_{j3}\right) \quad (1)$$

3.7 Validity, Reliability, and Trustworthiness

The study utilized official secondary data obtained from the Central Bureau of Statistics Indonesia (BPS) and Bank Indonesia (BI), both of which are recognized as authoritative institutions responsible for producing national macroeconomic statistics. The use of standardized official data enhances the consistency, reliability, and credibility of the analysis. Furthermore, multicollinearity testing was conducted to ensure that the independent variables met the assumptions required for regression analysis and to improve the robustness of the estimation results.

3.8 Ethical Considerations

This research exclusively employed publicly accessible secondary data obtained from official government institutions, namely BPS and Bank Indonesia. Since the study did not involve human participants, surveys, interviews, or confidential personal information, ethical risks were minimal. The data were used solely for academic purposes while maintaining the integrity and transparency of the research process.

3.9 Research Procedure

The research was conducted through several sequential stages. First, secondary data on inflation, the BI Rate, exchange rate, and export value were collected from official publications issued by BPS and Bank Indonesia. Second, the collected data were organized into a monthly time-series dataset covering January 2019 to December 2024. Third, descriptive and regression analyses were performed using multiple regression and gamma regression approaches. Finally, the estimated models were

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evaluated through multicollinearity, simultaneous, and partial significance tests, followed by model comparison using the Akaike Information Criterion (AIC) and Hannan–Quinn (HQ) criterion to determine the most appropriate model.

3.10 Methodological Limitations

This study is limited to monthly secondary data covering the period from January 2019 to December 2024 and focuses only on three explanatory variables, namely the BI Rate, exchange rate, and export value. Consequently, other macroeconomic factors that may also influence inflation were not incorporated into the analysis. In addition, the findings are based on historical time-series data and should therefore be interpreted within the context of the selected observation period.

4. Results and Discussion

4.1 Research Results

4.1.1 Sample Description and Descriptive Statistics

This study uses monthly time-series secondary data covering the period from January 2019 to December 2024. The variables analyzed consist of inflation as the dependent variable and BI-Rate, exchange rate, and export value as independent variables. Since the study employs secondary macroeconomic data, no demographic or organizational characteristics are presented. The descriptive analysis focuses on the characteristics of the variables used in the regression modelling process.

4.1.2 Data Quality and Preliminary Analysis

a. Multicollinearity Test

In the first step that needs to be done in the analysis process to identify independence between independent variables. The purpose of the initial analysis carried out is the conditions between variables and it is required that the independent variables should not be related to each other. Measurement of independence of independent variables using tolerance value and VIF value. The following are the results of the analysis carried out:

Table 1. Independence Test

Variable	Tolerance	VIF
BI-Rate	0,672	1,488
Exchange Rate	0,514	1,945
Export	0,687	1,454

Source: Data processed, 2026

Based on the yields of the analysis shown in Table 1, it explains that the independent variables used include the amount of BI-rate, exchange rate, and export value have no relationship. This result is based on the tolerance value is more than 0.1 and VIF value for each variable is less than 10. So that in the next analysis step, all independent variables are used for the analysis of model formation.

b. Gamma-Distributed Testing

To determine the right model, it is needed to know about distribution of dependent variable data used. So that the analysis of the accuracy of the data distribution is carried out. The following are the results of the data distribution test shown in Figure 2:

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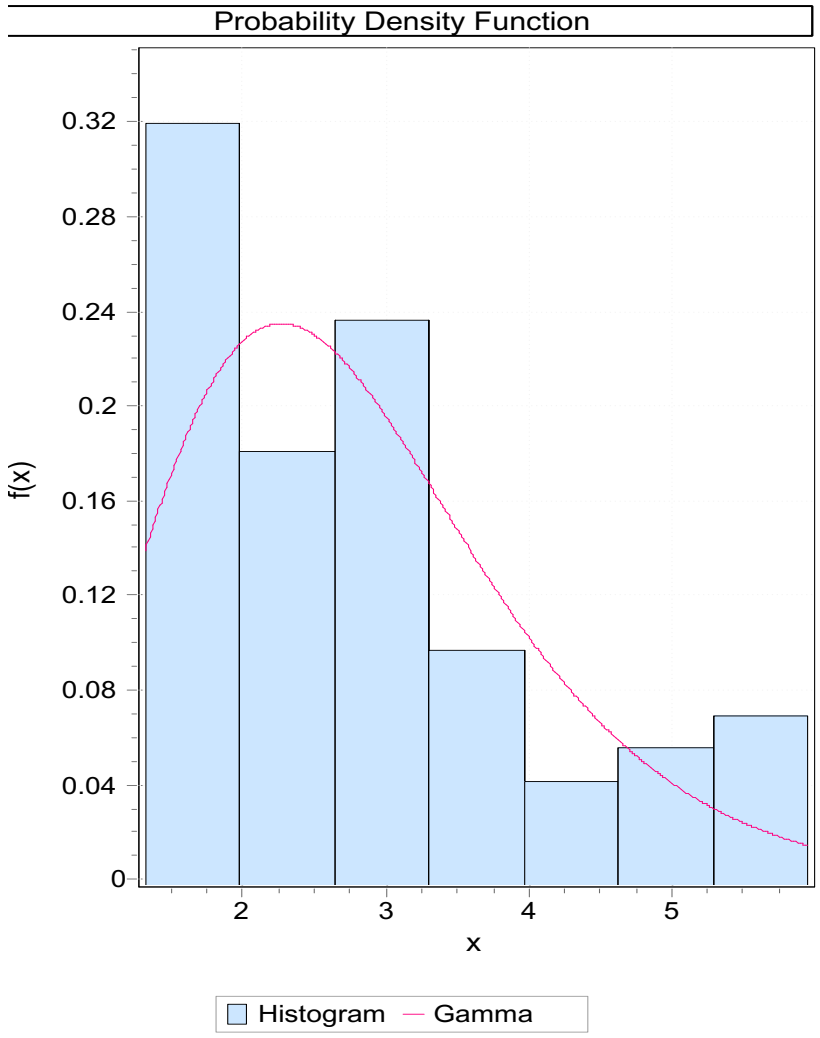

Fig. 2. Gamma-Distributed Result

The accuracy of data distribution from independent variables analyzed visually approaches the Gamma-distributed form. The results of statistical analysis show that with the Kolmogorov-Smirnov, Anderson-Darling, and Chi-Square method approaches with a significance level of 5%, the data is gamma distribution. By looking at these 3 methods, for a more complete analysis, it can be shown in Table 2 as follows:

Table 2. Statistical Testing of Data Distribution

Methods	P-value	Decision
Kolmogorov-Smirnov	0,65806	Accepted H_0
Anderson-Darling	0,90317	Accepted H_0
Chi-Squared	0,1819	Accepted H_0

Source: Data processed, 2026

Table 2 can explain that the p-value generated from each method is more than 0.05. So the decision concluded is to accept H_0, which means that with the approach of the three methods, the dependent variable data is Gamma distribution.

4.1.3 Main Analytical Results

a. Global Regression and Gamma Regression

The results of the previous analysis showed that the dependent variable was gamma distribution. The next step is to form an

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inflation model and the factors that influence it using 2 approaches, namely global regression and Gamma regression. The results of the model formation with the 2 methods can be seen in Table 3

Table 3. Forming of Inflation Model

Methods	Model
Global Regression	$Y = 3{,}534 + 0{,}429X_1 - 0{,}00036X_2 + 1{,}322X_3 + \varepsilon$
Gamma Regression	$\ln Y = -0{,}37 + 0{,}533X_1 - 0{,}000099X_2 + 1{,}08X_3 + \varepsilon$

