

**ESTIMATING INFLATION THRESHOLD IN INDONESIA
(2005 Q3 – 2017 Q2)**

A Research Journal

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الاستقلال

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Abstract

Inflation is an economic phenomenon that concerns various parties. Inflation is not only the concern of the society, but also the concern of the business world, the central bank, and the government. Inflation can affect the society and economy of a country. Many western countries had adopted Inflation Targeting Framework since 1990s as their monetary policy stance to control inflation. In Indonesia Inflation Targeting Framework (ITF) had adopted based on policy rate (BI Rate) as monetary policy stance for Bank Indonesia since July 2005.

The dynamic monetary policy changes for monitoring and stabilized the inflation in Indonesia, untrack-able to do research to figure it out the main problems in history of inflation in Indonesia since independent. This study tries to figure it out the red line of the inflation threshold in Indonesia since 2005 Q3 when BI Rate as policy had adopted as monetary policy stance until current in 2017 Q2. The purpose of this research to see what major problems caused

inflation high. In addition, this study sees how government can control the inflation back on track.

Keywords: Inflation, Inflation Targeting Framework (ITF), Monetary Policy, Inflation Threshold

INTRODUCTION

Inflation is an economic phenomenon that concerns various parties. Inflation is not only the concern of the society, but also the concern of the business world, the central bank, and the government. Inflation can affect the society and economy of a country. For the society, inflation is a concern because inflation directly affects the well-being of life, and in the business world, the rate of inflation is a very important factor in making decisions. Inflation is also the government's concern in formulating and implementing economic policies to improve people's welfare. Given its enormous influence on people's lives, each country, through the monetary authority or central bank, is constantly trying to control the inflation rate to keep it low and stable. For all countries, both developed and developing, one of the fundamental objectives of macroeconomic policy is economic stability. High inflation is regarded a problem in the economy. Indonesia experienced economic collapse for failing to control inflation volatility. Indonesia is one of the few countries with a hyperinflationary experience. The regime of the founding President Soekarno fell with the economy reeling when the annual inflation rate rose to 1500% (Chowdhury & Ham, *Inflation Targeting in Indonesia*, 2009) The consequent untold misery of ordinary Indonesians during

1960– 1966 created an anti-inflationary national psyche. The New Order regime of Soeharto, thus, promulgated legislation enshrining the “balanced budget principle” that prevented government borrowing from the central bank (Bank Indonesia). The economic team of Soeharto was spectacularly successful in preventing another episode of hyperinflation, until the Asian financial crisis of 1997–98 when inflation shot up close to 70%.

Indonesia is a country that has experienced economic collapse due to not being able to suppress inflation rate. During the years 1958 to 1966, the Indonesian economy on average only grew by 0.18%. At that time the average inflation reached 199%, even touched the level of 636% in 1966. According to Subekti (2011), the main cause of the high inflation of Indonesia in the 1960s was an unbalanced government budget and the closest access to obtain foreign loans, so that all activities involving the government's role must largely fund by the printing of the money. Therefore, it is not surprising that the growth in the money supply (M1) in that era always accompanied the inflation surge with a rapid percentage increase that is an average of 99.57%.

Indonesia's attention to inflation has been seeing as the New Order regime came to power in 1967. The entire New Order bureaucratic cabinets share a common vision that inflation is a major problem in the economy so control considered necessary. To control spending, the government implements a balanced budget system. The program proved to be quite effective. The growth in the money supply (M1) in the period 1967 to 1997 can reduce to an average of

52.7%. Nearly two decades, the economy grew about 7% with an average inflation of 12%.

Inflation control efforts continued throughout the reform period event intensified following the 1998 monetary crisis. In 2005 Indonesia officially began implementing the Inflation Targeting Framework, a policy aimed at achieving stability of inflation at certain levels ranging from 4% to 10% for the short term and 3% up to 5% for the long term (Chowdhury & Ham, Inflation Targeting in Indonesia, 2009).

Based on the aforementioned background, this study models the inflation in Indonesia using the first and second-moment regression, namely conditional mean and conditional variance, respectively. In addition to such model, this study also calculated the threshold of deemed risky inflation, represented as conditional Value-at-Risk.

LITERATURE REVIEW

1. Cost-Push Inflation

This theory suggests that due to an increase in wages, say because of trade unions. The rise in money wages more rapidly than the productivity of labor. The labor unions press employers to grant wage increases considerably, thereby raising the cost of production of commodities. Employers in turn, raise prices of their products. Higher wages enable workers to buy as much as before in spite of higher prices. On the other hand, the increase in prices induces unions to demand still higher wages.

