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Measurement of the efficiency of monetary policy

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Abstract

Since 2000, monetary policy in Indonesia started to use Inflation Targeting Framework (ITF). To evaluate the performance of the monetary policy, it requires efficiency indicators. The measurement of the efficiency of monetary policy is based on inflation and output variations. This paper formulates a method for measuring the efficiency of monetary policy and applies it in Indonesia. It finds that since the implementation of ITF, the efficiency of monetary policy has not changed significantly. However, the efficiency of monetary policy tends to increase after the full implementation of the ITF framework after 2005 than in the transition period of 2000-2005.

Abstrak

Sejak tahun 2000 kebijakan moneter di Indonesia mulai menggunakan Inflation Targeting Framework (ITF). Untuk mengevaluasi kinerja kebijakan moneter, diperlukan indikator efisiensi. Pengukuran efisiensi kebijakan moneter didasarkan pada variasi inflasi dan output. Makalah ini merumuskan metode untuk mengukur efisiensi kebijakan moneter dan menerapkannya di Indonesia. Penelitian ini menemukan bahwa sejak implementasi ITF, efisiensi kebijakan moneter tidak berubah secara signifikan. Namun, efisiensi kebijakan moneter cenderung meningkat setelah implementasi penuh kerangka kerja ITF setelah tahun 2005 dibandingkan dengan periode transisi 2000-2005.

Introduction

In the past few decades, policy makers around the world have become increasingly aware of the social and economic costs due to inflation. Economists and politicians have begun to discuss the costs caused by the high inflation since 1960 in which the world has been experiencing the rising inflation. Inflation may lead to uncertainty concerning relative prices and the rate of price index in the future, so that brings companies and individuals become difficult to make a decision, and in turn, lead to lowers the economic efficiency. Economists claim that inflation may harm economic growth, especially when the inflation is high (Mishkin, 2007).

The awareness of high costs due to inflation lands to the viewpoint that low and stable inflation will encourage the productivity of economic resources and support economic growth, price stability becomes an important factor for the long term healthy economic growth. Therefore, price stability defined as low and stable inflation is regarded as the main goal of the monetary policy.

In relation to the matters, the central element which is necessary for the monetary policy is the use of a nominal anchor to be used as a policy strategy. Nominal anchor is a nominal variable such as inflation, and money supply that could limit the fluctuation of prices in order to achieve price stability. There are three monetary policy strategies that are nominal anchor determination namely monetary targeting, inflation targeting, and implicit nominal anchor. Inflation targeting has advantages compared to the other strategies because it is more correlated with the price fluctuation (Mishkin, 2007).

The optimal choice of a monetary policy instrument depends on how tight and transparent the available instruments are and on whether policymakers can commit to future policies (Atkeson, Chari, & Kehoe, 2007). Tightness is always desirable; transparency is only if policymakers cannot commit. Interest rates, which can be made endogenously tight, have a natural advantage over money growth and exchange rates, which cannot. As prices, interest and exchange rates are more transparent than money growth. All else equal, the best instrument is interest rates and the next-best, exchange rates.

Inflation targeting is characterized by the announcement of official target ranges for the inflation rate at one or more horizons, and by explicit acknowledgement that low and stable inflation is the overriding goal of monetary policy. Other important features of inflation targeting include increased communication with the public about the plans and objectives of the monetary policy makers, and in many cases, increased accountability of the central bank for attaining those objectives (Mishkin, 2007). The monetary policy with strategy of inflation target has been widely adopted by many countries. New Zealand was the first country which implemented the strategy of the inflation targeting in 1990, followed by Canada in 1991, England in 1992, Sweden and Finland in 1993, Australia and Spain in 1994, followed by other countries such as Israel, Chile, and Brazil (Mishkin, 2007).

The ITF approach in the monetary policy implementation in several developed countries generally noted a success stories. Aguir & Smida (2015) found that the implementation of the ITF can raise the credibility of the monetary authority. Their study indicates the ITF regime is conducive to sustainable economic growth and the inflation targeting countries recognize more macroeconomic performance as its neighbour of not targeting and that these differences are generally attributable to the choice of this new regime.

Athanasios & Mo (2016) found a unique feature of their model is that inflation affects welfare not only through the traditional channel, i.e., through determining equilibrium real balances, but also through influencing agents' entry decisions in the financial market. They use their framework to study the effect of inflation on welfare, asset prices, and OTC (over the counter) trade volume. In contrast to most monetary models predict a negative relationship between inflation and welfare. They found that inflation can be welfare improving within a certain range, because it mitigates a search externality that agents impose on one another when they make their OTC market entry decision.

There is no universal relationship between the conduct of monetary policy and the performance of the capital market (Marinescu, Ion-Iulian, & Horobet, 2015). In USA for example, we have a strong response of the capital market to the rules monetary policy component but we do not see the same behavior for other countries. This interesting fact can only be explained by the discretionary indicator, showing that if monetary policy decisions rely more on discretion, the stock market response becomes increasingly erratic and can cause irrational responses.

