ALMANA
Jurnal Manajemen dan Bisnis

The Threshold Effect of Inflation on Regional Economic Growth in Indonesia

Resti Ramadhaniyati*[1], Ashari Gunawan[2], Susan Susanti[3], Fadli Agus Triansyah[4]
Universitas Pendidikan Indonesia, Indonesia*[1234]
restiramadhaniyati@upi.edu*[1], asharigunawan@upi.edu[2], susansusanti@upi.edu[3],
fadliagustriansyah@upi.edu[4]

Abstract: Recent studies state that the relationship between inflation and economic growth is not linear. When inflation exceeds a certain threshold, it will have a negative impact on economic growth. This study aims to investigate the linear and non-linear relationship between inflation and economic growth in Indonesia using provincial panel data. The linear relationship was tested using a panel regression fixed effect model, while a non-linear relationship was tested using a panel regression threshold fixed effect model. When a linear test is carried out, inflation in Indonesia does not affect economic growth. When conducting a non-linear test, inflation in Indonesia has a positive impact on economic growth only when the value is below 2.11 percent. Meanwhile, when inflation exceeded 2.11 percent, economic growth in Indonesia slowed down. Inflation control policies must still be carried out to reduce the negative effects of inflation because high and fluctuating inflation is not good for the economy.
Keywords: Economic Growth; Inflation; Threshold

INTRODUCTION

Economists around the world state that low and controlled inflation is a requirement for sustainable economic growth following the spirit of the Sustainable Development Goals (SDGs) (Triansyah et al., 2023). The development of national inflation in Indonesia is inseparable from the dynamics of inflation developments that occur in the region. National inflation is an aggregation of regional inflation with a certain weighting. The weight of each city as a sample for calculating inflation is obtained from the Cost of Living Survey (CLS).

The role of the central government in controlling inflation is through monetary policy using monetary policy instruments, one of which is controlling bank interest rates, buying and selling bonds, selective credit, and so on (Triansyah et al., 2023). One of the roles of the regional government in controlling inflation is to form a Regional Inflation Monitoring and Control Team (RIMCT). With the RIMCT, it is hoped that coordination between relevant stakeholders can run better so that price stability can be realized at the regional level throughout Indonesia.

Macroeconomic policy aims to encourage economic growth and keep inflation at a low level. The relationship between inflation and economic growth is one of the most debated and discussed issues in the history of the process of economic development which is very influential in setting targets in the macroeconomy and in maintaining economic stability. Economic growth is one of the most significant things in a country's economy, both development and growth, which can increase the wealth and welfare of its citizens at the level of income per capita (Dima, 2021). Economic growth is a long-term process of increasing per capita production. The higher a country's economic growth, the greater its ability to meet the needs of its people, and therefore, the greater its ability to prosper its people (Anokhina, 2022). They can also define economic growth as an expansion of economic activity that increases the production of goods and services in society (Widarni & Bawono, 2021). Based on the knowledge above, economic growth is a process of growing the production capacity of the economy and overall creating a more meaningful national income.

ALMANA
Jurnal Manajemen dan Bisnis

In today's world, an economy that is not experiencing growth or inadequate growth is always associated with indicators of growth parameters, one of which is an increase in national income as seen from an increase in regional gross domestic product per capita (GDP per capita), decreased unemployment and poverty. An incorrect understanding of the relationship between these parameters can result in inefficient decisions in production development at the micro level.

Sources of inflationary pressure are highly dependent and influenced by the characteristics of each region. Inflation in Java tends to be below the national inflation rate, while outside Java the inflation rate is higher than the national rate, especially in Eastern Indonesia, such as Kalimantan, Sulawesi, Maluku, Papua, Bali, and Nusa Tenggara. Policies in controlling inflation must consider the characteristics of each region's inflation and the trade-off on economic growth. Because output growth varies between regions, money growth must also vary between regions. The theory of the relationship between inflation and economic growth explained by Mankiw (1987) states that when inflation drops too low in a short time, the economy will grow and become overheated, causing inflationary pressures and a decline in economic growth. Consequently, optimal inflation targeting (inflation threshold) is required to maintain optimal economic output. This is illustrated through the money demand function as follows:

$$M_{(t)}\Big/P_{(t)} = kY_{(t)} \tag{1}$$

Where $M_{(t)}$ was out of money at the time t ; $P_{(t)}$ is the price level at that time t; k is a constant; $Y_{(t)}$ is the output level.