Oligopolies and monopolist firms raise the price of their products to offset the rise in labor and cost of production to earn higher profits. There being imperfect competition in the case of such firms, they are able to administered price of their products can increase the price to any level.

A few sectors of the economy may affected by increase in money wages and prices of their products may be rising. In many cases, their products are using as inputs for the production of commodities in other sectors. As a result, cost of production of other sectors will rise and thereby push up the prices of their products. Thus, wage-push inflation in a few sectors of the economy may soon lead to inflationary rise in prices in the entire economy. Further, an increase in the price of imported raw materials may lead to cost-push inflation. In a way, this increase in price is due to the increase in cost of production.

2. Demand-Pull Inflation

According to Keynes (1936) emphasized the increase in aggregate demand as the source of demand-pull inflation. When the value of aggregate demand exceeds the value of aggregate supply at the full employment level, the inflationary gap arises. The larger the gap between aggregate demand and aggregate supply, the more rapid is the inflation. The aggregate demand comprises consumption, investment, and government expenditure. The conventional demand-pull theorists suggest the excess of aggregate demand over aggregate supply causes inflation. In full employment equilibrium condition, the economy reaches its maximum production capacity. At such condition, when aggregate demand increase, inflation takes place.

3. Structural Theories of Inflation

It is related to the effect of structural factors on inflation. Structural analysis attempts to recognize how economic phenomena are occurring and finding the root of the permanent disease and destruction such as inflation that evaluates the relationship between the phenomena. The structural theorists suggest that inflation is a result of structural maladjustments in the country or some of the institutional features of the business environment. In the economic structural factor causes, supply increase related to demand-push, even if abundant unemployment production factor is impossible or slow. Therefore, reasoning of less developed countries, until the time not successful to change in the form of lagging behind structure or not to make attempt for immediate self-economic growth or should compromise with the inflation that is very severe sometimes. They have provided two types of theories to explain the causes of inflation, namely markup theory and bottleneck inflation theory:

a. **Mark-up Theory**

Prof Gardner Ackley proposed this theory. According to him, inflation is the cumulative effect of demand-pull and cost-push activities. When aggregate demand exceeds aggregate supply, there will be inflation, known as demand-pull inflation. This inflation stimulates production as well as demand for factors of production. Therefore, both the cost and price increase.

b. **Bottle-Neck Inflation**

Prof Otto Eckstein introduced this theory. He suggests that the main cause of inflation is the direct relationship between wages and prices of products.

Inflation takes place when there is a simultaneous increase in wages and prices of products. He says that the inflation occurs due to the boom in capital goods and wage-price spiral. He also believes that during inflation prices in every industry is higher, but few industries show a very high price hike than rest of the industries. These industries are termed as bottleneck industries, which are responsible for increase in prices of goods and services.

METHODOLOGY

1. Data Collection Method

This study models inflation uses five independent variables namely; interest rate, reserve requirement, open market operation policy, base money printing, and gross domestic product. All the data are secondary data in nature. The researcher wishes to be able to find the data from various sources, namely from *Badan Pusat Statistik*, *Bank Indonesia*, Ministry of Finance, and some other possible sources.

2. Unit Root test and Error Correction Model

To avoid estimating a spurious regression, this study will conduct unit root tests to test the presence of non-stationary variables. Based on the status of the stationarity levels, this study takes into considerations two model candidates, namely short run, and long run models. The chosen model could be the combination of both, generally known as an Error Correction Model (ECM). This ECM can be built from two different situations, namely all variables are of $I(1)$,

namely integrated into the first difference, or the variables are the combination of both I (1) and I (0), where I (0) states that the variables are stationary in level.

3. ARDL and GARCH

As discussed, this study models the inflation using both conditional mean and conditional variance. The conditional variance is then employed to calculate the VaR. Different from non-conditional VaR, where the value is calculated as the mean plus or minus the distribution value times the standard deviation, this study uses conditional VaR since the standard deviation (volatility) is a conditional volatility, modeled by a family of GARCH model. Some possible second-moment models to estimate are ARCH, GARCH, GJR, and EGARCH models. The ARCH, GARCH, GJR, and EGARCH models were created by Engle (1982), Bollerslev (1986), Glosten, Jagannathan and Runkle (1993), and Nelson (1991), respectively.