(Cortes & Paiva, 2017) argued that a long-term effort of credibility construction in Brazil dating back to the 1990s suffered a setback in 2011, when the Board of Governors of the Central Bank of Brazil (BCB) was changed at the onset of the Rousseff government. They found preliminary evidence that the looser monetary policy under Rousseff's first term has contributed to a deterioration of inflation expectations and dynamics, which have become more sensitive to inflationary shocks.

Source: Bank Indonesia

Figure 1. The rate of inflation in the period 2003-2015

In Indonesia, the monetary policy with the nominal anchor began to be implemented along with the implementation of Act 23 year 1999 concerning Bank of Indonesia. In the legislation, it is stated that the task of Bank Indonesia is focused on keeping the rupiah value stable. In the implementation, Bank In-

donesia is obliged to determine the inflation targeted. Therefore, the monetary policy outlined in the Act 23 has implicitly detected that the monetary policy of meanwhile, in the explanation of Act number 23 year 1999. It is stated that the stability of rupiah and its reasonable exchange rate is part of prerequisites for achieving sustainable economic growth which in turn will improve the people's welfare.

Since the use of BI rate for achieving the inflation target, inflation remain high and fluctuating. Figure 1 shows that, there were of least five points of climax inflation and five points of anti-climax inflation in period of 2003 to 2015. During the period, the lowest inflation was at the rate of 2.41%, in November 2009, while the highest inflation was at the rate of 18.38%, in November 2005. The considerable difference between the highest and the lowest inflation rates show that the inflation fluctuation in Indonesia is still high. The inflation rate has still been high and fluctuating since the implementation of the monetary policy with the inflation targeting strategy should be paid attention to, considering that the purpose of the implementation of the policy is to meet the low and stable inflation rate.

A fairly large inflation fluctuation in Indonesia requires a method of evaluation to measure the accuracy of the method in achieving the targeted inflation. The indicators of the success of the monetary policy within the framework of the ITF are usually measured by counting efficiency. The efficiency monetary policy views the accuracy of the policy in achieving the inflation target. The accuracy is seen through how big the inflation deviation occurring from the inflation targeted. On the other hand, inflation has a trade-off relationship with the output, where the output is also the goal of economic development. Therefore, in measuring the efficiency of the monetary policy, in addition to inflation variation, the output variation is also calculated. Therefore, the efficiency of the monetary policy is usually calculated from the output variation and the inflation variation.

Research Method

There are several methods for calculating the efficiency of the monetary policy offered by economists. This paper develops a method for measuring the efficiency policy based on a formula that has been previously established. It then uses the technique to measure efficiency of the monetary policy in Indonesia.

The purpose of the monetary policy in the ITF Framework is to achieve the inflation rate targeted. The success of the monetary policy is indicated by its capability in maintaining stable inflation, called efficiency. On the other hand, inflation has trade off relationship with the output. Basically the model of efficiency measurement was made by calculating gap between optimum loss function. That is minimum output and inflation variation with the actual condition of the inflation variation and output variation. Several methods of efficiency measurement have been made by economists such as Cecchetti, Flores-Lagunes, & Krause (2006) and Briec, Gabillon, Lasselle, & Ratsimbanierana (2012).

In the methods of Cecchetti et al. (2006), efficiency measurement of the monetary policy is done in two phases. First, the identification of the minimum loss functions. The minimum loss function is formed from the determination of optimum interest rate. Further, we need identify output and inflation variation. The gap between minimum loss function and actual condition indicates the degree of the efficiency of monetary policy. The smaller gap between the optimal and the actual monetary policy, the more efficient the monetary policy.

Briec et al. (2012) developed a method for measuring the efficiency based on the theory of production Farrell (1957). In the case of constant returns to scale technology, this distance function allows to find a more efficient way of producing the same level of output given that in the new allocation the inputs are employed in the same ratio as in the original (but inefficient) allocation. This ratio is often called the measure of technical efficiency.

Furthermore Briec et al. (2012) developed a method for measuring the efficiency based Malmquist index. In production theory, the Malmquist index is a bilateral index which compares the production technology of two economies, namely the technical change and the efficiency change. In the Cecchetti's framework, the Malmquist index is defined from the Farrell measures evaluating the output–inflation variability frontier. It determines the shift of this frontier and the changes in macroeconomic performance. The use of the Malmquist index allows to separate the effects of the policy-maker and the changes in the structure of the economy. Briec et al. (2012) mentioned that the global efficiency changes can be rewritten as the product of the changes in macroeconomic performance, minimum quadratic loss, and efficiency frontier. The Malmquist index can identify the contributions of improvements in the efficiency of monetary policy and changes in the variability of aggregate supply shocks.

