Inflation Targeting under Imperfect Credibility based on ARIMBI (Aggregate Rational Inflation – Targeting Model for Bank Indonesia); Lessons from Indonesian Experience

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Abstract

Credibility is one of central issues in conducting monetary policy. It is necessary in order to anchor economic agent’s expectation on central bank’s inflation target. A central bank which capable to manage public’s expectation inflation properly would able to implement monetary policy more effective and efficient. This paper try to assess role of credibility in the implementation of inflation targeting framework in Indonesia. It illustrates how credibility may play an important role in the evolution of the Indonesian monetary policy. Knowing the degree of credibility would beneficial for Bank Indonesia (BI) to understand how to adjust policy instrument to achieve a long-term inflation target.

A small open economy model originally based on GPM IMF (Carabenciov et.al, 2008), namely ARIMBI ((Aggregate Rational Inflation – Targeting Model for Bank Indonesia) is developed to analyze how monetary policy affects the economy and how optimal policy should be designed. The model employs a New-Keynesian Phillips Curve (NKPC), an expectation IS curve, an uncovered interest parity (UIP) equation and a monetary policy rule which are basically derived from microfoundation of economic agents’ behaviours. Hence, the model is able to generate key economic variables (inflation, output, interest rate and exchange rate). In addition, we also study how credibility affects these dynamic variables by incorporating add-hoc credibility variable in two alternatives ways: exogen and endogen.

For initial value in the model, we need to measure current value for the credibility index of Indonesian monetary policy. We follow Valentin & Rozalia (2008) dan Cecchetti & Krause (2002) for the

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approaches. Summing up with previous measurement results (such as Harmanta (2009)), we conclude that monetary credibility in Indonesia is not yet perfect credible or, in other words, imperfect credible. In a range scale from zero (purely not credible) to one (perfect credibility), our quantitative measurements found that credibility index for Indonesian monetary policy seems converging to around 0.5.

Refer to projection and simulation results in this paper, the study shows expectation inflation of economic agents is strongly influenced by monetary policy credibility. More credible the monetary policy, inflation expectation would anchor to its target faster. Consequently, most likely actual inflation would anchor also to the target. In turn, disinflation process in long-term target to the low-and-stable inflation would accelerate. In addition to this effectiveness, high credibility is also beneficial in term of efficiency of the monetary policy transmission as disinflation cost (described by sacrifice ratio) would also decrease. In term of two alternative ways on incorporating credibility, the result shows that endogenous way is more realistic than the exogenous one. In addition, we found that under imperfect credibility the central bank prefer to attain its inflation target gradually. Another interesting finding is that if the authority has twice credibility stock then achieving its long-term inflation target required only much shorter time periods (approximately 0.4 periods than the baseline).

JEL Classification: E31, E52, E58, E61
Keywords: Disinflation, Monetary Policy, Imperfect Credibility, Sacrifice Ratio.
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1. INTRODUCTION

1.1 Background

Law No.23 of 1999 mandated to Bank Indonesia (BI) to achieve and maintain the stability of the Rupiah (single objective). Although it is not explicitly formally in the Act, Inflation Targeting Framework (ITF) is currently BI’s monetary policy framework. ITF is characterized by setting an inflation target, announcing to public, and pursue its target as the primary goal of monetary policy. Implementation of the ITF in Indonesia emphasizes the importance of controlling inflation anchored to the target as it is necessary condition for improving overall social welfare. Numerically, low and stable long-term inflation is commonly refer to 3% in order to be competitive with other countries.

ITF could reflected as the framework of forward looking monetary policy, focused on inflation, and inflation expectations of economic agents. According to Mishkin (2000) important features of the ITF are commitment to pursue inflation as a primary goal of monetary policy, announcement of inflation target (including monetary policy measures), and accountability. Some advantages from ITF are a clear inflation target, easily observable and the monetary policy measures easily understood. The framework would provide a nominal anchor of economic agents in forming inflation expectations and predict monetary policy actions. However, to make an inflation target as a nominal anchor needed credible monetary policy.

The most important point in which monetary policy could affect inflation is that when the leading inflation expectations of economic agents are able to be anchored to the central bank's inflation target. There is general agreement that inflation expectations of economic agents is an important variable in carrying out the monetary policy. If economic agents' expectations remain high, the disinflation process would last longer and require great cost (loss of output) (Clarida, Gali and Gertler, 1999). A central bank which able to manage inflation expectations would gain effective monetary policy and thus monetary policy could be said credible (Blinder, 1999).

In some studies indicated that monetary policy credibility problem may arise because of the uncertainty of economic agents about the preferences of monetary authorities. Although the monetary authorities announce an inflation target, but may not be fully credible if the preferences of central banks towards inflation reduction is not too strong (Geraats, 2001; Kozicki and Tinsley, 2003). Economic agents try to interpret preferences based on the monetary authorities of monetary policy actions and performance of inflation and further renew their expectations. King (1996) stressed that transparency would encourage the learning process so that the inflation expectations of economic agents would anchor to the inflation target more quickly.
There are some significant attention associated with disinflation strategy in achieving low and stable inflation, namely: (i) the cost of disinflation, in relation to the trade off of output - inflation (output loss), and (ii) the length of disinflation. Numerous studies show that the disinflation strategy is highly influenced by the credibility of monetary policy. Within the framework of the ITF, if monetary policy is not fully credible (imperfect credibility), the economic agents do not fully believe whether monetary policy could achieve the inflation target so that the learning process of economic agents is very slow. This, in turn, would affect the formation of inflation expectations and the actual inflation also would convergence slowly to the inflation target. Consequently, it would dampen on policy rates and other macro variables (GDP, exchange rate, etc).

\textbf{1.2 Objective and Benefit}

In order to answer several questions related to the impact of monetary policy credibility on the dynamics of main macroeconomic variables, particularly in achieving the inflation target, the study aimed to develop a model namely ARIMBI (Aggregate Rational Inflation - Targeting Model for Bank Indonesia), which is equipped with credibility features. Specifically, the research objectives are:

- measuring the degree of credibility of monetary policy in Indonesia;
- studying the dynamics of the credibility of monetary policy in Indonesia and its impact on the dynamics of key macroeconomic variables (inflation, GDP, exchange rates, interest policy rates)
- conducting simulations to obtain how big the cost of disinflation and how fast the process of disinflation to inflation target over medium term and long term in Indonesia with knowledge of the degree of credibility of monetary policy.