Source: Data processed, 2026

Referred to the results of the model formation which shows by using both methods that the contribution of each factor to inflation as a dependent variable is relatively the same. The results of the global regression analysis, the coefficient value of BI rate parameter is 0,429 which means that every increase in the BI rate by 1 unit will increase inflation by 0,429. The coefficient value of the parameters of exchage rate will reduce inflation by 0,00036. Another factor shows a positive sign which means that export variable exchange rate by 1 unit will increase inflation by 1,322. The same results are also shown in the Gamma regression analysis, where exchange rate by 1 unit reduces inflation by -0.000099. It means that coefficient parameter value of exchange rate in gamma model is lower than global model. In other factors with different parameter coefficient values, each value of 1 unit in factors BI rate and export value will increase the parameter coefficient value of the model formed.

4.1.4 Hypothesis Testing Results / Key Findings

a. Simultaneous Test

At the stage after knowing the form of each global model and gamma model, it is necessary to conduct a simultaneous test to find out whether one of the independent variables has an impact on the inflation or tidal variable., which are shown in Table 4:

Table 4. Simultaneous Test Result

Model	Statistics	
	p-value	Decision
Global	0,000	Tolak H_0
Gamma	0,000	Tolak H_0

Source: Data processed, 2026

The simultaneous test shown in Table 4 from both the global model analysis and the Gamma model yields a good p-value which is 0.000 and it can be said that the p-value is less than the 5% significance level. Based on these results, it can be stated that Reject H_0 means that there is one of the 3 factors that has a significant effect on inflation as a response variable.

b. Partial Test

Referring to the simultaneous test that shows that there are predictor variables that have an effect p at the stage after knowing the form of each global model and gamma model, it is necessary to conduct a simultaneous test to find out whether one of the independent variables has an impact on the inflation or tidal variable. Table 5 below is the result of the partial test:

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Table 5. Partial test Result

Variables	Global Model		
	coefficient	Z-test	p-value
X_1	0,429	2,921	0,0047
X_2	-0,00036	-1,428	0,1578
X_3	1,322	3,799	0,0003
Statistics	Goodness of Fit		
AIC	3,062		
HQ	3,113		
Variables	**Gamma Model**		
	coefficient	**Z-test**	**p-value**
X_1	0,533	4,145	0,0000
X_2	-0,000099	-0,551	0,5815
X_3	1,08	4,581	0,0000
Statistics	Goodness of Fit		
AIC	2,755		
HQ	2,805		

Source: Data processed, 2026

Referred to the partial test results shown in Table 5, it shows that in the global model, the predictors variables that influence the dependent variable are variables BI rate and export value as seen from the |Z-test| more than $Z\alpha_{/2}$ of 1.96. This result is supported by the p-value of these variables which are less than 5%. Exchange rate factor shows different results where the significant test is 0,1578 which is this variable does not have an impact for respond variable. The same results are shown in the Gamma model which BI-rate and export value have a significant effect on the independent variable as measured by a p-value of less than 5% and exchange rate does not have a huge impact too. A comparison between the two models shows that the Gamma model is more appropriate in interpreting the relationship between inflation variables and influencing factors as seen from the AIC (Akaike Information Criterion) and HQ (Hannan-Quinn). Criteria using AIC and HQ values which show that the smaller the value of these criteria, the smaller the residual value formed from the model. Criterion value of the Gamma model which is lower than the global model. It means that gamma model is more appropriate that global model to represent inflation and its factors.

4.1.5 Visual Presentation of Results

The research findings are presented through Tables 1–7 to improve clarity and facilitate comparison between the Global Regression and Gamma Regression approaches. Table 1 summarizes the multicollinearity test results, while Tables 2 and 3 present the Gamma distribution assessment and statistical distribution tests. Table 4 reports the estimated regression equations for both models. Furthermore, Tables 5–7 summarize the simultaneous test, partial test, and goodness-of-fit statistics. Overall, the Gamma Regression model demonstrates superior model performance, as reflected by its lower AIC and HQ values compared with the Global Regression model.