The basis for the theory of growth was first described by Adam Smith. Adam Smith argued that output is a function of capital or investment, labor, and land. The effect of inflation will have an impact on high wages so it will hamper production activities leading to a slowdown in economic growth. In conclusion, inflation is indicated to have a negative relationship to economic growth. Meanwhile, according to the theory of endogenous growth, economies of scale, increasing returns of scale, and technology play an important role in output growth. In this theory, output growth is highly dependent on the variable rate of return on capital. Variables such as inflation can reduce the rate of return on capital so that it will reduce capital accumulation which in turn suppresses output.

The research that was conducted resulted in different conclusions about how the linear relationship between inflation and economic growth. Several studies produce different conclusions about the relationship between inflation and economic growth. First, inflation does not affect economic growth (Ahmad, 2022; Ershov & Tanasova, 2019). Second, inflation has a positive effect on economic growth (Behera and Mishra, 2017). Inflation is negatively related to economic growth (Liu et al., 2022). In line with several official documents submitted by governments and central banks around the world, it is assumed that an increase in the price level is definitely associated with a slowdown in economic growth and perhaps also with an economic downturn (Aydin et al., 2016). Finally, the relationship between the two is positive when the inflation rate is low, but the relationship between the two becomes negative when inflation is high (Eldomiaty et al., 2020). Obinna (2020) confirmed the finding of a more significant negative effect of high inflation (above 40%) but an insignificant effect on increasing growth of low inflation (below 40%).

ALMANA
Jurnal Manajemen dan Bisnis

At present we are facing facts confirming that the relationship between these two parameters is nonlinear, that is, there are so-called 'inflection points', 'returning points', 'threshold levels', and 'extreme points', which break the trend and direction of the relationship. between inflation and the GDP growth rate turns to the other way around. Most of the previous studies in the field were, in our opinion, not efficient enough in their conclusions, due to the information base they used to collect long-term panel data for several countries. For example, Carstens (2022) conducted research on the rise in inflation that reflects the rapid and goods-intensive economic recovery from the Covid-19-induced recession – bolstered by highly accommodative fiscal and monetary policy – which supply has been unable to fully meet. We should not expect inflationary pressures to ease soon as many of the forces behind high inflation remain in place and new ones are emerging. There are already signs of increased price spillovers across sectors and between prices and wages, as is common in a high inflation environment. Moreover, the structural factors keeping inflation low in recent decades may wane as globalization retreats. The inflationary paradigm may be changing. Central banks need to adjust to this new environment, not least by raising policy rates to more appropriate levels. The world economy must learn to rely less on expansionary monetary policies. Tien (2021) studied the relationship between inflation and economic growth in Vietnam. Inflation is assumed to have a nonlinear relationship with GDP growth. Thanh (2015) found a negative relationship between inflation and growth for the inflation rates above the threshold level of 7.84%, above which inflation starts impeding economic growth in the ASEAN-5 countries. Thanh (2015) used the Panel Smooth Transition Regression (PSTR) model to estimate the threshold value for the inflation rate and its effect on economic growth in ASEAN-5 countries for the period 1980-2011 and found that inflation rates above 7.84% hindered growth. economy in ASEAN-5 countries. Mallick and Sethi (2019) found an inflation threshold of 4.77 percent for India using threshold VAR analysis and datasets covering the period 2006 to 2015.

