Inflation-Output Efficiency in Lowering High Cost Economy: A Comparative Study of Several Provinces in Indonesia

Betta Y.; Eugenia Mardanugraha; Chaikal Nuryakin

Abstract

Inefficiency contributes high cost to the economy. One of the high cost economy sources is the inflation rate. Therefore, the government has important roles to anticipate and control the rate of inflation, hence, the high cost economy. Studies and researches on the comparison of inflation-output efficiency among provinces in Indonesia have never been conducted. An inflation-output efficiency is a measurement of an optimization problem where the monetary authority is to minimize its loss function. The purpose of this research is to develop an economic model that measures inflation-output efficiency in several provinces in Indonesia, so that a region’s relative efficiency position to others can be recognized. This research produces inflation and output targets estimation that can stimulate regional economic growth. It estimates and evaluates inflation-output efficiency of a region against another region made as the reference region. The study provides recommendation to the government of Indonesia and local government on strategic issues in order to achieve a more efficient economy.

Key words: Inflation; Economic Growth; Efficient.
JEL Classification: E31, O40, O47

© 2007 LPEM
1. BACKGROUND

Inefficiencies contribute to high costs economy that emerges from costs of production, distribution, transportation, and others. Such high cost economy brings about high output prices, thus triggers inflation. High inflation will in turn create and causes inefficiency in the production of goods and services in the economy.

A study of the relationship between inflation and output was conducted by Ceccheti, Flores-Lagunes, and Krause (2004). They used 24 countries as their sample observation and found that 20 countries were experiencing low inflation variability, whereas 15 countries were experiencing low output volatilities. However, among those countries studied, Indonesia is not included. Therefore, we cannot recognize Indonesia's relative position against those 24 countries in implementing its monetary policies.

Studies on inflation-output in Indonesia were conducted by Laksono (2005), Solikin (2005), and Muelgini (2004). These studies demonstrated that inflation and output growth variability were lower in the periods of post economic crises. Their findings confirmed that the progress of inflation and output growth variability was in line with that of industrial and other developing countries.

Scoring of efficiency is typically applied to measure performances of companies and the most commonly used method to measure it is the production frontier method. Mardanugraha (2005) applied the method to measure bank efficiency in Indonesia. The production frontier method measures how close a company's efficiency is relative to the most efficient one in the sample observed. By this method, one can obtain a benchmark and thus indicate whether a company is indeed operating efficiently.

Cecchetti (2004) employed the production frontier method to measure monetary policy efficiency and to compare efficiency scores among countries. Again, however, Indonesia is not included in the research sample. Therefore, one cannot see whether Indonesia's monetary policies have already been conducted efficiently or how efficient Indonesia's monetary policies are compared to other countries. Krause (2004) measured monetary policy efficiency by solving optimization problems and utilizing the suspected parameters with VAR (vector autoregressive) method to gain the optimal solution. Krause's optimization problems were solved by minimizing biases between fluctuation of actual and targeted output and inflation.
The problem of a high cost economy is a serious problem which has to be tackled by the government. Inflation is used to measure the movement of the general price level which affects production costs in the economy. Consequently, it will affect the economic growth performance. To overcome the problem of a high cost economy, government policies must be efficient and properly implemented, including anticipating the rates of inflation. A tool that has the capability to measure whether a policy is efficiently run becomes very crucial. With that measurement, the government is expected to be able to implement their policies in better modes and hence to achieve its targets. A low inflation rate and high economic growth generally are objectives which a government wishes to achieve. This can be accomplished by creating and maintaining efficiency in the economy.

This study aims at measuring inflation-output efficiency in several provinces in Indonesia. The output is expected to provide a measurement that can be used as an inflation-output efficiency benchmark. The study is also expected to provide some recommendation for the central and local governments to formulate policies that are in line with other economic policies in Indonesia. The study consists of four main sections. Section I contains backgrounds and the purposes of the research. Section II describes the model employed and the theories underlying it. Section III analyzes the results of inflation output efficiency for 20 provinces in Indonesia. Lastly, section IV concludes the study and provides some policy recommendation based on the output of the study.