The conditional mean model can be written as follows:

$$INF_t = \theta_0 + \theta_1 MS_t + \theta_2 RR_t + \theta_3 GDP_t + \theta_4 RATE_t + \theta_5 ER_t + \theta_6 BIC_t + \varepsilon_t \quad (1)$$

$$\varepsilon_t = \eta_t \sqrt{h_{t-1}} \quad (2)$$

The conditional variance can be modeled as follows:

The ARCH model
$$h_t = \omega + \sum_{j=1}^r \alpha_j \varepsilon_{t-j}^2, \quad (3)$$

The GARCH model
$$h_t = \omega + \sum_{j=1}^r \alpha_j \varepsilon_{t-j}^2 + \sum_{j=1}^s \beta_j h_{t-j}, \quad (4)$$

The GJR model
$$h_t = \omega + \sum_{j=1}^r (\alpha_j \varepsilon_{t-j}^2 + \gamma_j I_{t-j} \varepsilon_{t-j}^2) + \sum_{j=1}^s \beta_j h_{t-j}, \quad (5)$$

Where $I_t = \begin{cases} 0, & \varepsilon_t \geq 0 \\ 1, & \varepsilon_t < 0 \end{cases}$. If $r = s = 1$, $\omega > 0$, $\alpha_1 \geq 0$, $\alpha_1 + \gamma_1 \geq 0$, and $\beta_1 \geq 0$ are sufficient condition to ensure that the conditional variance $h_t \geq 0$. The short-persistence of positive (negative) shock is given $\alpha_1(\alpha_1 + \gamma_1)$. When the conditional shocks, η_t follow a symmetric distribution, the expected short-run persistence is $\alpha_1 + \gamma_1/2$, and the contribution of shocks to expected long-run persistence is $\alpha_1 + \gamma_1/2 + \beta_1$ (see McAleer (2005)).

$$\ln(h_t^2) = \omega + \beta \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}^2}} + \gamma \ln(h_{t-1}^2) + \xi_t$$

The EGARCH model , (6)

Where $\eta_t \sim iid(0,1)$, and F_{t-1} is the past information which is available at the time t . The VaR can construct as:

$$VaR_t = E(y_t | F_{t-1}) - z \sqrt{h_t} , \quad (7)$$

Where z is the statistical value from the ε_t distribution.

Since the introduction of Engle's (1982), Autoregressive Conditional Heteroscedasticity (ARCH) and Bollerslev's (1986) Generalized ARCH (GARCH) models, a plethora of models proposed to investigate conditional variance (or volatility).

EMPIRICAL RESULTS

From 43 observation after adjustment, 42 data have probability value below 0.05 of standards error, is mean 42 data have significant result to influence

inflation, only variable inflation in lag two not significant because have probability value above 0.05 of standard error, 0.0902 . The data processed use Hannan-Quinn criterion (HQ) model selection method; the data have automatic selection to looking for best result. The data processed five of maximum dependent lags and five of dynamic regression, automated selection. The Selected model select by ARDL are in lag five.

The dependent variable Inflation, in lag five has probability value 0.0088; does statistically significant to influence inflation with coefficient level - 6.316263, mean previous inflation negatively influence current inflation by 6.3%, strengthen the result that found by Larasati & Amri (2017). This indicate inflation in Indonesia well controlled and managed by Bank Indonesia as central bank to maintain inflation keep on track by implementing a policy mix with an enhanced inflation-targeting framework.

Independent variable M2, in lag five has probability value 0.0092, does statistically significant to influence inflation with coefficient value 0.003392, mean Money Supply (M2) positively give influence to inflation by 0.003%. The finding is in line with Sutawijaya (2012), Nguyen (2015), and Langi, Masinambow, & Siwu (2014), they found that the money supply has a positive and significant effect on inflation.

Independent variable GWM, Statutory Reserve Requirements, in lag five has probability value 0.0124, does statistically significant to influence inflation with coefficient value 3.170784, mean GWM positively give influence to inflation

by 3.17%. This finding is not in line with Setyawan (2010), his found GWM negatively influence inflation.

Independent variable GDP, Gross Domestic Product, in lag five has probability value 0.0074, does statistically significant to influence inflation with coefficient value -0.004155, mean GDP negatively influence inflation by 0.004%. Negative relationship between GDP as economic growth indicator and inflation is important, as it quite often occurs in practice, as ascertained by empirical literature.

Independent variable Interest Rate in lag five has probability value 0.0094, does statistically significant to influence inflation with coefficient value 13.05059, mean Interest Rate influence inflation by 13.05%. Independent variable ER, exchange rate, in lag five has probability value 0.0197, does statistically significant to influence inflation with coefficient value -3.89E-05, mean exchange rate negatively influence inflation by 3.89%. Variable SBI, Bank Indonesia's Certificate, in lag five have probability value 0.0097, does statistically significant to influence inflation with coefficient value 0.000809, mean.