Optimal interest rate

The efficiency monetary policy is calculated by considering the inflation variation and the optimal output variation. Optimal output and inflation variation occurring in the interest rate results in the minimum los function. Rudebusch & Svensson (1999) stated that the optimal monetary policy was given by the equation of output and inflation as follows.

$$y_t = a_1 y_{t-1} + a_2 y_{t-2} - a_3 (i_{t-1} - E_{t-1}\pi_t) + u_t \quad (1)$$

$$\pi_t = \pi_{t-1} + \gamma y_t + \eta_t \quad (2)$$

From the equation (2) inflation expectation may be made into equation: $E\pi_{t+1} = \pi_t + \gamma E_t y_{t+1}$ and inserted into the output equation, it is abstained:

$$\begin{aligned} y_{t+1} &= a_1 y_t + a_2 y_{t-1} - a_3 (i_t - \pi_t - \gamma E_t y_{t+1}) + u_{t+1} \\ &= \frac{a_1 y_t + a_2 y_{t-1} - a_3 (i_t - \pi_t)}{1 - a_3 \gamma} + u_{t+1} \end{aligned} \quad (3)$$

If: $\theta_t = \frac{a_1 y_t + a_2 y_{t-1} - a_3 (i_t - \pi_t)}{1 - a_3 \gamma}$ so output and inflation of period t+1 is:

$$y_{t+1} = \theta + u_{t+1} \quad (4)$$

$$\pi_{t+1} = \pi_t + \gamma\theta_t + \eta_t + v_{t+1} \quad (5)$$

where $v_{t+1} = \gamma u_{t+1} + \eta_{t+1}$

The value function from the loss function is:

$$L = \min_{\theta_t} E_t \left[\frac{1}{2} (\lambda y_{t+1}^2 + \pi_{t+1}^2) + \beta V(\pi_{t+1}) \right] \quad (6)$$

Minimization of lost function with equation obstacle (4) and (5) is:

$$L = \min_{\theta_t} E_t \left[\frac{1}{2} \lambda (\theta_t + u_{t+1})^2 + \frac{1}{2} (\pi_t + \gamma\theta_t + v_{t+1})^2 + \beta V(\pi_t + \gamma\theta_t + v_{t+1}) \right] \quad (7)$$

The first order condition is

$$(\lambda + \gamma^2)\theta_t + \gamma\pi_t + \gamma\beta E_t V_\pi(\pi_{t+1}) = 0 \quad (8)$$

From the envelope theorem, it is obtained:

$$L = \pi_t + \gamma\theta_t + \beta E_t V_\pi(\pi_{t+1}) \quad (9)$$

By multiplying the equation (8) by γ, and being added to the equation (9), so it results in: $\gamma V_\pi(\pi_t) = -\lambda\theta_t$. By withdraw the time one period and making expectation, $\gamma\beta E_t V_\pi(\pi_{t+1})$ can be eliminated from the equation (8) becoming:

$$(\lambda + \gamma^2)\theta_t + \gamma\pi_t - \beta\lambda E_t \theta_{t+1} = 0 \quad (10)$$

or:

$$\theta_t = -\left(\frac{\gamma}{\lambda + \gamma^2} \right) \pi_t + \beta \left(\frac{\lambda}{\lambda + \gamma^2} \right) E_t \theta_{t+1} \quad (11)$$

Optimal condition occurs in $\theta_t = B\pi_t$. Optimal B value is:

$$\beta\lambda\gamma B^2 + (\beta\lambda - \lambda - \gamma^2) B - \gamma = 0 \quad (12)$$

Considering $\theta_t = \frac{a_1 y_t + a_2 y_{t-1} - a_3 (i_t - \pi_t)}{1 - a_3 \gamma}$, this optimal monetary policy is:

$$i_t = \left(1 - \frac{B(1-a_3\gamma)}{a_3}\right)\pi_t + \frac{a_1}{a_3}y_t + \frac{a_2}{a_3}y_{t-1} \tag{13}$$

Efficient monetary policy

Efficient monetary policy is a policy that minimizes loss as a side effect the implementation of a monetary policy. Monetary policy efficiency may be seen by comparing the actual monetary policy with the monetary policy efficiency frontier. The monetary policy efficiency frontier is reduced from the minimization of loss function for discretion monetary policy.

Loss function contains output and inflation variation like the equation (14). While λis level of tolerance of the monetary policy maker, towards the output gap variation for keeping stable inflation. In other words, λmay be required as a preference level of monetary policymakers towards the output gap variation. Several economists gave the optimal value of λ which is 0.25 or 0.3 (Walsh, 2003).

$$L(\hat{\lambda}) = (1-\beta)\, E_t \sum_{i=1}^{\infty} \beta^i (\lambda y_{t+i}^2 + \pi_{t+i}^2) \tag{14}$$

The result of equation minimization (14) with many combinations of output and inflation variation add certain level of λ will from a trade off line between output and inflation variation as shown in Figure 2. The smaller λ is the closer the trade off line to the point of origin (point 0). The monetary policy efficiency frontier for discretion policy is a tangent the trade off line of output and inflation variation.