2. MODEL SPECIFICATION

This study specifically examines inflation and output dynamics in provinces in Indonesia. The level of inflation-output efficiency is calculated as the solution to an optimization problem through which the monetary authority objective is assumed to minimize its loss function. A loss function is a weighted average of a quadratic deviation between inflation and output from each of its target level. It is mathematically expressed as:

\[
\text{Minimize } E_t \left[ \lambda (\pi_t - \pi_t^*)^2 + (1 - \lambda) (y_t - y_t^*)^2 \right]; \quad 0 \leq \lambda \leq 1
\]

where:

- \( E_t \) = expectation operator at time \( t \)
- \( \pi \) = inflation
- \( y \) = natural logarithm of aggregate output
\[ \pi^T = \text{inflation target} \]
\[ y^T = \text{output target} \]

= relative weighing factor that is given for quadratic deviation from inflation and output from its expected level.

The value of \( \lambda \) ranges between 0 and 1. The value of \( \lambda = 1 \) indicates that the government's policy target is only for inflation stabilizing, while \( \lambda = 0 \) is only for output stabilizing. The value of \( \lambda \) is obtained based on expert judgments and published literature. Inflation and output targets are obtained through the methods described below.

2.1 Inflation and Output Targets

Economic growth of a country must constantly be pushed to a higher level. However, trade-offs between a country's economic growth and inflation rate cannot be easily avoided. Inflation threshold level in this study will be estimated by using an econometric method developed by Hansen (2000).

Gujarati (2003:318), in econometric terms, defined a threshold as a target whose value may not always be apparent; therefore, it must be estimated. Ghosh and Phillips (1998a), in the context of inflation, explained that there is a value of inflation threshold where any point above the inflation threshold will endanger economic growth; therefore as mentioned by Sarel (1996) inflation has to be maintained below the threshold value.

The regression equation is:

\[
d \log(y_t) = \mu + \gamma_1(1 - \delta^*) \left[ \pi_t - 1 \right] \I{\pi_t \leq 1} + \log(\pi_t) - \log(\pi^*) \I{\pi_t > 1} + \gamma_2 \delta^* \left[ \pi_t - 1 \right] \I{\pi_t \leq 1} + \log(\pi_t) - \log(\pi^*) \I{\pi_t > 1} + \theta' X_t + \epsilon_t \quad \ldots (2)
\]

where:

- \( d \log(y_t) \) = a country's economic growth calculated from the real GDP growth rate
- \( \pi_t \) = actual inflation calculated based on consumer price index (CPI)
- \( \pi^* \) = the threshold level of inflation which has to be estimated
Inflation-Output Efficiency in Lowering High Cost Economy: A Comparative Study of Several Provinces in Indonesia

\[ d^* = \begin{cases} 
1 & \text{if } \pi_t > \pi^* \\
0 & \text{if } \pi_t \leq \pi^* 
\end{cases} 
\]

\( I(\pi_t \leq \pi) \) and \( I(\pi_t > \pi) \) = indicator function with 1 if the statement inside the parentheses is true and zero if it is wrong

\( X_y = \) vector of control variables\(^1\) that consist of (1) local investment ratio to GDRP; (2) local government expenditure ratio to GDRP; (3) a region’s relative position toward all regions included in the sample; (4) local population growth; (5) a region’s openness;

The effect of inflation on economic growth is captured by the parameters \( \gamma_1 \) and \( \gamma_2 \) – both are showing the effect of inflation below and above the threshold toward growth, respectively. The parameters are expected to have the following signs \( \gamma_1 > 0 \) and \( \gamma_2 < 0 \). It implies that if inflation performance of a region exceeds its threshold value, it will have a negative effect on economic growth, conversely, if the level inflation occurs below the threshold value, it will have a positive effect on economic growth. Parameter \( \gamma_1 \) and \( \gamma_2 \) both estimated together with other parameters.

The next step is to conduct a threshold effect test. Because the classical t-test in this case has a non-standard distribution, the bootstrap method needs to be employed (Hansen 1996, 1999) to empirically simulate the distribution of likelihood ratio (LR). In order to obtain the output targeted, the inflation target estimated needs to be substituted into equation (2).