The average inflation threshold is 9 percent, based on Widaryoko (2018), and Kusumatrisna et al. (2022). This inflation rate is high because the series of data includes inflation in 1998 when Indonesia was experiencing an economic downturn. Second, the average threshold for inflation is 5 percent, based on studies by Aziz and Nasrudin (2019). This inflation rate is lower because the data series does not include inflation in 1998.

In general, threshold regression research finds a non-linear relationship between inflation and economic growth. If it is below the threshold value, inflation will have a positive effect or will not affect economic growth, but if it is above the threshold value inflation will have a negative impact on economic growth. However, the threshold values reported in these studies differ due to different periods, statistical methods, or economic characteristics of each country studied. Several economic theories and empirical findings state that high inflation threatens the economy (Widaryoko, 2018; Luthfi et al., 2022), although the relationship between the two variables is highly debatable. In practice, controlling inflation in Indonesia poses a dilemma because when inflation is kept to a low level, economic growth declines, whereas when inflation is high, investment and productivity suffer. Therefore, it is necessary to carry out an in-depth study to determine the effect of inflation on economic growth and determine the optimal inflation rate that must be applied in Indonesia to ensure optimal economic growth.

Some of the economic theories and empirical findings above state that high inflation has a negative impact on the economy, although the relationship between the two variables is still being debated. Indonesia has experienced an economic downturn as a result of high inflation which ultimately prompted the government to implement a low inflation policy.

ALMANA
Jurnal Manajemen dan Bisnis

But what is the low inflation rate? What is the inflation threshold that does not have a negative impact on the economy in Indonesia? Therefore this study will look for inflation thresholds in Indonesia using provincial data from 2014 to 2021. This paper is structured as follows. Section II describes the data and regression models. Section III presents and discusses the estimation results for the relationship between inflation and growth. Finally, Part IV concludes.

METHODS

The data contained in this study uses panel data for 8 years (2014-2021) in 34 provinces in Indonesia. Data for all variables used in this study comes from the Central Bureau of Statistics (www.bps.go.id), which consists of Gross Domestic Product Growth (GDRP) per capita as a proxy for economic growth, inflation, Consumer Price Index (CPI) as indicators to determine inflation, population, investment, and unemployment rate.

The variable used in this study is GDP growth per capita as the dependent variable, the independent variable is inflation plus several other variables such as population growth, investment, and unemployment.

The analytical method used to answer the research objectives uses econometric analysis in the form of a panel fixed effect model and a panel threshold fixed effect model, both of which are estimated using ordinary least squares (OLS). The method for finding threshold points refers to the Hansen model (1999), where in this model it is limited to the panel fixed effect model. Expansion of the method into a random effect model is hindered by endogeneity problems and the results will be biased (Hansen, 1999).

The equation used to see a linear relationship using the panel fixed effect model is:

$$Growth_{it} = \beta_{0(i)} + \beta_1 Inf_{it} + \beta_2 Pop_{it} + \beta_3 Inv_{it} + \beta_4 Unem_{it} + e_{it} \qquad (2)$$

The form of the equation to see non-linear relationships and find threshold points is:

$$Growth_{it} = \beta_{5(i)} + (\beta_6 Inf_{it} + \beta_7 Pop_{it} + \beta_8 Inv_{it} + \beta_9 Unem_{it}) * I(Inf_{it} < Y)$$
$$+ (\beta_{10} Inf_{it} + \beta_{11} Pop_{it} + \beta_{12} Inv_{it} + \beta_{13} Unem_{it}) * I(Inf_{it} \geq Y) + e_{it} \qquad (3)$$

With:

$Growth$	= Growth of GDRP Percapita
Inf_{it}	= inflation
Pop_{it}	= Population Growth
Inv_{it}	= Investment Growth
$Unem_{it}$	= Unemployment
β_0 dan β_6	= intercept
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11}, \beta_{12}, \beta_{13}$	= parameter estimation coefficient
e_{it}	= residual
γ	= threshold value

Panel threshold regression analysis is a development of linear panel regression analysis, which divides the estimation unit into two or more regimes. To estimate the model, two ways can be done, the first is through the ordinary least squares (OLS) if the threshold value is known and the second is by conditional least squares if the threshold value is not known. The principle of conditional least squares is to find the threshold

ALMANA
Jurnal Manajemen dan Bisnis

value and the slope parameter value together. Hansen (1999) recommends that the model chosen is a model with a minimum residual sum of squares (RSS). In this study, the threshold value was unknown, therefore we used a conditional least squares estimator to estimate the threshold model.