By adding credibility feature into model, we expect ARIMBI could generate an optimal trajectory of the main macroeconomic variables, namely GDP, inflation, interest rates and exchange rates. Furthermore, ARIMBI with Imperfect Credibility could be utilised for simulation and forecasting of monetary policy to support achieving low and stable inflation with minimum output loss based on knowledge about its credibility.
1.3 Research Limitation

ARIMBI with Imperfect Credibility has been used to conduct simulations and projections of economic policy by adding features of monetary policy credibility. There are two methods to add such features: exogenous and endogenous. Degree of credibility is measured by considering the extent to which inflation targeting monetary authority is trusted by economic agents in forming inflation expectations. Smaller deviation between the inflation expectations of economic agents and its target inflation, higher the policy credibility. ARIMBI model is developed using IRIS toolbox in Matlab environment which possibly for programming, parameter estimation, manage data and conduct simulations and forecasting.

1.4 Paper Organization

This research is arranged as follows:

Chapter 1. Introduction, explains the background of development models, objective and benefit, and research limitation.

Chapter 2. Theoretical Review, discuss about macroeconomic models, stylized facts of Indonesian economy in recent years, and the credibility of monetary policy.

Chapter 3. Methodology and Model, describes model structure and transmission mechanism with imperfect credibility and equations in the model.

Chapter 4. Results and Analysis, presents results of simulations and projections using this model, particularly related to its cost and periods of disinflation process.

Chapter 5. Conclusions and Policy Implications, presents conclusions from this study and policy implications. In addition, we suggest some potential improvement in model development.
2. THEORETICAL REVIEW

2.1 Model Review

In general, the structure of macroeconomic models are built with the aim to capture the reality of the workings of an economy that is reflected from the interaction relationships of various economic variables. Basically there are two main objectives of macroeconomic modeling, namely: (i) preparing economic projections (economic projection), and (ii) policy impact analysis (policy simulation). Refers to the practice of modeling done by the various central banks who hold the ITF, a reliable macroeconomic model must fulfill several characteristics: (i) to reflect the characteristics of economic structure and is able to produce a comprehensive analysis of the main determinants of inflation, (ii) represents the workings of monetary policy transmission mechanism; (iii) equipped with a policy rule, suppose the interest rate, Taylor rule, and put the inflation target and an explicit expectation formation mechanism therein, (iv) consistent with its underlying theory (theoretically consistent), and (v) has a well-defined steady state and could produce projections / analysis that are consistent with theory.

Macro economic modeling that is directed to generally characterized by short-term projection and use a lot of historical data (time series) doped with econometric methods. Econometric models may plausible to produce short-term forecasting of economic variables, but the estimated relationship between variables is usually less well when used as a benchmark to evaluate a policy (policy simulation). While the policy simulation is usually more of a medium and long term, highly theoretical orientation and its ability to explain real world phenomena could be validated with historical data. One of the economic model used for policy simulation was built based on micro-economic foundations, is dynamic (dynamic path), prepared on the general principle of equilibrium, and is operated by entering a stochastic shock that is so often known as the Dynamic Stochastic General Equilibrium (DSGE).

In practice, there is usually a trade off between accuracy projection resulting from the econometric model and the medium-long term policy simulation obtained from the DSGE model. Projections generated from Econometric models and the direction is not necessarily commensurate with the simulation results issued by the DSGE model. Short-term projections based on the goodness of fit is good from the econometric model, not necessarily aligned with the DSGE model simulation results. Based on its trade-offs, since 2008 BI start to develop a model that combines the advantages of econometric models (Bayesian Econometric estimation method adopted) and DSGE (New Keynesian macroeconomic model) so that it could be used for projection and policy simulation.
ARIMBI with Imperfect Credibility could be classified as a semi-structural model which derived from a simple DSGE model. The equation used in the model is ad-hoc basis, in the sense of not purely derived from standard equations as DSGE model. This provides flexibility in model development as the emphasize of this research is on policy-oriented sense.

### 2.2 Inflation Behavior and Expectation in Indonesia

In the last two decades, Indonesian inflation behavior was in the high single digit level. By removing the crisis period, average inflation is around 8.5%, with a level of volatility (standard deviation) is quite high. After eliminating the effect of structural shocks (shocks), inflation in Indonesia is still reached 7.9%. However, core inflation tends to decline relative to an average of more than 7.4% after the implementation of the ITF (Table 2.1). If there is no surprises from the supply side and demand side, then inflation would tend to lead to a level of core inflation. Indonesian inflation is relatively high compared to other ASEAN countries (Thailand, Malaysia, Singapore or the Philippines), see Figure 2.1.

<table>
<thead>
<tr>
<th>Period</th>
<th>IHK</th>
<th>Inti</th>
<th>VF</th>
<th>Adm</th>
<th>Std. Deviasi IHK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before ITF (2000.01 - 2005.06)</td>
<td>7.94</td>
<td>7.69</td>
<td>4.47</td>
<td>14.96</td>
<td>4.34</td>
</tr>
<tr>
<td>After ITF (2005.07 - 2009.08)</td>
<td>9.75</td>
<td>7.41</td>
<td>14.18</td>
<td>13.33</td>
<td>4.35</td>
</tr>
<tr>
<td>Total (excluding crisis)</td>
<td>8.47</td>
<td>7.93</td>
<td>8.84</td>
<td>11.44</td>
<td>3.40</td>
</tr>
</tbody>
</table>

Table 2.1 Inflation Disaggregation in Indonesia

[Graph 2.1 Comparison of Inflation in ASEAN Region]
The phenomenon of high inflation, which survived despite eliminating shocks led to the hypothesis of inflation persistence. If persistence is defined as the time required to return to the original level after the occurrence of shocks, then the above facts have implications for the persistence of high inflation Indonesia. Several studies have been done to confirm it (Alamsyah, 2008). Persistence of CPI inflation and disaggregated by groups of goods and services to be around 0.8 to 0.9, although generally showed decreasing trend between the periods before and after Asian Crisis (1997)

Decrease in the degree of inflation persistence is also consistent with research due to Yanuarti (2007).

Furthermore, the high persistence of inflation in Indonesia was influenced by inflation expectations. Some studies in Indonesia in recent years also demonstrate the importance of inflation expectations on inflation forming. Therefore, inflation expectations must be considered in formulating monetary policy in order to achieve the inflation target.

In the transition period and the implementation of ITF since 2000-2009, the actual inflation rate is more often out of target range. It was mainly due to large shocks in the domestic economy, both in terms of food supply and distribution (volatile food) and pricing policies set by the government (administered prices). Unfortunately, core inflation is also often higher than the CPI inflation target.

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2 Estimation of the persistence was completed by employing an autoregressive univariate model. By adopting the formula of Gujarati (2003) contained in the Alamsyah (2008), the persistence of inflation from 0.8 to 0.9 means that if there is a surprise then 50% of those surprises would be absorbed within a period of 4-9 months and the rest would be absorbed as inflation trip back to the normal average length of term. Long computation time required to absorb 50% shocks using a formula calculating the mean lag \( \frac{\rho}{1-\rho} \), with \( \rho \) is the degree of persistence.