The estimation results from inflation and output targets are further used to measure the monetary policy frontier by applying equation (1). ‘Frontier’ here is a minimum value from \( L \) on equation (1); whereas inflation-output efficiency can be measured by comparing the minimum \( L \) values of regions to that of a reference region. Therefore, the score of efficiency can be obtained by the following formula:

\[^1\] Here control variable will only include variables that are considered to be important for economic growth (see Sala-i-Martin, 1997).
Efficiency = \frac{L_{\text{Min}}}{L^B} \quad (3)

where $L^B$ = a reference region’s $L$ value and $L_{\text{Min}}$ = the lowest $L$ value of regions included in the research sample. By using the percentage of equation (3) the most efficient inflation-output region can be determined, that is a region with the efficiency value of 100% or one. The higher the percent-value of equation (3) indicates a region achieving the inflation-output target.

Due to data availability, this study only covers 20 provinces in Indonesia--including North Sumatera, West Sumatera, Riau, Bengkulu, Lampung, DKI Jakarta, East Java, Central Java, DI Yogyakarta, East Java, Bali, East Nusa Tenggara, West Kalimantan, South Kalimantan, North Sulawesi, Central Sulawesi, South Sulawesi, Southeast Sulawesi, Maluku, and Papua.

This research is expected to provide inputs to the central bank, Bank Indonesia, as the monetary authority to improve macroeconomic performance in achieving more efficient policies. This research assumes that any improvement in economic performance is a result of an economic policy, in terms of a better inflation-output performance. Of course, there are several factors beyond the policy maker’s capability that also contribute to the increase of the overall economic performance. Specifically, the policy environment is one of many factors that determines a policy maker’s performance.

3. ESTIMATION RESULT AND ANALYSES

3.1 Inflation Target and Output

Threshold estimation for inflation and economic growth target of the 20 provinces in Indonesia is shown in the Table 3.1 below. A province with a lower inflation target will have a higher economic/output growth target. In general, the provinces’ samples experience a higher actual inflation average than the inflation targeted; consequently they have a lower actual economic growth average than the economic growth target. For example, East Java has an inflation average of 10.6% which is slightly higher than its targeted inflation rate, of 10%. Consequently, East Java experiences an economic growth average of 4.5% which is lower than its 6.7% target.
Inflation-Output Efficiency in Lowering High Cost Economy: A Comparative Study of Several Provinces in Indonesia