RESULTS AND DISCUSSION

Table 1. Descriptive Statistics of Variables

Variable	Average (%)	Standard Deviation (%)	Minimum Value (%)	Maximum Value (%)	Observation (n)
(1)	(2)	(3)	(4)	(5)	(6)
Growth of GDRP Perkapita	4,38	3,60	-15,74	21,76	272
Inflation	3,34	2,20	0,14	11,91	272
Investment	1,51	1,51	-13,57	13,5	272
Unemployment	5,30	1,92	1	10,95	272
Population	11,40	75,3	-90,37	820,69	272

Source: Data processing (2023)

Table 1 shows the descriptive statistics of the variables during the study period, namely from 2014 to 2022. The average economic growth per capita is 4.385037 percent, with a minimum value of -15.74 percent and a maximum value of 21.76 percent. The average inflation rate is 3.34 percent, with a minimum value of 0.14 percent and a maximum of 11.91 percent.

The average investment growth is 1.51 percent, with a minimum value of -13.57 percent and a maximum value of 13.5 percent. The average unemployment rate is 5.30 percent, the minimum value is 1 percent and the maximum value is 10.95 percent. The average population growth is 11.40 percent, with a minimum value of -90.37 percent and a maximum value of 820.69 percent.

During the period 2014 to 2021, the movement of inflation shows a downward trend. After the implementation of the Inflation Targeting Framework (ITF) policy in 2005, average inflation was at 5-6 percent. The figure shows that inflation is always below the upper limit of the inflation target except in 2014.
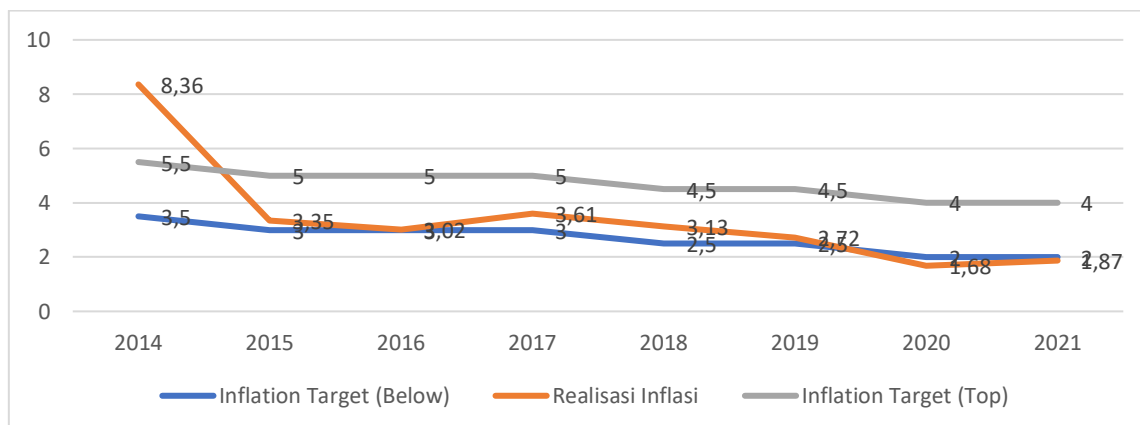
Figure 1. Inflation Realization and Target in Indonesia 2014-2017
Source: Data processing (2023)

ALMANA
Jurnal Manajemen dan Bisnis

The linear effect of inflation on economic growth is identified through the fixed effect panel regression. In this study, the fixed effect model is not compared with the random effect model because the threshold analysis is limited to the fixed effect only. Table 2 shows the results of the panel fixed effect model test to determine the linear relationship between inflation and economic growth in Indonesia.