4.2 Research Discussion

4.2.1 Interpretation of Key Findings

a. BI-rate and Inflation

The results of the analysis using gamma regression show that the BI rate has a significant impact. The study is in line with research conducted by Anggriani et al. (2024) which shows that interest rates have a

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significant effect. The BI rate shows one of the monetary policies where the value is a provision determined by Bank Indonesia to be the basis for determining the amount of interest imposed on customers where this also applies to savings and interest rates on loans. Thus, when the BI rate increases, banks also increase bank interest rates. In theory, the BI rate has an impact on people's purchasing power, because when the BI rate increases, people are faced with conditions of increasingly high credit interest rates so that they allocate the money they have to save. In addition, when the BI rate is decreasing, it can cause inflation which is because the cost of borrowing will be more affordable for the community, so that conditions have an impact on increasing prices due to increasing public demand.

The increase in Bank Indonesia's benchmark interest rate (BI-Rate) is actually intended to control inflation. Because the higher the BI rate, it also has an impact on people's ability to However, in some cases, this increase can actually increase inflation itself. This is because the increase in the BI-Rate can cause borrowing costs to be higher than before, which in turn can increase production costs and prices of goods. If the BI-Rate increases, business actors will shift additional costs to consumers, which will cause inflation. Based on the data obtained, it shows that throughout 2019-2024 the BI-Rate was at 3.5% -6.25%. Since 2021-2024 the BI-Rate has continued to move up, and inflation has also continued to increase which coincides with the period of interest rate increases. So this further clarifies the significance of the relationship between the BI rate factor and inflation in Indonesia.

b. Exchange Rate and Inflation

Based on the results of the analysis carried out, it shows that the exchange rate does not have a significant effect on inflation. This means that every increase or decrease in the exchange rate does not have a real impact on the amount of inflation in Indonesia. The exchange rate is one of the parameters that shows the economy of a country. This value becomes a relative currency value against the currencies of other countries. The exchange rate is fluctuating which can increase or decrease where this is based on demand or supply on the foreign exchange market. The United States with the dollar as the world's benchmark currency is experiencing a weakening condition caused by various things such as interest rates, bonds, and demand for goods and services in the United States. This condition affects the global economy. The impact is also on the exchange rate in Indonesia. However, the weakening exchange rate with imported goods that have a more expensive impact, on the other hand, allows for government efforts to maintain the exchange rate against the dollar. So that this suppresses inflation. This research has the same results with by Sari and Nurjannah (2023) which said that the exchange rate did not have a significant impact on inflation.

When the exchange rate increases, it means that the rupiah is weakening or is called rupiah depreciation. With the depreciation of the rupiah, industrial players who rely on imported raw materials must spend more to get the same goods. This increase can cause producers to be forced to raise the selling price of their products to cover additional costs, which can increase inflation. However, the government's efforts to maintain the exchange rate will decrease the selling price of products for producers of goods. From 2019-2024, the rupiah exchange rate to the US dollar showed a depreciation trend. In 2019 the exchange rate was around IDR 14,000 per dollar, and in 2024 the exchange rate increased to around IDR 16,000 per dollar. Inflation also tends to increase, even reaching 6.5%, which shows the impact of the increase in the exchange rate.

c. Export Value and Inflation

Referring to the results of the research that has been conducted, the export value factor has an impact on inflation in Indonesia. Based on the theory stated by Sukirno, which emphasizes that if inflation in a region

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decreases, the export of goods in that region will increase, but if inflation in a region increases, the export of goods in that region would decrease. The economic conditions of a region are related to the problem of increasing inflation in that region. This shows that the economic conditions in the region are experiencing excess demand for goods. If the inflation rate of a country or region increases, it will result in the price of goods in that country being more expensive. Research conducted by Maulana et al. (2020) obtained the same results as this study, which stated that the amount of exports has a significant impact on inflation.