### Table 3.1
Inflation and Growth Average and Estimation Result of Inflation and Growth Threshold According to Province

<table>
<thead>
<tr>
<th>No.</th>
<th>Province</th>
<th>Inflation Average (1)</th>
<th>Growth Average (2)</th>
<th>Inflation Target (3)</th>
<th>Growth Target (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>North Sumatera</td>
<td>0.105</td>
<td>0.059</td>
<td>0.073</td>
<td>0.100</td>
</tr>
<tr>
<td>2</td>
<td>West Sumatera</td>
<td>0.099</td>
<td>0.050</td>
<td>0.087</td>
<td>0.059</td>
</tr>
<tr>
<td>3</td>
<td>Riau</td>
<td>0.103</td>
<td>0.028</td>
<td>0.072</td>
<td>0.032</td>
</tr>
<tr>
<td>4</td>
<td>Bengkulu</td>
<td>0.099</td>
<td>0.057</td>
<td>0.070</td>
<td>0.062</td>
</tr>
<tr>
<td>5</td>
<td>Lampung</td>
<td>0.107</td>
<td>0.065</td>
<td>0.058</td>
<td>0.074</td>
</tr>
<tr>
<td>6</td>
<td>DKI Jakarta</td>
<td>0.103</td>
<td>0.046</td>
<td>0.113</td>
<td>0.088</td>
</tr>
<tr>
<td>7</td>
<td>East Java</td>
<td>0.106</td>
<td>0.052</td>
<td>0.046</td>
<td>0.107</td>
</tr>
<tr>
<td>8</td>
<td>Central Java</td>
<td>0.098</td>
<td>0.053</td>
<td>0.057</td>
<td>0.093</td>
</tr>
<tr>
<td>9</td>
<td>DI Yogyakarta</td>
<td>0.105</td>
<td>0.043</td>
<td>0.089</td>
<td>0.063</td>
</tr>
<tr>
<td>10</td>
<td>East Java</td>
<td>0.106</td>
<td>0.045</td>
<td>0.100</td>
<td>0.067</td>
</tr>
<tr>
<td>11</td>
<td>Bali</td>
<td>0.111</td>
<td>0.062</td>
<td>0.113</td>
<td>0.078</td>
</tr>
<tr>
<td>12</td>
<td>NTT</td>
<td>0.092</td>
<td>0.056</td>
<td>0.095</td>
<td>0.068</td>
</tr>
<tr>
<td>13</td>
<td>West Kalimantan</td>
<td>0.105</td>
<td>0.063</td>
<td>0.057</td>
<td>0.088</td>
</tr>
<tr>
<td>14</td>
<td>South Kalimantan</td>
<td>0.096</td>
<td>0.057</td>
<td>0.039</td>
<td>0.087</td>
</tr>
<tr>
<td>15</td>
<td>North Sulawesi</td>
<td>0.107</td>
<td>0.044</td>
<td>0.035</td>
<td>0.069</td>
</tr>
<tr>
<td>16</td>
<td>Central Sulawesi</td>
<td>0.110</td>
<td>0.056</td>
<td>0.560</td>
<td>0.070</td>
</tr>
<tr>
<td>17</td>
<td>South Sulawesi</td>
<td>0.097</td>
<td>0.055</td>
<td>0.091</td>
<td>0.064</td>
</tr>
<tr>
<td>18</td>
<td>Southeast Sulawesi</td>
<td>0.107</td>
<td>0.064</td>
<td>0.038</td>
<td>0.089</td>
</tr>
<tr>
<td>19</td>
<td>Maluku</td>
<td>0.099</td>
<td>0.010</td>
<td>0.183</td>
<td>0.069</td>
</tr>
<tr>
<td>20</td>
<td>Papua</td>
<td>0.096</td>
<td>0.042</td>
<td>0.135</td>
<td>0.066</td>
</tr>
</tbody>
</table>

Source: Estimation Result

South Sulawesi is a province with an inflation rate and economic growth averages of 9.7% and 5.5% respectively; whereas inflation target estimation provides a slightly lower rate than experienced, that is 9.1%. With that targeted inflation rate, South Sulawesi’s economy growth target is 1% higher than experienced. It implies that if South Sulawesi can push the inflation rate down to the targeted level, South Sulawesi will have the chance to have a higher economic growth.

Like East Java and South Sulawesi, North Sumatra has a higher average rate of inflation than the targeted rate. However, the difference between the inflation rate experienced (10.5%) and targeted (7.3%) is quite significant, it is about 3%. The difference of actual and targeted
economic growth is also considerable, namely 4%–5.9% and 9.9% for the average actual economic growth and the targeted economic growth, respectively. Another example of a province with a large difference of inflation and economic growth is Central Sulawesi. The region experienced inflation at an average of 11%, and 5.6% for the targeted rate; while the average rate of economic growth was 5.6% whereas the targeted economic growth was 7%.

Even so, lower differential inflation rates (average and targeted) are found in the following provinces, DKI Jakarta, Bali, NTT, Maluku and Papua. DKI Jakarta has an average inflation rate of 10.3% which is slightly lower than that of the targeted rate (11.3%). Nevertheless, the economic growth rate differential is quite large, namely 4%—since economic growth was 4.6% and the targeted rate was 8.8%. This figure implies that DKI Jakarta still has possibilities to an inflation rate of up to 11.3% and enjoy a higher rate of economic growth.

Both Bali and NTT have an average inflation rate that closely approaches the target. It implies that Bali and NTT still have an opportunity to raise their economic growth to a higher level. Other examples are Maluku and Papua. Both of these provinces may be considered as outliers in the sample, therefore, high targeted rates of inflation in Maluku and Papua needs to be interpreted in a very cautious way. Both provinces are located in the far eastern part of Indonesia where transportation and distribution costs may be the causal factors of high inflation targets.

To summarize, most provinces in Indonesia experience higher actual inflation rates than their threshold levels, and further imply lower economic growth. Regions with higher inflation rates should put effort to keep their inflation rates down to the threshold levels. The role of local government in realizing the aims is exceptionally important.