3 Hutabarat (2005) also found that inflation expectations of economic agents in the period 1999-2004 was dominated on inflation formation than the output gap, administered prices, supply shocks, and exchange rates.

4 A study by Chatib Basri, Damayanti and Sutisna (2002) from LPEM - UI indicates that the source of most major Indonesian inflation is expected inflation, followed by exchange rate depreciation, and after that the money supply.
Besides the problems mentioned above, the high inflation in Indonesia is also sourced from external influence, including exchange rate pass through effect and world commodity prices. Additionally, the inevitable fact is that quite dominant of phenomenon shocks that spread through the follow-up expectations which in turn would core inflation. For example, inflationary pressures in 2005 and 2008 was originating from the external shocks coming from the increase in global commodity prices of both energy and food commodities. The increase in world oil prices has prompted the government to raise fuel prices by an average of up to 28.7%. In addition to providing a direct impact on inflation, the impact of this second round effect would also contributed to push the inflation rate. In general, in almost a decade, the deviation between actual inflation and target due to good fundamentals as well as non-fundamental shocks are closely associated with supply side management. Given the monetary policy tools are more suitable to solve the problem on the demand side, the supply side problems requires coordination between institutions including Bank Indonesia and the government and its related agencies.

With the above facts, the work brings to the decline in inflation (disinflation) is not an easy task. Characteristics of inflation that tend to persistent bring consequence the slow process of disinflation. One of the research (Alamsyah, 2008) showed that persistence is caused primarily by the formation of inflation expectations which mostly in backward looking manner. This occurs due to fairly large proportion of producers who do not adjust their price and maintain price to the previous\(^5\). The Survey of Price Formation Mechanism (in 2000 and 2003) confirmed

\(^5\) In the formation of inflation within the framework of NKPC equation (the New Keynesian Phillips Curve), it is assumed that the firm faces a monopolistic competition market structure so there are companies that could determine
the relative reluctance of price changes in producer level. The survey showed that price is less flexible and company rarely made changes in its price (only 1-2 times a year).

This backward looking manner in forming of inflation expectation is also indicated in other regular surveys, both metric (stating level) and non-metric (only direction). BI’s Inflation expectations surveys cover a range of respondents: consumer level (Survey of Consumer-BI), traders (Retail Sales Survey-BI), enterprises (Business Survey-BI) and economists (Market Perception Survey-BI and Consensus Forecast (CF)). In general, these surveys confirm a correlation of expectation with its lag actual inflation. For example, in CF, inflation expectations move in line with actual inflation. In addition, backward-looking nature is also demonstrated through empirical observations, in which the average of last six month of actual inflation has a significant explanatory power on inflation expectations (Bank Indonesia, 2008).

On the other hand, forward-looking is seems indicated in spite of in very short term. This is partly visible from inflation expectations on Survey of Consumer for three months periods that have a high correlation with actual inflation at t +1 and t +2. Regression testing with the involvement of other macroeconomic variables also showed that inflation expectations three months on Survey of Consumer has explanatory power of ahead core inflation projection in very short term ie 2-3 months. This indicates that inflation expectations from surveys have been able to act as an indicator of inflationary pressure despite the very short term.

In general, though backward looking behavior is quite dominant in the inflation formation in Indonesia, this tend to decline in period after Asian Crisis (1997). Conversely, Alamsyah (2008) found that forward looking behavior tends to increase in the period after the crisis. As backward looking behavior is declining, degree of inflation persistence is seems declining. From groups of commodities perspective, the decline of inflation persistence mainly occurred in clothing goods and imported goods as the increasingly competitive market structure. Hence, decreasing the degree of inflation persistence would bolster the growing role of monetary policy to control inflation.

the price (price setting) because it has little monopoly power. However, most companies still keep its price by indexation to a price before (backward looking). With this assumption, we would get the hybrid NKPC, in which inflation expectations would be influenced by the backward looking and forward looking and the output gap (as a proxy of marginal cost).
2.3 Inflation Persistence, Credibility Issue, and Disinflation Process

2.3.1 Inflation Persistence and Policy Credibility

The high persistence of inflation in the midst of current economic conditions facing pressure from both external and domestic causes of disinflation efforts towards low and stable inflation in the medium-long term have a very serious challenge. It should be noted also that the ability of central banks in controlling inflation is not on overall CPI inflation, but only limited to core inflation (core inflation) that are influenced mainly by fundamental factors, namely the output gap, exchange rates, particularly on prices of imported goods (imported inflation), and inflation expectations. Meanwhile, other components such as volatile food and administered prices as part of the CPI inflation rate are not a central bank domain. Thus, the rate of low and stable inflation could not be achieved solely through the monetary policy of Bank Indonesia, but also determined by fiscal and other economic policies pursued by the Government. In addition to reducing the exchange rate pass through effect into inflation, it is necessary to also support policies to keep exchange rate volatility is not too large.

As noted earlier, core inflation contributes to CPI inflation more dominant than volatile food and administered. In this case, core inflation is more influenced by inflation expectations that occurred in the community compared to the output gap and exchange rates. To that end, the inflation target and monetary policy measures and monetary instruments used to achieve it should be communicated effectively to public to influence and shape inflation expectations.

Hence, credibility of monetary policy is essential to achieve a central bank’s goal, namely low and stable inflation. Within ITF, if economic agents believed that monetary policy would be capable or credible in achieving its inflation target, the inflation expectations of economic agents would soon anchored to the inflation target so that actual inflation would also be anchored on the inflation target. This would further reduces inflation persistence. More credible monetary policy, adjustment process of economic agents on anchoring inflation expectations with the target would be quick, and vice versa. As a common indicator, deviation between inflation expectations and actual inflation towards the inflation target is employed to indicate the credibility.

Erceg and Levin (2003) showed that the low credibility of monetary policy of the US in 1980-1985 led to the persistence of high inflation and high cost (sacrifice ratio). An important implication of these findings is that the persistence of inflation is not an inherent characteristic of an economy but diversity associated with the credibility of monetary policy. It is shown that the persistence of inflation would be lower if monetary policy is credible, and otherwise create a high persistence of inflation when monetary policy is not fully credible (imperfect credibility) because economic agents have not fully believe in the inflation target in the future (forward looking).
Due to high persistence of inflation, rapid process on disinflation would be very expensive as it requires tight interest rates that could cause a huge of output loss. Consequently, to achieve the objectives of monetary policy and minimizes the loss of social welfare then the monetary authority tends to make gradual disinflation. If the decline in actual inflation that occurred is not significant then inflation expectations of economic agents would adjust only marginally to the inflation target. Moreover, economic agent would rely on backward looking behavior which increases the persistence of inflation.