Table 2. Estimate of the Linear Fixed Effect Model

Variable (1)	Coefficient (2)	P value (3)
Constant	65,114	0,000***
Inflation	0,118	0,369
Investment Growth	-0,867	0,000***
Population Growth	0,002	0,508
Unemployment	-0,005	0,356
R-squared		
Within	0,1415	
Between	0,0438	
Overall	0,0380	
F-statistic	9,65	
Prob	0,0000	

*** significant at the significance level of 5%

Source: Data processing (2023)

The test results using the fixed effect panel regression model show that inflation does not affect economic growth. This was indicated by obtaining a p-value of 0.369. The same thing happened to the variables of population growth and unemployment. However, the investment variable has a significant negative effect on economic growth. The finding of no effect of inflation on economic growth follows the research by Tien (2021).

The panel fixed effect model estimates show that inflation does not affect economic growth in Indonesia. However, previous empirical research has shown that the relationship between inflation and economic growth may not be linear. One method to identify model nonlinearity is to use panel analysis of the threshold fixed effect model developed by Hansen (1999).

Table 3. Threshold Test Result for Indonesian Regions

Existence of Threshold Value	Threshold Value	Probability
Single Threshold	2,11 %	0,037

Source: Data processing (2023)

The results of the threshold significance test show that the relationship between inflation and economic growth in Indonesia is not linear. The existence of a threshold test found that the inflation threshold value for the Indonesian region was found to be a threshold value of 2.11 percent, significant at the 5 percent level of significance.

ALMANA
Jurnal Manajemen dan Bisnis

Table 4. Panel Test Results for the Threshold Fixed Effect Model

Variable (1)	Coefficient (2)	P value (3)
Constant	60,099	0,000***
Inflation (below the threshold value)	1,768	0,012***
Inflation (above the threshold value)	-0,192	0,160
Investment (below the threshold value)	-0,854	0,000***
Investment (above the threshold value)	-0,767	0,001***
Population Growth (below the threshold value)	0,005	0,467
Population Growth (above the threshold value)	0,005	0,847
Unemployment (below the threshold value)	0,003	0,961
Unemployment (above the threshold value)	-0,006	0,301
R-squared		
Within	0,2477	
Between	0,0156	
Overall	0,0653	
F-statistic	9,47	
Prob	0,0000	

*** significant at the significance level of 5%

Source: Data processing (2023)

Table 4 shows the probability value obtained is 0.0000, which means that there is a significant influence. This also shows how inflation affects economic growth in Indonesia in two conditions, when inflation is below the threshold, inflation has a significant positive effect on economic growth. Meanwhile, when inflation is above the threshold value, inflation does not affect economic growth.

CONCLUSION

Based on the results and discussion it can be concluded that Inflation in Indonesia does not affect economic growth when tested linearly. When inflation is below this value, inflation has a positive effect on economic growth in Indonesia. Economic growth in Indonesia slowed down. Inflation control policies must still be carried out to reduce the negative effects of inflation because high and fluctuating inflation is not good for the economy.

REFERENCES

Ahmad, T. (2022). A Case of Pakistan Investigating the Relationship between Inflation and Economic Growth: A Case of Pakistan. *Acta Pedagogia Asiana, 1*(1), 1-8.

Anokhina, M. Y. (2022). Fuzzy cognitive model of agricultural economic growth. *Economic Systems Research, May.* https://doi.org/10.1080/09535314.2022.2065466

Aydin, C., Esen, O., Bayrak, M. (2016). Inflation and Economic Growth: A Dynamic Panel Treshold Analysis for Turkish Republics in Transition Process. *Procedia-Social and Behavioral Science 229,* 196-205. https://doi.org/10.1016/j.sbspro.2016.07.129

Aziz, E.B., & Nasrudin. (2019). Estimation Threshold Inflation in Indonesia. *Journal of Applied Economic Sciences, 7,* 1376-1383

Behera, J., & Mishra, AK (2017). Krisis Inflasi Baru-Baru Ini dan Pertumbuhan Ekonomi Jangka Panjang di India: Survei Empiris Tingkat Ambang Inflasi. *Jurnal Makroekonomi Asia Selatan dan Keuangan Publik, 6,* 105-132.