To synchronize the performance of regional economies (growth and inflation) and the regional efficiency scores, the next sub-section discusses the results of inflation-output efficiency estimation in 20 provinces in Indonesia.

3.2 Inflation-Output Efficiency Score Estimation

This section will present the score estimation and the analyses of inflation-output efficiency based on equation (3) above. Other than the actual and targeted inflation rates and economic growth, in order to
obtain the efficiency score estimation, one will need the lambda parameter \((\lambda)\) to solve the loss function minimization in equation (1).

The first part of this sub-section describes the determination of lambda values based on empirical studies in several countries and some considerations fitted to Indonesia’s economic conditions. The second part of this sub-section depicts the efficiency score estimation and analysis.

### 3.2.1 Determination of Lambda

Lambda parameter \((\lambda)\) in equation (1) is actually a weighting factor that indicates that an inflation targeting policy has an effect on an economy. If an inflation targeting policy in a country is considerably applied and has a wide impact to the country’s economy, the value of lambda will be high. Conversely, if a country has not vigorously implemented the policy and still pursues a higher economic growth, the lambda parameter will have a lower value.

Cecchetti (2004) conducted research on 24 countries consisting of developed industrial and developing countries. However, Indonesia was not included in his research. His study used a basic assumption where policy makers wished to reach the 2% inflation target and minimize the output variability around its potential level. Lambda \((\lambda)\) in his research is called the policy maker preference parameter that has a value of 0.8 for all the countries observed, except for Israel, Mexico, Chile, and Greece. For Israel, Mexico, Chile, and Greece, he assigned lambda \((\lambda)\) with the value of 0.3 because these countries had very high inflation rates in the 1980s, therefore, the inflation variability on the loss function should have a lower weight.

For Indonesia, the value assigned for lambda fits to the description of the four countries mentioned earlier, that is 0.3. Two considerations of assigning 0.3 for lambda value are, first, Indonesia experienced inflation fluctuations that fit more with the inflation fluctuation of the four countries compared to other countries whose lambda value is 0.8 such as Australia, Germany, or the United States of America. Moreover, Indonesia experienced a severe economic crisis in 1997-98 when inflation was extremely high, like Mexico experienced in 1980. Secondly, the implementation of inflation targeting in Indonesia is relatively new compared to those countries whose lambda value is 0.8.
3.2.2 Efficiency Score Result

The inflation-output efficiency measures the quadratic deviation between actual inflation and output from each of its target level. Below are the scores of inflation-output efficiency of 20 provinces in Indonesia. Table 3.2 indicates that there are only three provinces with inflation-output efficiency scores above 50%. South Sulawesi is found to be the most efficient province compared to the other nineteen provinces. It has the top score of 100%—implying that South Sulawesi’s performance of actual inflation and output which is very close to the targeted rates. It can be seen from Table 3.1 that the actual inflation average in South Sulawesi is 9.7%, whereas the inflation target is 9.1%. The output growth is 5.5%, whereas the targeted growth was 6.4%. Efficiency scores of other regions are estimated relative to the efficiency score of South Sulawesi.