Observations on Indonesia economy shows that the credibility of monetary policy in Indonesia is relatively low, and it contributes to the persistence of high inflation (Harmanta, 2009). However, in line with the implementation of the ITF, the credibility of monetary policy has improved. This is reflected by increasing of Kalman Gain\(^7\) parameter from around 0.2 in the period before implementation of the ITF (July 2005) to approximately 0.4 in the period after ITF implementation. It may be argued that with the increased credibility of monetary policy after the ITF, inflation tends to be influenced by the behavior of forward looking economic agents. As a consequence, declining inflation persistence would lead inflationary expectation to the target due to monetary authority\(^8\).

This is consistent with the observation of Orphanides and Williams (2007). Their study indicates that the formation of inflation expectations experienced by pointing at the target inflation as the main target of monetary policy in the era of the ITF would facilitate the learning process of economic agents better than non-ITF era with multiple objectives. This process would cause inflation expectations of economic agents become more forward looking and anchored to inflation target. The results are also consistent with Siregar and Goo (2008) which showed that inflation inertia in Indonesia has decreased for both non-tradable goods and tradable goods in the period of implementation of the ITF as compared to the period before implementation of the ITF.

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\(^7\) Technically, the Kalman Gain parameter captures a projection by economic agencies on an inflation target of monetary authorities in the Taylor rule equation through the derivation of Kalman filter. Kalman gain parameter reflects the learning process of economic agents about the target inflation so that monetary authorities could be used as a measure of the degree of credibility of monetary policy. The faster of learning process by economic agents about the inflation target of monetary authorities then the higher degree of credibility of monetary policy. Kalman Gain value is between 0 and 1, where it is getting closer to a more credible monetary policy.

\(^8\) The behavior of economic agents that are more forward looking in inflation formation during the period of ITF implementation is in line with the findings due to Solikin (2004), Yanuarti (2007), and Alamsyah (2008).
Table 2.2. Actual, Expectation, Inflation Target & Monetary Policy Credibility

<table>
<thead>
<tr>
<th>Tahun</th>
<th>IHK Aktual</th>
<th>Ekspektasi IHK</th>
<th>Target IHK</th>
<th>Mistake (1)</th>
<th>Surprise (2) – (1)</th>
<th>Anchoring (2)</th>
<th>Credibility *</th>
<th>Credibility *</th>
<th>Credibility *</th>
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<tbody>
<tr>
<td>2000</td>
<td>9.35</td>
<td>10.61</td>
<td>6.00</td>
<td>3.35</td>
<td>1.26</td>
<td>4.61</td>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>12.55</td>
<td>14.29</td>
<td>7.25</td>
<td>5.30</td>
<td>1.74</td>
<td>7.04</td>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>10.03</td>
<td>12.12</td>
<td>9.50</td>
<td>0.53</td>
<td>2.09</td>
<td>2.62</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>5.06</td>
<td>8.04</td>
<td>9.00</td>
<td>-3.94</td>
<td>2.98</td>
<td>-0.96</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>6.40</td>
<td>7.38</td>
<td>5.50</td>
<td>0.90</td>
<td>0.98</td>
<td>1.88</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>17.10</td>
<td>9.75</td>
<td>6.00</td>
<td>11.10</td>
<td>-7.35</td>
<td>3.75</td>
<td>32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>6.60</td>
<td>9.20</td>
<td>8.00</td>
<td>-1.40</td>
<td>2.60</td>
<td>1.20</td>
<td>23</td>
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<td></td>
</tr>
<tr>
<td>2007</td>
<td>6.60</td>
<td>7.47</td>
<td>6.00</td>
<td>0.60</td>
<td>0.87</td>
<td>1.47</td>
<td>47</td>
<td></td>
<td></td>
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<tr>
<td>2008</td>
<td>11.06</td>
<td>7.75</td>
<td>5.00</td>
<td>6.06</td>
<td>-3.31</td>
<td>2.75</td>
<td>37</td>
<td></td>
<td></td>
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<tr>
<td>2009</td>
<td>2.78</td>
<td>4.90</td>
<td>4.50</td>
<td>-1.72</td>
<td>2.12</td>
<td>0.40</td>
<td>51</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) Credibility: the number of respondents that have a range of inflation expectations in inflation targeting monetary authority (Business Survey - BI, processed).

Meanwhile, Business Survey – BI (SKDU) with 2000 companies as correspondent showed that 51% of the number of companies anchored their inflation expectations to the target at the end of 2009. This number has increased significantly compared to around 24% in the early implementation of the ITF. If the results of the survey could be used as one of proxy for the degree of credibility of monetary policy, the credibility of monetary policy has increased from approximately 0.24 to 0.51 in line with a consistent implementation of the ITF, see Table 2.2.

2.3.2 Monetary Policy Credibility and Disinflation Process

Theoretically, the ITF aims to achieve a low and stable inflation. Experience in several countries ITF showed that the inflation target set has the characteristics: (i) quite low, (ii) have a low inflation volatility, (iii) is quite challenging to achieve by the bank central, and (iv) could be achieved with a minimum loss of output.
Empirically based on the experience of many countries, they have several strategies to reduce inflation to low and stable level. In general, developed countries that have a low inflation level, (ie single digit) are aggressively pursuing a strategy of disinflation directly to level-term inflation of about 2.0% - 3.0%. While developing countries have a fairly high level of inflation (ie double digit) usually use gradual disinflation strategy with short-term inflation target with speed decrease of about 0.8% per year before converging to the level of long-term inflation around 2.0% - 3.0% (Roger and Stone, 2005)\(^{10}\).

Observations for the Indonesian case shows that the disinflation process conducted monetary authorities would bring the cost of sacrifice in the form of decline in economic growth, given that monetary policy is not credible (Harmanta, 2009)\(^{11}\). In this case, in line with monetary policy in Indonesia that are still not fully credible, the learning process towards the reduction of economic agents inflation target toward low and stable inflation is slow. This causes the process convergence of perceptions or expectations of economic agents to inflation target runs slowly and gradual\(^{12}\). With reference to these conditions, the strategy of disinflation in Indonesia during the period 2000 - 2008 tend to be gradual. In this case the speed of disinflation in Indonesia during the period of transition and implementation of the ITF, from 2000 - 2008 is was approximately -0.5% per year, slightly lower than average disinflation rates of developing countries amounted to -0.7% per year (Roger and Stone, 2005).

Gradual procees in the disinflation in Indonesia is very basic. This is due to the imperfect credibility. If monetary policy is too aggressive for make disinflation in a short time then it would lead to high costs of disinflation in the form output loss and sacrifice ratio. In the context of small open economy, the impact of rapid rate reduction of inflation in imperfect credibility situation would provide very high pressure to the appreciation of the exchange rate thus

\(^{10}\) Some researchers showed that the strategy is strongly influenced by the credibility of disinflation policy central bank monetary. Developed countries are considered more credible monetary policy tends implementing an aggressive strategy of disinflation because monetary policy is able to guide inflation expectations of economic agents and actual inflation to its target quickly. Hence, interest rate response would be optimal and would not cause a large loss of output. While developing countries are considered less credible, the strategy of disinflation is likely to apply gradually as monetary policy has not been able to guide fully inflation expectations so that response rates could not optimal and may cause large loss of output.