Cecchetti et al. (2006) calculated a change of the monetary policy efficiency in an almost similar way. Cecchetti focused on the change of the monetary policy efficiency through a graphic method and mathematic calculation of loss function as a function of output and inflation variation by weighted the preference of λ and (1 – λ). The loss function can be written as follows:

$$Loss = \lambda \mathrm{Var}(\pi) + (1-\lambda)\mathrm{Var}(y), \qquad 0 < \lambda < 1 \tag{15}$$

where:

λ = parameter of central bank preference towards inflation variation
$Var(\bullet)$ = inflation deviation squared from its target or output deviation from potential output
π = inflation
y = output

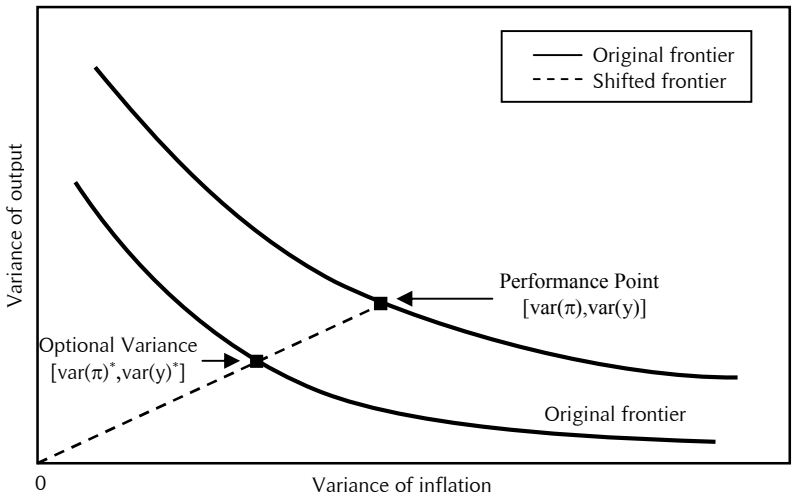

Figure 4. Monetary policy efficiency frontier (original frontier) and performance point

Based on the loss function formed, the measurement of the macroeconomic performance can be formulated at the period of i (Pi) given by the equation:

$$P_i = \lambda\, \mathrm{Var}(\pi_i) + (1-\lambda)\mathrm{Var}(y_i) \tag{16}$$

The optimal macro-economic performance (Si) is the economic performance resulting from the minimum *Pi*, with *Si* :

$$S_i = \lambda \,\mathrm{Var}(\pi_i)^* + (1-\lambda)\mathrm{Var}(y_i)^* \tag{17}$$

Where, var$(\pi)^*$ and var$(y)^*$ are inflation variance and output variance in the optimal condition. If $\Delta S = S2 - S1$ has a negative value, it indicates that the performance of economy decreases.

To determine var $(\pi)^*$ and var $(y)^*$, we can see a homothetic shift of the original frontier curve outward tangent the performance point as shown in Figure 4. The optimal variance is the intersection point between original frontier and the line drawn from the original point to the performance point.

The efficiency of the monetary policy is calculated from the distance of the actual performance toward the optimal performance. The inefficiency level for every period *i* is:

$$E_i = \lambda[\mathrm{Var}(\pi_i) - \mathrm{Var}(\pi_i)^*] + (1-\lambda)[\mathrm{Var}(y_i) - \mathrm{Var}(y_i)^*] \tag{18}$$

Then, the variable of monetary policy efficiency ΔE is calculated, based on the proportion toward ΔP that is:

$$Q = \frac{\Delta E}{|\,\Delta P\,|} \tag{19}$$

Furthermore, the average inefficiency between two periods will be calculated by assumed that central bank chooses the interest rate minimizing the loss function that is minimizing deviation squared from the inflation and output of the average target. The average is formulated as follows:

$$E(L) = E[\lambda\,(\pi_i - \pi^*)^2 + (1-\lambda)\,(y_i - y^*)^2] \tag{20}$$

Where π^* and y^* are the inflation target and the output target for every *t* taken from the average value, and π_t is the inflation level for every *t* taken from the average value.

Measurement for efficiency of monetary policy

Monetary policy is considered to be efficient if the policy generates low fluctuation of output and inflation. Low and stable inflation will encourage the output growth in the long term. High fluctuation of inflation will cause social loss, in which model is called loss function. The equation of loss function is defined as follows: $LF = \lambda$(inflation variance) + (1 - λ) (output variance). The symbol λ valued between 0 and 1, is level of tolerance of BI toward the inflation fluctuation, while the level of tolerance of BI toward the output fluctuation is 1-λ. Theoretically, output and inflation variation at time t is calculated toward the target value and its potential value.

Efficiency is measurement for optimal policy in limiting the output growth in order that inflation is not too high for the purpose of output growth stability. Optimal policy is macroeconomic policy resulting in minimal loss function. The los function used in this research is: $Loss = \lambda\mathrm{Var}(\pi) + (1-\lambda)\mathrm{Var}(y)$, where $0 < \lambda < 1$. Var (*) show deviation squared toward its target that is var $(\pi) = (\pi - \pi^*)^2$ and var $(y) = (y - y^*)^2$, where π and y are inflation and output. The inflation variability aversion for developing countries uses λ = 0,3 (Cecchetti et al. 2006). After λ is determined, efficiency analysis can be continued.