ALMANA
Jurnal Manajemen dan Bisnis

Carstens, A. (2022). The return of inflation. Speech at the International Center for Monetary and Banking Studies. *Geneva, 5.*

Dima, A. (2021). The Importance of Innovation in Entrepreneurship for Economic Growth and Development. A Bibliometric Analysis. *Review of International Comparative Management, 22*(1), 120–131. https://doi.org/10.24818/rmci.2021.1.120

Eldomiaty, T., Saeed, Y., Hammam, R., & AboulSoud, S. (2020). The associations between stock prices, inflation rates, interest rates are still persistent: Empirical evidence from stock duration model. *Journal of Economics, Finance and Administrative Science, 25*(49), 149-161.

Ershov, M. V., & Tanasova, A. S. (2019). The world and Russia: Inflation is minimal, economic growth is slowing, risks are rising. *Voprosy Ekonomiki, 12,* 5-23.

Hansen. (1999). Threshold effects in non-dynamic panels: estimation, testing, and inference. *Journal of Econometrics*, *93*(2):345-368.

Kusumatrisna, AL., Sugema, I., & Pasaribu, SH. (2022). Threshold Effect in The Relationship Between Inflation Rate and Economic Growth in Indonesia. *Bulletin of Monetary Economics and Banking*, 25(1), 117-126

Liu, Y., Sharma, P., Jain, V., Shukla, A., Shabbir, M. S., Tabash, M. I., & Chawla, C. (2022). The relationship among oil prices volatility, inflation rate, and sustainable economic growth: Evidence from top oil importer and exporter countries. *Resources Policy, 77*, 102674.

Luthfi, A. (2022). *Pengaruh corporate social responsibility, kebijakan dividen, dan risiko bisnis terhadap nilai perusahaan dengan profitabilitas sebagai moderas*i. Skripsi-2022.

Mallick, Arundhati., & Sethi, Narayan. (2019). What Causes India's High Inflation? A Threshold Structural Vector Autoregression Analysis. *Institutions and Economies*, *11*(1), 23-43.

Mankiw, MG. (1987). Kumpulan Seigniorage yang Optimal (Teori dan Bukti). *Jurnal Ekonomi Moneter, 20*, 327-341.

Obinna, O. (2020). Effect of inflation on household final consumption expenditure in Nigeria. *Journal of Economics and Development Studies, 8*(1), 104-111.

Thanh, SD (2015). Threshold Effects of Inflation on Growth in the ASEAN-5 Countries: A Panel Smooth Transition Regression Approach. Jurnal Ekonomi, Keuangan dan Ilmu Administrasi, 20, 41-48.

Tien, N. H. (2021). Relationship between inflation and economic growth in Vietnam. *Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12*(14), 5134-5139.

Triansyah, F. A., Gunawan, A., & Ramadhaniyati, R. (2023). Factors of Indonesia Economic Growth (2017-2022). *Jurnal Pendidikan Ekonomi Dan Bisnis (JPEB)*, *11*(1), 51–65.

Widarni, E., & Bawono, S. (2021). Human Capital, Technology, and Economic Growth: A Case Study of Indonesia. *The Journal of Asian Finance, Economics and Business, 8*(5), 29–35. https://doi.org/10.13106/jafeb.2021.vol8.no5.0029

Widaryoko N. (2018). *Inflasi dan Pertumbuhan Ekonomi: Pendugaan Ambang Batas Inflasi di Indonesia* [tesis]. Bogor (ID): Institut Pertanian Bogor.

www.bps.go.id