\(^{11}\) As shown by Ball (1994, 1995) and Roberts (1997), disinflation could be done without sacrificial fee (costless) significantly during inflation expectations are rational pure inflation (purely rational expectation) and monetary policy is fully credible (perfect credibility).

\(^{12}\) In such a situation is not fully credible monetary policy so that inflation expectations principals actual inflation and slow economic convergence of the inflation target, the monetary authority considers that rapid disinflation would require a response of interest rates so large that they could disinflation raises the cost of very expensive form of output loss is very high. Consequently, to run a monetary policy that minimizes the loss of social welfare then the central bank pursuing a strategy of gradual disinflation. Observing economic agents dynamics of the monetary policy pursued by looking at actual inflation compared inflation target. By looking at the decline in inflation that is not too large to provide new information a little so that inflation expectations of economic agents would adjust only marginally against the central bank inflation target.
exacerbating the trade off inflation - output\textsuperscript{13}. In addition, the strategy of gradual disinflation is chosen as considering these factors: inflation level sometimes reached double digits, moderate degree of persistence, and mainly on backward looking behaviour.

![Graph 2.4 Projection of Disinflation Process](image)

With this strategy, the achievement of long-term inflation target in Indonesia is expected to take quite a while. However, it is also highly influenced by the development progress of the credibility of policy itself and the dynamic of public learning process. Related to this issue, an empirical study due to Cukierman (2005) showed that one of the characteristics of the stabilization of inflation from double digits to mid-long term inflation is it should be done in gradual disinflation. Experience from some countries, such as Chile, also showed that the process of disinflation to the level of low and stable inflation within the framework of ITF requires less than 36 quarters, or nearly 9 years (Schmidt-Hebbel and Werner, 2002). In fact, apart from Indonesia, there are still some developing countries that implement ITF but still disinflation process are on going, such as the Philippines - since 2002, Colombia - since 1999, Romania - since 2005, and Turkey - since 2006 (Roger, 2009).

\textbf{2.4 Various Measurement of Monetary Policy Credibility}

Implementation of monetary policy on inflation targeting framework (ITF) could not be separated from the inflation expectations of economic agents. This is due to the inflation targets set by central banks, there are two polar possibilities that are trusted by economic agents (and

\textsuperscript{13} When monetary policy is not fully credible, the slow decline of interest rates would possibly generate a larger output loss. Monetary policy that seems likely to tight would affect the behavior of economic agents in doing so thus consumption is slow down. Further more, it affects the production side then finally the output would not be increase. In overall, this mechanism is reflected in the Sacrifice Ratio.)
scrolling to be expected) or not trusted. Level of confidence of economic agents is an abstract object, but it is very important that the inflation target is achieved. In other words, the level of confidence from economic agents is directly proportional to the level of central bank credibility. The higher level of confidence of economic agents, the higher the credibility of monetary policy thus inflation expectations would anchor to the inflation target of monetary authorities.

Blinder (1999) defines credibility as a "words matching deeds". Compatibility between words and actions is what actually became the core of the credibility. In inflation-targeting context, an institution is considered credible if these institutions truly run its monetary policy to achieve what has been stated. That definition is similar to Svensson (1999) who showed that a credible monetary policy is reflected in the close relationship between inflation targets with inflation expectations of economic agents, and thus contrary to policies which are not credible. Despite the general definition could be varies, for a technical measurement of credibility (credibility index), there are several options. Given the nature of unobserved, level of credibility is generally defined in the form of value in the range from 0 (not credible) to 1 (perfectly credible).

Valentin and Rozalia (2008) offers a method of measuring the credibility of monetary policy as formulated as follows:

\[
ICI_{\text{adjusted}} = \begin{cases} 
1 - \frac{|\pi^e - \pi_{\text{target}}|}{\pi_{\text{target}}}, & \text{if } |\pi^e - \pi_{\text{target}}| \leq \pi_{\text{target}} \\
0, & \text{if } |\pi^e - \pi_{\text{target}}| > \pi_{\text{target}} 
\end{cases}
\]

With \(\pi_e\) is inflation expectations of economic agents (private sector) and \(\pi_{\text{target}}\) is the central bank inflation target. For illustration, in terms of successfully anchored inflation expectations perfectly on target for inflation (\(\varepsilon\pi = \text{target } \pi\)), then from the equation above would be a valuable index gained credibility or perfect credibility. Conversely, if inflation expectations are very high and higher than twice the inflation target, then the credibility index would be valued at 0 or is not credible (no credibility). It is worth to mention that, this approaches imposes "symmetric punishment".

As an alternative measurement of the credibility of monetary policy, Cecchetti and Krause (2002) formulates as follows:
With $\pi_e$ is inflation expectations of economic agents (private sector) and $\pi_{\text{target}}$ is the central bank's inflation target. Referring to the formula above, if inflation expectations miss the upper bound of 20%, then the credibility index would be worth 0 automatic (not credible). Unlike previous measures, Cecchetti and Krause (2002) does not impose symmetric punishment and inflation expectations are moving under an inflation target represents a success for the central bank and the credibility index value 1 (perfect).

Within the framework of this ITF, credibility becomes crucial, particularly for central banks in developing countries which are not usually independent from the interests of the government or political establishment. This credibility could be built also through communication and transparency to the public. Through these efforts, the public trust to the central bank would increase and in turn inflation expectations in the community could anchor on inflation targets. Achieving low and stable inflation is a prerequisite for good macroeconomic developments. Central banks have substantial flexibility in conducting monetary policy (eg. consider economic growth, stable exchange rate, the existing business cycle, boom, asset price), but their main responsible is attaining medium-long term inflation target. Thus, the ITF framework is often described as "constrained discretion" (Bernanke and Mishkin, 1997). Constraint is manifested through high transparency and accountability of central banks, in order to build the credibility of monetary policies on disinflation process and to reduce time-inconsistency problem.
3. METHODOLOGY & MODEL

3.1 Model Structure and Its Mechanism Transmission

ARIMBI with Imperfect Credibility is a small scale model of a quarterly macroeconomic model adopted from GPM (Global Projection Model) IMF with the added feature of monetary policy credibility. However, because Indonesia does not have a good rate of unemployment data, the unemployment rate equation is not implemented. This model is a form of interaction of the main macroeconomic variables, namely output, inflation, short term interest rate, exchange rates and monetary policy credibility. This model is basically a gap model, where the gap for each variable to the value of balance is the essence of modeling. In addition there are also several other variables and the equation of identity that complements the model.