This study also got the result that exports have a significant positive effect on inflation. An increase in exports can increase national income and people's purchasing power, which can also encourage domestic demand to increase. If domestic demand increases but the supply of goods and services is low or decreases, it will cause prices to rise and this will cause inflation. Based on the data obtained, it shows that Indonesia's export volume is at a constant level of 1.17-2.79 billion. The highest export volume of 2.79 billion occurred in 2022. The data shows that Indonesia's non-oil and gas exports increased significantly with a contribution of 92.97% in 2019, and continued to grow until 2024. In 2022, inflation also reached its highest figure of 5.51% which coincided with the surge in exports. This shows a positive relationship between increased exports and inflation.

4.2.2 Comparison with Previous Studies

The findings concerning the BI-Rate are consistent with the study conducted by Anggriani et al. (2024), which also concluded that interest rates significantly influence inflation. Both studies confirm the important role of monetary policy in controlling price stability through interest rate adjustments. Similarly, the finding that the exchange rate does not significantly affect inflation is consistent with the results reported by Sari and Nurjannah (2023), indicating that exchange rate fluctuations alone are insufficient to explain inflation because government intervention and other macroeconomic factors may moderate their impact. Furthermore, the significant influence of export value on inflation supports the findings of Maulana et al. (2020), which also reported that export performance significantly affects inflation. Both studies suggest that stronger export activity can stimulate domestic demand and contribute to higher price levels.

4.2.3 Theoretical Contributions

The findings contribute to macroeconomic theory by providing empirical evidence regarding the relationship between monetary policy, international trade, and inflation using the Gamma Regression approach. The results confirm the theoretical role of the BI-Rate as an important monetary instrument influencing inflation and demonstrate that export performance contributes to inflationary pressure through increased domestic demand. In addition, the findings indicate that exchange rate fluctuations do not necessarily exert a direct influence on inflation, suggesting that policy interventions and broader macroeconomic conditions may weaken the transmission mechanism between exchange rates and domestic prices. Moreover, the study demonstrates that Gamma Regression provides a more appropriate analytical framework than conventional Global Regression when modelling inflation data that follow a Gamma distribution.

4.2.4 Practical and Policy Implications

The results have several practical implications for policymakers. First, Bank Indonesia should continue to carefully manage the BI-Rate because changes in the benchmark interest rate significantly influence inflation. Monetary policy decisions should therefore balance inflation control with maintaining economic growth. Second, although exchange rate movements were not statistically significant in this study, maintaining exchange

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rate stability remains important to minimize uncertainty in international trade and reduce imported inflation risks. Third, the significant effect of export value suggests that policies promoting exports should be accompanied by measures to ensure adequate domestic supply. Maintaining a balance between export expansion and domestic market availability can help prevent excessive inflationary pressure. Finally, the superior performance of the Gamma Regression model suggests that policymakers and researchers may consider this approach when modelling macroeconomic variables with Gamma-distributed characteristics.

4.2.5 Integration with the Research Gap

This study addresses the research gap identified in the literature by applying the Gamma Regression approach to analyse inflation determinants in Indonesia. Previous studies have generally relied on conventional regression models, whereas this study first evaluates the distribution of the dependent variable before selecting the appropriate modelling approach. The findings demonstrate that inflation data follow a Gamma distribution and that Gamma Regression provides a better model fit than Global Regression, as indicated by lower AIC and HQ values. Consequently, this study contributes additional empirical evidence supporting the suitability of Gamma Regression for analysing inflation and its determinants.

4.2.6 Acknowledgement of Study Limitations

Several limitations should be considered when interpreting the findings. First, the analysis is limited to three macroeconomic variables, namely BI-Rate, exchange rate, and export value, whereas inflation may also be influenced by other factors such as money supply, government expenditure, energy prices, and global economic shocks. Second, the findings are based on Indonesian macroeconomic conditions during the 2019–2024 period, including the post-pandemic economic recovery, and therefore should be interpreted within this specific context. Future studies are encouraged to incorporate additional macroeconomic variables and longer observation periods to provide a more comprehensive understanding of inflation dynamics.