In this research, this efficiency that will be measured is the efficiency variable between two periods. The first period is the period before pure ITF is used or FFIT (*Full Fledged Inflation Targeting*) in 2001 (I) up to 2005 (II). The second period was the period sure ITF was implemented or FFIT in which only one nominal anchor had bed used that is the inflation occurred in 2005 (III) up to 2008 (IV).

Stages of analysis are as follows:

1. In each period, determine the least loss function value from the actual data in Indonesia by using λ = 0.3 in all quarter in the related period.
2. Forming original frontier. The curve was derived by changing the value of λ with the minimal loss function value derived at the stage 1. Some pair combinations of var(π) and var(y) are derived as a result of value of λ. Plotting var(π) in vertical axis and and var(y)in horizontal axis will from a curve of indifference or curve of efficiency frontier, in which stage is called the curve of original frontier (This curve has social MRS = λ/(1-λ)). To improve the formation of the curve of efficiency frontier to be steeper, it may be done by a simple regression of var(y) toward 1/var(π) as follows:

$$Var\,(y) = \beta_0 + \beta_1\left(\frac{1}{Var\,(\pi)}\right) + \varepsilon$$

If β_1 significant (β_0 is not significant), the curve original frontier can be formed from $Var\ (y) \times Var\ (\pi) = \beta_1$.

3. In each period var$(\pi)^*$ and *var*$(y)^*$ are graphically searcher for. The variation is obtained from the tangency point between the lines drawn from the original point to the performance point as shown in Figure 4.
4. Calculating P_i and S_i

$$P_i = \lambda \mathrm{Var}(\pi_i) + (1-\lambda)\mathrm{Var}(y_i)$$

$$S_i = \lambda \mathrm{Var}(\pi_i)^* + (1-\lambda)\mathrm{Var}(y_i)^*$$

Where P_i is economic performance and S_i is inflation and output variation in the optimal condition. P_i and S_i is calculated once each for every period of i by taking the average of π_i and average y_i in each period.

5. Calculating E_i and ΔE
E_i is a difference of P_i and S_i are $E_i = P_i - S_i$ or it can be calculated by a formula as follows:

$$E_i = \lambda[\mathrm{Var}(\pi_i) - \mathrm{Var}(\pi_i)^*] + (1-\lambda)[\mathrm{Var}(y_i) - \mathrm{Var}(y_i)^*]$$

Then it is calculated:

$$\Delta E = E_1 - E_2$$

The value of positive ΔE indicates an increase or gain of monetary policy efficiency.

6. Calculating Q

$$Q = \frac{\Delta E}{|\Delta P|}$$

The positive value of ΔP indicates an increase or gain in macro-economic performance (performance gain). Value of Q indicates the efficiency variable of the monetary policy. The value of positive Q indicates that the monetary policy is getting more efficient. If var (π) indicates inflation variable or var(y) indicates output variable, correlating between periods and is statistically significant, the optimal policy is implemented in condition $\hat{\lambda} < \lambda$ (Walsh, 2003). This research takes $\lambda \leq 0.3$.

Results and Discussion

Measurement of the efficiency of monetary policy

In this part, the efficiency of monetary policy will be calculated in the first and the second period. The first period is the period before ITF was fully used or FFIT (*Full Fledged Inflation Targeting*) in 2001 (1) to 2005 (II). The second period was the period after ITF was fully implemented or FFIT where only one nominal anchor had been used, that is the inflation occurring in 2005 (III) to 2009 (III). The stages of analysis are as follows:

Determining the least loss function

The value of λ for calculating loss function is determined through several methods i.e.: determined by central bank, choosing the value of λ recommended, or calculated. According to the method of Cecchetti et al. (2006) that country with high inflation can be uses the value of λ = 0.3; and λ = 0.8 for developed countries (The countries with low inflation). In Indonesia the quarterly inflation during, the research period was 2 percent on the average, this rate was considered high. Therefore, in this model of efficiency the value of λ = 0.3 is applied. With λ being mentioned, the value of loss function was chosen from the actual data in Indonesia in the whole quarter for each of the first and the second period. In the first period, the minimum loss function value was 0.4393 occurring in 2005 (II) and the loss function in the second period was 1.009 occurring in 2007 (II).

Forming the original frontier curve

The curve of original frontier is derived by change the value of λ with the minimal loss function obtained from the first stage. Several pair combinations of var(π) and var(y) are derived as a result of value λ. Plotting var(π) in vertical axis and and var(y) in horizontal axis will from a curve of indifference or curve of efficiency frontier, in this stage is called the curve of original frontier. There are two curves of efficiency frontier that are for the first and the second period.