Prior to further review the existing equation in each model, we first explain shortly the relationship between macroeconomic variables and the transmission mechanism of the model.

3.1.1 Model Structure

Relationships between variables in ARIMBI with Imperfect Credibility described in the following chart.

Diagram 3.1 Model Structure of ARIMBI with Imperfect Credibility
The figure above shows that there are four primary behavioral equations in the model, namely the inflation equation New Keynesian Phillips Curve (NKPC), the output gap, uncovered interest rate parity (UIP) and the Taylor rule. Inflation equation, besides influenced by forward and backward looking inflation itself, is also influenced by the output gap, inflation of changes in oil prices and real exchange rate. Output gap equation is affected by the backward and forward looking variable itself, the real interest rate, real exchange rates and external demand (captured by the US GDP). Taylor Rule equation for determining the nominal policy interest rate is influenced by the real interest rate, deviations of inflation from target and output gap. While UIP, which is a deviation between the expectations of the exchange rate, interest rate differentials are influenced by both domestic and foreign (rest of the world).

One important assumption on the model, the attainment of inflation targets with minimum cost is strongly influenced by the credibility of monetary policy. There are two ways to capture the dynamics of the credibility of monetary policy in a model these are exogenous and endogenous. Modelling exogenous credibility of monetary policy assumes that the credibility of monetary policy moves follow the auto regressive AR (1). While modeling the endogenous credibility of monetary policy is to assume that the credibility of monetary policy is the nature of stock and would be increased or decreased in accordance with the past performance of the previous inflation target. In this case the better past performance, then the credibility of monetary policy would increase from the previous. More detail, increasing the credibility of monetary policy would cause inflation expectations getting closer to target inflation, then forecasting future inflation would getting closer to the inflation target. In other words, the higher the credibility of monetary policy, then inflation expectations and actual inflation would sooner anchored to the inflation target.

3.1.2 Transmission Mechanism of Monetary Policy and Credibility

As a model designed to support the inflation targeting framework, ARIMBI with Imperfect Credibility have the transmission mechanism on how BI rate as monetary policy tool could be used to achieve the inflation target. The model has an inflation target which is placed as an anchor, namely an inflation target to be achieved. Suppose, there is shock that affects the path of inflation to its target then the model could be used to simulate an appropriate monetary policy to driven back inflation to its target, in addition to the use of professional judgments.
Interest rate as monetary policy tool is expected to drive inflation towards the target through multiple transmission lines. Interest rates could affect inflation through the output gap and real exchange rate. The output gap could directly affect inflation as an illustration of the existence of excess demand, while the real exchange rate could be directly (direct passthrough) affect inflation as a description of the imported inflation, and exchange rates could also indirectly (indirect passthrough) affect inflation through the output gap as the overview of the export activities that would increase aggregate demand.

Meanwhile, the transmission mechanism of monetary policy credibility is a brief look at how much confidence of economic agents on monetary policy in achieving the inflation target. Within the framework of the ITF, if economic agents believe that a credible monetary policy in achieving the inflation target, the inflation expectations of economic agents would soon anchor to the inflation target thus actual inflation would also be anchored to the target. The more credible monetary policy, the process of adjustment of economic agents to the inflation target would be quick, and vice versa.

3.3 Data

There are eight variables, namely real GDP, CPI inflation, short-term interest rate, exchange rate, U.S. inflation, Fedfund rate, U.S. GDP and world oil prices (Minas). Before the filtering process to separate the variables and its gap and trend, firstly, observed variables are removed from its seasonal effects by employing X12 US Census Bureau. Filtering process generally uses the HP filter method with some adjustment to the level and trend growth in the variable.

The data used is since 2000Q1 to 2009Q4. Indonesia does not use long historical data for several reasons, among them is that before 1997 Indonesia implemented fixed exchange rate regime and there is a significant jump in the data due to economic crisis in the late 90s period.

3.3 Calibration Parameters

Behavioral parameters is a parameter that would determine the dynamics of the model towards long-term equilibrium or steady state. Behavioral parameters in ARIMBI model using parameter calibration approach based on parameters in other model BISMA constructed by Bank Indonesia and some other studies both from domestic and abroad that have similar characteristics with the Indonesian economy. The following baseline parameters used in ARIMBI:
Table 3.1 Behaviour Parameters

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>beta1</td>
<td>Backward Looking Param on Output Gap Eq.</td>
<td>0.8</td>
</tr>
<tr>
<td>2</td>
<td>beta2</td>
<td>Forward Looking Param on Output Gap Eq.</td>
<td>0.1</td>
</tr>
<tr>
<td>3</td>
<td>beta3</td>
<td>Real Interest Rate Param on Output Gap Eq.</td>
<td>0.15</td>
</tr>
<tr>
<td>4</td>
<td>beta4</td>
<td>External Demand Param on Output Gap Eq.</td>
<td>0.15</td>
</tr>
<tr>
<td>5</td>
<td>beta5</td>
<td>Real Exh. Rate Param on Output Gap Eq.</td>
<td>0.01</td>
</tr>
<tr>
<td>6</td>
<td>beta6</td>
<td>World Oil Price Param on Output Gap Eq.</td>
<td>0.01</td>
</tr>
<tr>
<td>7</td>
<td>lambda1</td>
<td>Backward Looking Param on Inflation Eq.</td>
<td>0.5</td>
</tr>
<tr>
<td>8</td>
<td>lambda2</td>
<td>Output Gap Param on Inflation Eq.</td>
<td>0.05</td>
</tr>
<tr>
<td>9</td>
<td>lambda3</td>
<td>Real Exh. Rate Param on Inflation Eq.</td>
<td>0.02</td>
</tr>
<tr>
<td>10</td>
<td>lambda4</td>
<td>World Oil Price Param on Inflation Eq.</td>
<td>0.01</td>
</tr>
<tr>
<td>11</td>
<td>gamma1</td>
<td>Smoothing Param on Taylor Rule</td>
<td>0.8</td>
</tr>
<tr>
<td>12</td>
<td>gamma2</td>
<td>Inflation Gap Param on Taylor Rule</td>
<td>1.575</td>
</tr>
<tr>
<td>13</td>
<td>gamma3</td>
<td>Output Gap Param on Taylor Rule.</td>
<td>0.5</td>
</tr>
<tr>
<td>14</td>
<td>sigma</td>
<td>Forward Looking Param on Output Gap Eq.</td>
<td>0.95</td>
</tr>
<tr>
<td>15</td>
<td>rho_pieter</td>
<td>AR(1) param on Inflation Target Eq.</td>
<td>0.8</td>
</tr>
<tr>
<td>16</td>
<td>rho_incred</td>
<td>Smoothing param on Incredibility Eq.</td>
<td>0.9</td>
</tr>
<tr>
<td>17</td>
<td>alpha*</td>
<td>Past Performance Param on Incredibility Eq.</td>
<td>0.1</td>
</tr>
<tr>
<td>18</td>
<td>rho_ygap_star</td>
<td>AR(1) param on Foreign Output Gap Eq.</td>
<td>0.8</td>
</tr>
<tr>
<td>19</td>
<td>rho_i_us</td>
<td>AR(1) param on Foreign Interest Rate Eq.</td>
<td>0.8</td>
</tr>
<tr>
<td>20</td>
<td>rho_dcpi_us</td>
<td>AR(1) param on Foreign Inflation Eq.</td>
<td>0.8</td>
</tr>
<tr>
<td>21</td>
<td>rho_dybar</td>
<td>AR(1) param on Output Trend Eq.</td>
<td>0.8</td>
</tr>
<tr>
<td>22</td>
<td>rho_prem</td>
<td>AR(1) param on Risk Premium Eq.</td>
<td>0.8</td>
</tr>
<tr>
<td>23</td>
<td>rho_rbar_us</td>
<td>AR(1) param on Foreign Real Int Rate Trend Eq.</td>
<td>0.8</td>
</tr>
<tr>
<td>24</td>
<td>rho_rpoilgap_us</td>
<td>AR(1) param on Foreign Inflation Eq.</td>
<td>0.8</td>
</tr>
</tbody>
</table>