5. Conclusion

5.1 Summary of Key Findings

This study aimed to analyze the effects of BI-Rate, exchange rate, and export value on inflation in Indonesia using the Gamma Regression approach. The findings indicate that BI-Rate and export value have significant effects on inflation, while the exchange rate does not significantly influence inflation during the observation period. The significant effect of the BI-Rate suggests that changes in the benchmark interest rate affect borrowing costs and ultimately influence inflation. Meanwhile, the significant effect of export value indicates that export activities are associated with domestic demand and price movements. Furthermore, the comparison between the Global Regression and Gamma Regression models demonstrates that the Gamma Regression model provides a better representation of inflation data, as reflected by its lower AIC and HQ values.

5.2 Theoretical Contributions

This study contributes to the literature on inflation modelling by providing empirical evidence that the Gamma Regression approach is more appropriate than the conventional Global Regression model for analyzing inflation data that follow a Gamma distribution. The findings confirm the theoretical importance of monetary policy through the BI-Rate as a determinant of inflation and reinforce the role of export performance in influencing domestic price dynamics. In addition, the insignificant effect of the exchange rate suggests that exchange rate movements may not directly affect inflation under certain macroeconomic conditions, thereby enriching the existing empirical evidence regarding inflation determinants in Indonesia.

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5.3 Practical and Policy Implications

The findings provide several implications for policymakers, particularly Bank Indonesia and the government. Since the BI-Rate significantly affects inflation, monetary policy should continue to be implemented carefully to maintain price stability while supporting sustainable economic growth. Maintaining the stability of the rupiah exchange rate remains important to reduce uncertainty in international transactions, although the exchange rate was not found to have a significant direct effect on inflation in this study. In addition, policies encouraging export growth should be accompanied by efforts to maintain adequate domestic supply to prevent excessive inflationary pressures. The government should also continue to monitor market demand, manage the money supply appropriately, and coordinate fiscal and monetary policies to sustain macroeconomic stability amid economic uncertainty and financial system challenges.

5.4 Limitations of the Study

This study is limited to the analysis of three macroeconomic variables, namely BI-Rate, exchange rate, and export value, as determinants of inflation in Indonesia during the 2019–2024 period. Therefore, the findings should be interpreted within the context of these variables and the observed period. Since inflation is influenced by numerous domestic and international factors, the results may not fully capture the complexity of inflation dynamics under different economic conditions or time horizons.

5.5 Directions for Future Research

Future studies are encouraged to include additional macroeconomic variables, such as money supply, government expenditure, energy prices, or other external economic indicators, to obtain a more comprehensive understanding of inflation determinants. Further research may also extend the observation period or examine different economic conditions to improve the generalizability of the findings. In addition, future studies may compare Gamma Regression with other advanced statistical models to evaluate their performance in modelling inflation and other macroeconomic indicators.

6. References

Amanatagama, N. A. (2017). Pengaruh Tingkat Inflasi dan Nilai Tukar terhadap Ekspor Tekstil dan Produk Tekstil Indonesia tahun 2010-2016. *Jurnal Administrasi Bisnis*, *53*(1), 204.

Anggriani, D., FItrawaty, F., Sirait, R., Aisyah, S., & Anzani, W. (2024). Pengaruh Tingkat Suku Bunga (BI Rate) dan Jumlah Uang Beredar (JUB) Terhadap Tingkat Inflasi di Indonesia Tahun 2014-2023. *EKOMA : Jurnal Ekonomi, Manajemen, Akuntansi*, *4*(1), 295–301. https://doi.org/https://doi.org/10.56799/ekoma.v4i1.5576

Arifin, I., & W, G. H. (2007). *Membuka Cakrawala Ekonomi*. Bandung: PT setia Purna Inves.