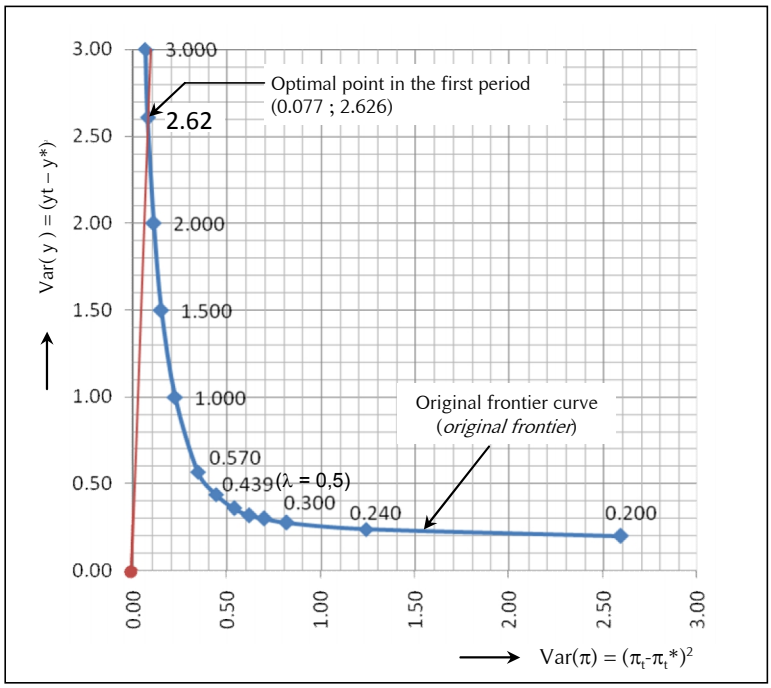

Figure 5. Original frontier curve of the first period

Annotation: original frontier curve above was the minimal loss function curve in 2005 (II). This curve was derived by shifting the value of λ in the fixed loss function value that is the minimal loss function.

The original frontier curve is symmetrical to the origin. The curve of original frontier can be seen in Figure 5. To improve the formation of the original frontier curve to be more accurate, it may be done by a simple regression of var(y) towards 1/var(λ) as follows:

$$Var(y) = \beta_0 + \beta_1\left(\frac{1}{Var(\pi)}\right) + \varepsilon$$

$$Var(y) = 0{,}043 + 0{,}201\left(\frac{1}{Var(\pi)}\right) + \varepsilon$$

This regression equation is required to seek var(π)* and var(y)* in the third stage followed by the formation process of original frontier for the second period. Figure 6 provides of pairs of var(y) and var(π) in the minimal loss function of the second period as input to make the original frontier in this period.

Like the first period, in λ =0.5 (the value of tolerance of output and inflation in the equation of loss function) had the same strength, the value of var(y) was the same as the value of var(π). This shows that the original frontier curve is symmetrical to the origin. The original frontier can be seen in Figure 6.

To improve the formation of the original frontier curve to be more accurate, a simple regression of var(y) toward 1/var(π) can be done as follows:

$$Var(y) = \beta_0 + \beta_1\left(\frac{1}{Var(\pi)}\right) + \varepsilon \;;\; Var(y) = 0{,}030 + 0{,}903\left(\frac{1}{Var(\pi)}\right) + \varepsilon$$

This regression equation is required to seek var(π)* and var(y)* in the third stage.

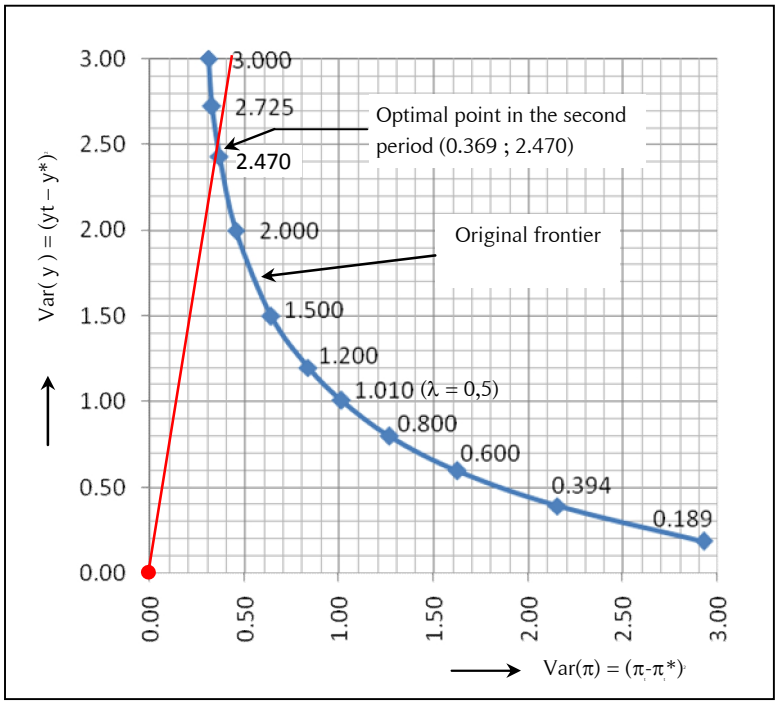

Figure 6. Original frontier curve of the second period

Searching optimal variance

Optimal variance is symbolized by var$(\pi)^*$ and var$(y)^*$, that is intersection point between lines drawn by origin point to the performance point. Performance point is the average var$(\pi)^*$ and $(y)^*$ in each period. In the first period, the average var$(\pi)^*$ = 1.07 and average var$(y)^*$ = 36.30, while in the second period, var$(\pi)^*$ = 5.03 and the average var$(y)^*$ = 33.63. The value of var$(\pi)^*$ and var$(y)^*$, according to Cecchetti et al. (2006), could be done graphically; but in this research, seeking var$(\pi)^*$ and var$(y)^*$ was done mathematically. This mathematic way is done in order to get a more accurate result.