* Endogenous Credibility Model only

In addition to behavioral parameters, there are steady state parameters that must be included. This parameter reflects a state in the long term that would be aimed. The magnitude of this parameter is obtained based on historical average consideration of existing and vision coupled with the Indonesian government that would be aimed for the long term. Here are some of the steady state parameters included in the model:

Table 3.2 Steady State Parameters

<table>
<thead>
<tr>
<th>No</th>
<th>Parameter</th>
<th>Description</th>
<th>Value (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>growth_ss</td>
<td>Pertumbuhan PDB</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>r_us_ss</td>
<td>US Real Interest Rate</td>
<td>0.5</td>
</tr>
<tr>
<td>3</td>
<td>dz_ss</td>
<td>Real Exchange Rate Dep</td>
<td>-1.5</td>
</tr>
<tr>
<td>4</td>
<td>prem_ss</td>
<td>Risk Premium</td>
<td>2.5</td>
</tr>
<tr>
<td>5</td>
<td>pietar_ss</td>
<td>Inflation</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>dcpi_us_ss</td>
<td>US Inflation</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>cpiplus</td>
<td>Maximum Punishment on Inflation</td>
<td>0.5</td>
</tr>
</tbody>
</table>
Assuming a steady state value as mentioned above, it implies that the steady state real interest rate is 1.5%, the nominal interest rate is 4.5%, U.S. nominal interest rate is 2.5% and the nominal exchange rate appreciation is -0.5%. In other words, in a steady state, Rupiah (Indonesian currency) would be appreciated by 0.5%. Cpiplus parameter is a new feature in this model that illustrates how much additional maximum inflation is added to the variable inflation expectations if the central bank has no credibility. Further discussion would be described in next section.

3.4 Equations

ARIMBI with Imperfect Credibility could provide a combination of reasonable fit, the result of a suitable model structure in theory and the ability to be used as a forecasting and policy simulation (FPAS). Equations that have been prepared reflecting the characteristics of the Indonesian economy which is a small open economy. There are a number of key assumptions in the model, that Indonesia is a developing country which is relatively small economic activities than the rest of the world (ROW), is assumed not affecting ROW, but instead of the Indonesian economy was not immune to the influence of shock that occurred in the economy ROW. The following general equation are formulated in ARIMBI with Imperfect Credibility.

3.4.1 Main Equations

Trend variable is denoted by using alphabet letters with symbols line or bar on top, while the gap is denoted by using alphabet letters with symbols hat or cap on it. Variable annual rate year on year (yoy) is represented by four digits after the variable name, while the annual rate of quarterly (quarterly annualized) denoted four scoreless after the variable name, for example yoy CPI inflation is denoted by $\pi_{4t}^{CPI}$. For the growth variable is generally denoted by the letter d in front of a variable, eg GDP growth yoy denoted by $dy_{4t}$.

Gap is the difference between variable and its potential value. The variable $y$ is defined as 100 multiplied by the log of real GDP, $\bar{y}$ as 100 multiplied by the log of output potential and $\hat{y}$ as the output gap in percentage units, which $\hat{y} = y - \bar{y}$. The annual rate of quarterly inflation $\pi_{4t}^{CPI}$ is defined as 400 times the first difference of log CPI. While inflation yoy $\pi_{4t}^{CPI}$ is defined as 100 multiplied by the difference between inflation at this quarter and its previous four quarters. Several other important variables, $i$ is nominal interest rate, $r$ is real interest rate, $s$ is nominal exchange rate Rupiah per U.S. Dollar and $z$ is the log real exchange rate Rupiah compared to the U.S. Dollar.
Main Equation

Equation (3.1) to (3.4) are main behavioral equations which describe transmission mechanism in the model.

\[
\hat{y}_t = \beta_1 \hat{y}_{t-1} + \beta_2 \hat{y}_{t+1} - \beta_3 \hat{r}_t + \beta_4 \hat{y}_t + \beta_5 \hat{z}_t - \beta_6 (\pi_t^{RPOIL} - \bar{\pi}_t) + \varepsilon_t
\]  

Equation (3.1) is a behavioral equation for the output against the value of its lag and lead (a measure of backward and forward-looking), real interest rate gap, the real exchange rate gap, output gap in other countries, inflation in the real world oil prices and disturbance terms.

Equation (3.2) is a New Keynesian Phillips Curve equation to determine the level of inflation, where inflation in the equation is described by past and future inflation, output gap, real exchange rate, inflation and the real world oil prices to inflation disturbance term. The output gap is the variable that links the real side of economy with the inflation rate. Besides the inflation rate is also influenced by changes in the Indonesian real exchange rate (Rupiah) against the U.S. bilaterally.

\[
\pi_t^{CPI} = \lambda_1 \pi_t^{CPI} + (1 - \lambda_1) \pi_t^{CPI} + \lambda_2 \hat{y}_t + \lambda_3 \hat{z}_t + \lambda_4 (\pi_t^{RPOIL} - \bar{\pi}_t) + \varepsilon_t
\]

Equation (3.3) above is the Taylor rule equation used to determine the nominal value of short-term interest rates, in this case could be interpreted as the policy rate to Indonesia (BI Rate). The value of the interest rate is defined as a function of its lagged value (is a smoothing device for capturing short-term rate changes) and the central bank response to changes in the deviation of output gap between the expectations of inflation with target inflation. In other words, Bank Indonesia seeks to achieve long-term equilibrium interest rate (which is the sum of the equilibrium real interest rates and one quarter ahead expectation inflation), where interest rates could also be adjusted in response to a deviation from ekspokatasi year-on-year inflation rate fourth quarter would come from the inflation target, \(\pi_t^{CPI} - \pi_t^{TAR}\), and against the current output gap. This equation also has disturbance term to accommodate the adjustment of nominal interest rates if the results generated by the above equation is not appropriate.