ECM Regression

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFLATION(-1))	-0.022566	0.003546	-6.363707	0.0992
D(INFLATION(-2))	-0.261382	0.003531	-74.02732	0.0086
D(INFLATION(-3))	-2.238203	0.005029	-445.0184	0.0014
D(INFLATION(-4))	6.316263	0.016145	391.2101	0.0016

D(M2)	0.002216	5.62E-06	394.4847	0.0016
D(M2(-1))	-0.002391	5.97E-06	-400.2343	0.0016
D(M2(-2))	-0.005144	1.26E-05	-409.8383	0.0016
D(M2(-3))	-0.005921	1.46E-05	-406.9608	0.0016
D(M2(-4))	-0.003392	8.04E-06	-421.9570	0.0015
D(GWM1)	-13.26170	0.032907	-403.0038	0.0016
D(GWM1(-1))	-37.77157	0.091447	-413.0443	0.0015
D(GWM1(-2))	-15.76505	0.038457	-409.9443	0.0016
D(GWM1(-3))	-5.862502	0.014980	-391.3468	0.0016
D(GWM1(-4))	-3.170784	0.008222	-385.6595	0.0017
D(GDP)	-0.003650	8.85E-06	-412.2647	0.0015
D(GDP(-1))	-0.003122	7.90E-06	-394.9720	0.0016
D(GDP(-2))	-0.003719	8.91E-06	-417.4859	0.0015
D(GDP(-3))	-0.001018	3.03E-06	-336.2257	0.0019
D(GDP(-4))	0.004155	1.07E-05	388.9413	0.0016
D(RATE2)	-14.11192	0.038358	-367.8999	0.0017
D(RATE2(-1))	53.85021	0.133567	403.1694	0.0016
D(RATE2(-2))	9.184202	0.020489	448.2484	0.0014
D(RATE2(-3))	-7.212389	0.019710	-365.9289	0.0017
D(RATE2(-4))	-13.05059	0.032709	-398.9908	0.0016
D(ER)	0.000335	8.07E-07	414.6145	0.0015
D(ER(-1))	-0.000160	3.68E-07	-434.2847	0.0015
D(ER(-2))	0.000232	5.81E-07	400.0723	0.0016
D(ER(-3))	1.53E-05	9.45E-08	161.5502	0.0039
D(ER(-4))	3.89E-05	1.09E-07	357.3612	0.0018

D(SBI)	0.002045	5.68E-06	360.1967	0.0018
D(SBI(-1))	-0.010339	2.47E-05	-418.3348	0.0015
D(SBI(-2))	-0.004275	1.03E-05	-413.2025	0.0015
D(SBI(-3))	-0.002723	6.51E-06	-418.3745	0.0015
D(SBI(-4))	-0.000809	1.87E-06	-432.5694	0.0015
CointEq(-1)*	4.585701	0.011071	414.2105	0.0015

Table 1: Error Correction Model (ECM)

Interestingly in Error Correction Term (Table 1) show the model have positive coefficient (4.585701) and have significant result (0.0015), the model does not have co-integration in long run. In Durbin-Watson stat result 3.497113 is greater than two but less than four, mean the model have negative autocorrelation.

CONCLUSION

This study aimed to examine the effect of the money supply, statutory reserve requirement, GDP, interest rates, exchange rate, and Certificate of Bank Indonesia, to describe the threshold of inflation in Indonesia during the period 2005 Q3 to 2013. This study founds two variables as monetary transmission, rates and statutory reserve (GWM), positively influence inflation by 13.05% and 3.17%. This indicate Bank Indonesia monetary policy give enough impact to inflation and the decision to change the monetary policy can do more carefully remind the impact will affected to inflation. Seen from the negative impact of previous inflation to inflation, indicate Bank Indonesia as central bank managed

and controlled well to keep inflation keep on track. Moreover, this found negative relationship between GDP and inflation by only 0.004%, indicate economic growth in Indonesia closer to the inflation threshold because the coefficient level is below 0.0% is mean close to positive relationship with the inflation. All significant data justify hypothesis that there is an influence from Reserve Requirements, Money Supply, Bank Indonesia Certificate, Interest Rates and Exchange Rate to Inflation in Indonesia.

From the correlation between threshold and the value of inflation, Indonesia has inflation trend caused by administered prices and volatile food. With 10% threshold, indicate central government and central bank should keeping inflation low, stable, and predictable, thus providing a climate that is more favorable to sound, sustained economic growth and job creation and more carefully if want to raise the administered prices. The administered prices can give highest inflationary pressure when the government decreased subsidy and creating raise in administered price. For the volatile foods, usually the problem came from the supply cannot fulfill the demand side, the problem typically came from the climate, harvest season, the distribution, and the infrastructure can triggers high inflation in volatile food.

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