Deliarnov, D. (2006). *Ekonomi Politik* (R. Medya & W. C. Kristiaji, Eds.). Jakarta: Erlangga. Retrieved from https://books.google.co.id/books/about/Ekonomi_Politik.html?id=E8sPDpge5I0C&hl=id

Haryadi, S. (2015). *Ekonomi, Bisnis, Regulasi & Kebijakan Telekomunikasi*. Bandung: Institut Teknologi Bandung.

Idris, A. (2018). *Ekonomi Publik*. Yogyakarta: Deepublish.

Indonesia, B. (2013). Penjelasan BI Rate sebagai Suku Bunga Acuan.

Ismanthono, H. W. (2015). *Kamus Istilah Ekonomi Populer*. Penerbit Buku Kompas.

Madura, J. (2006). *International Corporate Finance Terjemahan Buku I*. Jakarta: Salemba Empat.

Maulana, R. A., Sarfiah, S. N., & Prasetyanto, P. K. (2020a). Pengaruh Ekspor, Suku

DOI: 10.26618

Bunga, dan Nilai Tukar Terhadap Inflasi di Indonesia. *DINAMIC: Directory Journal of Economic*, *2*(3), 675–684. https://doi.org/https://doi.org/10.31002/dinamic.v2i3.1417

McCullagh, P., & Nelder, J. A. N. (1989). *Generalized Linear Models, Second Edition* (2nd ed.). Florida: CRC Press.

Mishkin, F. S. (2001). *The Economics of Money, Banking and Financial Markets*. New York: Addison-Wesley.

Nopirin. (2008). *Pengantar Ilmu Ekonomi Makro & Mikro Edisi Pertama*. Yogyakarta: BPFE.

Otok, B. W., Rini, D. S., & Fadhilah, R. (2025). Model Regresi Gamma untuk Menganalisis Indeks Pengeluaran Kabupaten/Kota di Pulau Sumatra. *Limits: Journal of Mathematics and Its Applications*, *22*(1), 85–97. https://doi.org/10.12962/limits.v22i1.3375

Pohan, A. (2008). *Potret Kebijakan Moneter Indonesia*. Jakarta: Raja Grafindo Persada.

Pujoalwanto, B. (2014). *Perekonomian Indonesia Tinjauan Historis, Teoritis dan Empiris*. Jakarta: Graha Ilmu.

Salim, A., Fadilla, & Purnamasari, A. (2021). Pengaruh Inflasi Terhadap Pertumbuhan Ekonomi Indonesia. *Ekonomica Sharia: Jurnal Pemikiran Dan Pengembangan Ekonomi Syariah*, *7*(1), 17–28.

Salvator, D. (1990). *International Economics*. New York: MacMiclan Publishing Company.

Sari, S. P., & Nurjannah, S. (2023). Analisis Pengaruh Nilai Tukar, Jumlah Uang Beredar dan BI Rate Terhadap Inflasi di Indonesia dan Dampaknya Terhadap Daya Beli Masyarakat. *AKTIVA: Journal of Accountancy and Management*, *1*(1), 21–29. https://doi.org/10.24260/aktiva.v1i1.1015

Sukirno, S. (2007). *Makro Ekonomi Modern*. Depok: Raja Grafindo Persada.

Sukirno, S. (2016). *Makroekonomi: Teori Pengantar*. Jakarta: PT Raja Grafindo Persada.

Sukirno, S., Husin, W. S., Indrianto, D., Sianturi, C., & Saefulloh, K. (2004). *Pengantar Bisnis* (1st ed.). Jakarta: PT. Fajar Interpratama Mandiri.

Sunariyah. (2013). *Pengantar Pengetahuan Pasar Modal*. Yogyakarta: UPP-STIM YKPN.

Susilo, A. (2008). *Buku Pintar Ekspor Impor*. Jakarta: Trans Media Pusaka.

Yoopi, A. (2004). *Memahami Kurs Valuta Asing*. Jakarta: Lembaga Penerbit Fakultas Ekonomi Universitas Indonesia.

Zakaria, J. (2009). *Pengantar Teori Ekonomi Makro* (1st ed.). Jakarta: Gaung Persada Press.