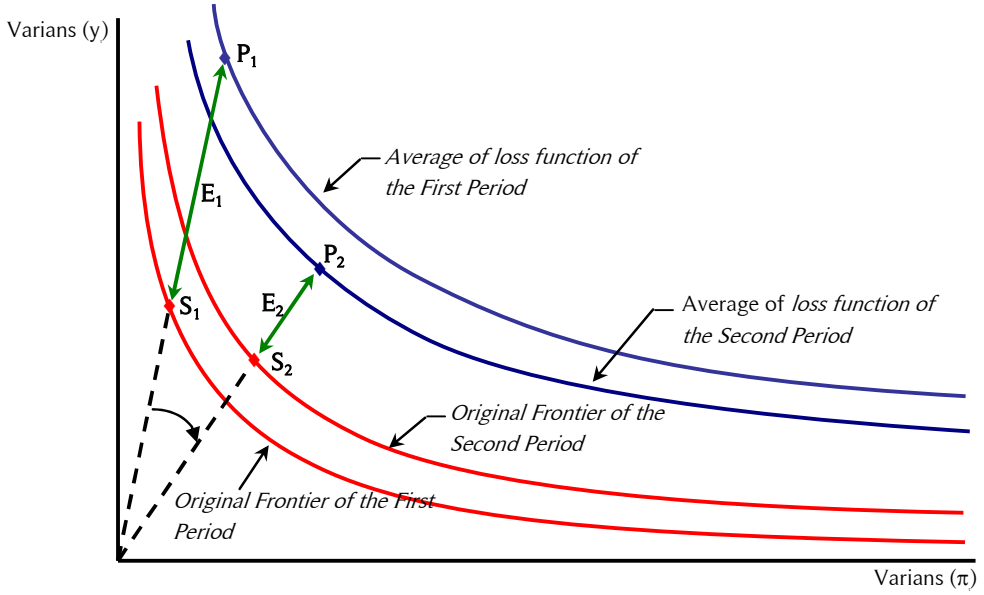

Figure 7. Original frontier and loss function curve of the first and the second period

Figure 7 is seen that the performance point (P_1) is higher compared with P_2. This means that there is an increase in the macroeconomic performance of Indonesia from the first period to the second period.

In the figure mentioned above it is also shown that E_1 is bigger than E_2 indicating that the efficiency of monetary policy is increasing. From the first period to the second period. Comparing P_1 with P_2 or E_1 with E_2 can only be done with the condition of constantλ, if λ of the first period is difference from the seconds period, P_1 and E_1 cannot be compared with P_2 and E_2. In this research the value of λ mentioned above is 0.3 both in the first and in the second period. The decrease in the value of P_2 compared with P_1 indicates that the macroeconomic performance increases due to the ITF implementation that is the inflation determination as target of monetary policy.

Figure 7 shows that the line drawn from the origin to the performance point rotates to the right. This indicates that the BI preference toward inflation in full implementation of ITF is relatively decreasing as compared with the implementation of transitional ITF. In period of full implementation of ITF, the average inflation fluctuation between quarters is bigger as compared with the period in the implementation of transitional ITF, but is output fluctuation is smaller as compared with the transitional period. Overall, social loss function in the period of full application of ITF is smaller compared with the previous period. The increase in inflation fluctuation and the decrease in output fluctuation in the full application of ITF (after July 2005) can be understood because the implementation of inflation target does not mean to ignore the output and its stability, there is still a space of flexibility in the implementation of ITF like a gradual program on disinflation and a flexible operational design. The implementation of ITF in Indonesia follows the basic principles that ITF is a framework, not a rule. The implementation of the monetary policy also considers a wider development target among other things is economic growth. Unlike the principle of full discretionary, ITF require that discretionary policy in the implementation of the monetary policy is restricted.

After inefficiency of monetary policy (E) is known then ΔE is calculated to know the efficiency variable (Q): $\Delta E = E_1 - E_2 = 23{,}886 - 23{,}241 = 0{,}645$.

The amount of ΔE is scale (not vector). The positive value of ΔE indicates an increase in the efficiency of monetary policy.

Calculating the efficiency variable (Q)

The change of efficiency is the ratio of change in efficiency to performance gain, that is:

$$Q = \frac{\Delta E}{|\Delta P|}$$

$$Q = \frac{0{,}645}{0{,}681} = 0{,}947$$

The value of Q indicates the efficiency of monetary policy. The value of Q in this research is 0,947 (positive), this indicates that monetary policy is getting more efficient. The result of this efficiency analysis indicates that the efficiency of period two (after ITF is fully implemented) is higher than the efficiency of period one (before ITF is fully implemented). By using inflation target strategy, output and inflation fluctuation become small indicating that output and inflation are relatively low and stable since ITF fully implemented.