Table 3.2
Inflation-Output Efficiency Scores of 20 Provinces in Indonesia

<table>
<thead>
<tr>
<th>No.</th>
<th>Province</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>North Sumatera</td>
<td>4.83%</td>
</tr>
<tr>
<td>2</td>
<td>West Sumatera</td>
<td>73.10%</td>
</tr>
<tr>
<td>3</td>
<td>Riau</td>
<td>23.71%</td>
</tr>
<tr>
<td>4</td>
<td>Bengkulu</td>
<td>26.51%</td>
</tr>
<tr>
<td>5</td>
<td>Lampung</td>
<td>8.81%</td>
</tr>
<tr>
<td>6</td>
<td>DKI Jakarta</td>
<td>5.50%</td>
</tr>
<tr>
<td>7</td>
<td>West Java</td>
<td>2.17%</td>
</tr>
<tr>
<td>8</td>
<td>Central Java</td>
<td>4.23%</td>
</tr>
<tr>
<td>9</td>
<td>DI Yogyakarta</td>
<td>19.50%</td>
</tr>
<tr>
<td>10</td>
<td>East Java</td>
<td>20.96%</td>
</tr>
<tr>
<td>11</td>
<td>Bali</td>
<td>41.49%</td>
</tr>
<tr>
<td>12</td>
<td>NTT</td>
<td>75.02%</td>
</tr>
<tr>
<td>13</td>
<td>West Kalimantan</td>
<td>6.00%</td>
</tr>
<tr>
<td>14</td>
<td>South Kalimantan</td>
<td>4.36%</td>
</tr>
<tr>
<td>15</td>
<td>North Sulawesi</td>
<td>3.42%</td>
</tr>
<tr>
<td>16</td>
<td>Central Sulawesi</td>
<td>0.11%</td>
</tr>
<tr>
<td>17</td>
<td>South Sulawesi</td>
<td>100.00%</td>
</tr>
<tr>
<td>18</td>
<td>Southeast Sulawesi</td>
<td>3.69%</td>
</tr>
<tr>
<td>19</td>
<td>Maluku</td>
<td>1.53%</td>
</tr>
<tr>
<td>20</td>
<td>Papua</td>
<td>7.86%</td>
</tr>
</tbody>
</table>

Source: Estimation Result
In general, the scores of inflation-output efficiency for provinces in Indonesia are still very low. The efficiency scores in the provinces of DIY, East Java, Bali, and NTT are relatively higher than those outside Java. The efficiency scores for provinces in Sumatera, except North Sumatera, show quite high scores; whereas other regions show lower scores. Central Sulawesi scored the lowest efficiency. Low efficiency scores indicate large differentials between the average and targeted inflation and output growth rates. Low efficiency scores may be caused by two factors: first, high inflation is occurring in that region, therefore, a higher output growth is harder to attain and even a negative output growth may occur. Second, the determination of lowering inflation have not been vigorously pursued by the respective regional governments. Inflation in the region is barely under control—the average rate of inflation is often far above the targeted rate. Consequently, the overall inflation rate is harder to control by the central bank. For that reason, it is very crucial to create a harmonization and a synergy between local and central government policies.

Regions with low efficiency scores need to control their inflation rate. This can be accomplished by reducing the costs of doing business in the regions—such as minimizing or eliminating fees, particularly illegal ones, that strongly contribute to increasing business costs. Efforts to minimize these additional costs will lower production costs, and in the end, will bring down the inflation rate. Inflation targeting policy, where the policy maker sets the inflation target at a certain level and tries to meet that level, needs to be widely socialized and disseminated throughout the regions. However, it does not mean that every region must have its own monetary policy. Monetary policies should still remain in and be determined by the central bank and applied generally for all regions in the country. Nevertheless, the accomplishment of inflation targeting, transparency and independency in decision making, particularly in reducing high costs, to some extent can be done by local policy makers.

4. CONCLUSION AND RECOMMENDATION

Provinces in Indonesia are in general experiencing high inflation and low output growth rates. They have not achieved the optimal rates yet. High inflation rates among others are caused by a high cost economy; and the importance of inflation targeting has not yet been considered properly by most regions in Indonesia because the policy is still relatively new.
This study concludes that provinces with a higher average inflation rate and lower average output growth than that of the targeted rates will in general have lower efficiency scores. South Sulawesi is the province with the highest efficiency score (100%). It is the reference region to make comparisons on efficiency scores among the other nineteen provinces. Most provinces in Indonesia have low efficiency scores, whereas only three provinces have an efficiency score above 50%. This indicates that a large difference between actual and target levels of inflation and output exists. Regional government should try to bring this difference to a lower level in order to pursue a higher economic growth rate.

Several recommendations can be drawn from this research is: First, in order for every region to have the rates of inflation and economic growth approximating the targeted rates, it must improve its coordination with the central government and other regional governments. Second, the regional government can minimize the inflation level by tackling the high cost economy by eliminating or minimizing illegal fees that causes price distortions. Implementing such a policy, higher regional economic growth can be achieved without raising inflation. To accomplish a desired target level, there would need some transparency, accountability, independence, and good governance, which are required for inflation targeting, to be applied and implemented in regional economic policies.

REFERENCES


Inflation-Output Efficiency in Lowering High Cost Economy: A Comparative Study of Several Provinces in Indonesia