With the inflation target being determined by BI, inflation expectation will get close to or the same as the inflation target of Bank of Indonesia by π_{t+1}, or it applies to $E_t\pi_{t+1} = \pi_{t+1}$. So bias between public inflation expectation and inflation target is getting small or zero, which in turn, will decrease the inflation fluctuation. Furthermore, the decrease in inflation fluctuation encourages the decrease in gap between actual output and potential output (output in full employment). Therefore, monetary policy becomes more efficient.

On the other hand, the decrease in inflation fluctuation will make social less function smaller. This relationship is illustrated in model of Money in the Utility Function (MUF), where inflation relationship with loss function is positive (Walsh, 2003). The higher the inflation fluctuation is the bigger the social loss function. On the contrary, the lower the inflation leads the smaller the social loss. The result of the analysis of monetary policy efficiency indicates that the efficiency is getting bigger which means that the social loss is getting smaller.

In Indonesia, the monetary policy with ITF strategy has been applied since 2000. This policy has only one, single target that is inflation. This is different from the policy which was applied before 2000 that is monetary targeting which had a multiple target.

However, in the beginning of the application of ITF policy, banking condition in Indonesia was not yet completely stable so that the inflation target strategy had not worked out well. Observation on transmission mechanism was not an easy job. While in the ITF implementation, the running of this transmission mechanism played an important role considering the mandate given to achieve the stability of prices. In the condition like this, the increase in the interest rate of monetary instrument (SBI) to absorb cartel money to go back to the banking system was after late due to the response of deposit interest rate so to encourage the incoming of cartel money to banking system required of the increase in the interest rate which was higher than it should have been.

Never the less, the obstacle mentioned was not a specific obstacle for the application of inflation target framework, because basically, monetary policy with any framework because basically, monetary policy with and framework requires the presence of a healthy financial system so that the target achievement becomes credible. A mature preparation is required so timer in applying the inflation target framework, BJ can increase inflation prediction accuracy and understanding of the monetary policy transmission in Indonesia. This preparation is required for the application of full inflation target framework.

The ITF approach has advantages compared with the monetary targeting approach. With ITF, the monetary policy may focused better on domestic issues and respond immediately every shock occurring in domestic economy. Stability of relations between monetary aggregates and inflation is not a very important issue as the success of policy does not depend on the relation mentioned above. The ITF approach enables monetary authority to use all the information available in determining the policy direction that will be taken. In addition, with ITF the public may understand easily the policy direction that has been taken due to the presence of transparency of the policy taking process and the increase in central bank accountability with regard to the explicit inflation target announcement to the public. The ITF approach may also avoid the possibility of central bank to be trapped under politic pressure. Central bank may carry out the monetary policy independently.

In Indonesia, the full-fledged implementation of ITF by leaving monetary targeting in practice had just begun since the middle 2005. The observation on empirical data in Indonesia indicated that the inflation fluctuation and the output fluctuation were relatively small since the full-fledged application of ITF (Romer, 2006). From the result of this research the monetary policy efficiency in Indonesia on the full-fledged application of ITF was higher than the monetary policy efficiency before the full-fledged application of ITF was used. Unfortunately the increase in the efficiency was not significant. This means that a longer period is required an order that is shifting from the monetary targeting to ITF can run well. The time passed was too short to evaluate significantly whether or not the policy implementation taken was successful.

The performance of Bank Indonesia to minimize the inflation and output fluctuation was relatively successful. The credibility of Bank Indonesia in controlling the inflation has begun to get better and the inflation tends to decline. The full-fledged implementation of ITF will strengthen public expectation toward the inflation decrease and speed the disinflation program being carried out. This in turn, will increase the credibility of Bank Indonesia in controlling the inflation. In addition, the inflation target containing the element of good governance for a modern central bank likes goal clarity; the transparency and accountability are parallel in the effort of Bank Indonesia to increase the credibility in the implementation of ITF. Consistence and more focus are paying close attention to the inflation are expected to encourage the output growth in a long term.

Conclusion

The efficiency of monetary policy can be measured by calculating the distance of performance point to the original frontier curve. Performance point is the average variance of inflation and the average variance of the output gap, while the original frontier curve is a curve obtained by varying the λ at the minimum loss function, where the value of λ is the degree of tolerance of Bank Indonesia to the inflation fluctuations.

This efficiency measurement method was applied to the data of Indonesia during the transitional ITF implementation period 2000-2005 and full implementation period 2005-2009. Since the monetary policy was fully implemented with the ITF on July 2005, there has been a tendency that the monetary policy efficiency increased as compared with the ITF application in the transitional period in 2000 to 2005. The monetary policy with full-fledged ITF application resulted in lower costs (inflation fluctuation and output fluctuation). This is due to the fact that the ITF policy is a set framework, starting from the instrument, targets to the policy goal.

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