\[
i_t - i_t^{HY} = 4(E_t s_{t+1} - s_t) + \text{prem}_t + \varepsilon_t
\]  

(3.4)
Equation (3.4) above is the equation of uncovered interest parity (UIP), which is expected depreciation \( (E_t s_{t+1} - s_t) \) equals the nominal interest rate differential with the U.S and Indonesia. This calculation also includes the balance of risk premium, whereby if interest rate of Indonesia is higher than US, there was one of two possibilities that could happen, or a combination of the two possibilities, namely whether the exchange rate of nominal Indonesia against the U.S. would experience a depreciation in the period Next \( (E_t s_{t+1} \) higher than \( s_t) \), or the nominal interest rate balance between Indonesia and the U.S. is different because of the risk premium. In addition, there was disturbance term.

To calculate the expected exchange rate of the nominal, conducted by weighted between the exchange rate of nominal forward that would happen with the assumption that expectations are perfect foresight, \( s_{t+1} \), with its variable lag, \( s_{t-1} \), which was added to twice the trends of exchange par of each quarter, because the nominal exchange rate variable has a trend.

\[
E_t s_{t+1} = \sigma s_{t+1} + (1 - \sigma)(s_{t-1} + 2(\delta s_t + \pi_t^{\text{tar}} - \pi_t^{\text{CPI,US,SS}})/4)
\]

(3.5)

World Oil Price Equation

World oil price data is the price of oil that comes from Minas (USD / barrel). Incorporating world oil prices into model, we need a few steps. Assuming that US inflation from the world representing the real world oil price levels could be calculated with the equation:

\[
P_t^{\text{RPOIL,US}} = P_t^{\text{OIL,US}} - \pi_t^{\text{CPI,US}}
\]

(3.6)

Then the filtering process is carried out by separate variables for trends and gaps in the real world oil price levels

\[
P_t^{\text{RPOIL,US}} = \bar{P}_t^{\text{RPOIL,US}} + \epsilon_t^{\text{RPOIL,US}}
\]

(3.7)

It is assumed that the growth trend of real world oil price is zero, so

\[
\bar{P}_t^{\text{RPOIL,US}} = \bar{P}_{t-1}^{\text{RPOIL,US}} + \epsilon_t^{\text{RPOIL,US}}
\]

(3.8)

While in the real world oil price gap is modeled by an AR (1)

\[
\hat{P}_t^{\text{RPOIL,US}} = (1 - \rho \epsilon_{\text{RPOIL,US}})\hat{P}_{t-1}^{\text{RPOIL,US}} + \epsilon_t^{\text{RPOIL,US}}
\]

(3.9)

Calculation of real world oil price inflation is

\[
\pi_t^{\text{RPOIL,US}} = 4(\hat{P}_t^{\text{RPOIL,US}} - \hat{P}_{t-1}^{\text{RPOIL,US}})
\]

(3.10)
Hence, the real world oil price inflation is converted from units of (USD / barrel) in local currency,

$$\pi_t^{ROIL} = \pi_t^{ROIL, US} + d_{zt} \quad (3.11)$$

Equation Variable Trends / Potential

For potential output variables, the shock is assumed to occur only in growth rate of potential output. This shock causes a persistent deviation between potential output growth to value growth in the long-run steady-state it.

$$\tilde{d}_{yt} = \rho_{\tilde{d}_{yt}} \tilde{d}_{yt-1} + \left(1 - \rho_{\tilde{d}_{yt}}\right)\tilde{d}_{yt}^{SS} + e_{\tilde{d}_{yt}} \quad (3.12)$$

Equation (3.12) states that the growth of potential output, in the long term equal to the value growth of steady-state is, but could deviate from the growth of its steady-state depending on the value of error, whether the negative / positive. Furthermore, it would return to the steady-state growth gradually, with a speed in accordance its parameter values, whereby the greater the value the faster potential output leads to the steady-state.

For the target variables of inflation, risk premium and real interest rates of U.S. trends, it is assumed that the dynamics using the same relationship with potential output variables in the equation above.

$$\pi_t^{TAR} = \rho_{\pi_{TAR}} \pi_t^{TAR} + (1 - \rho_{\pi_{TAR}})\pi^{TAR, SS} + e_{\pi_{TAR}} \quad (3.13)$$

$$\text{prem}_t = \rho_{\text{prem}} \text{prem}_{t-1} + (1 - \rho_{\text{prem}})\text{prem}^{SS} + e_{\text{prem}} \quad (3.14)$$

$$\tilde{r}_t^{US} = \rho_{\tilde{r}_{US}} \tilde{r}_{US,-1} + (1 - \rho_{\tilde{r}_{US}})\tilde{r}_{US}^{SS} + e_{\tilde{r}_{US}} \quad (3.15)$$

While for the variable trend of real interest rates and trend real exchange rate depreciation, are assumed to follow UIP relationship or

$$\tilde{r}_t = \tilde{r}_t^{US, SS} + d_{zt}^{SS} + \text{prem}^{SS} \quad (3.16)$$

$$\tilde{d}_{zt} = \tilde{r}_t - \tilde{r}_t^{US} - \text{prem}_t \quad (3.17)$$
Identity Equation

Identity equation is divided into three parts, namely the equation for calculating an annualized quarterly growth year on year and, as in the following equation:

\[
\pi_t^{CPI} = 4(p_t^{CPI} - p_{t-1}^{CPI})
\]

\[
\pi_t^{CPI, US} = 4(p_t^{CPI, US} - p_{t-1}^{CPI, US})
\]

\[
\pi_t^{CPI} = (p_t^{CPI} - p_{t-4}^{CPI})
\]

\[
\overline{d}y_t = 4(\overline{y}_t - \overline{y}_{t-1})
\]

\[
\overline{d}z_t = 4(\overline{z}_t - \overline{z}_{t-1})
\]

\[
dy_t = 4(y_t - y_{t-1})
\]

\[
dz_t = 4(z_t - z_{t-1})
\]

\[
d\overline{y}_t = (y_t - y_{t-4})
\]

\[
d\overline{z}_t = (z_t - z_{t-4})
\]

\[
d\pi_t^{CPI} = (\pi_t^{CPI} - \pi_{t-4}^{CPI})
\]

\[
d\pi_t^{CPI, US} = (\pi_t^{CPI, US} - \pi_{t-4}^{CPI, US})
\]

\[
ds_t = 4(s_t - s_{t-1})
\]

Or equation that represents the identity of filtering process to separate the trends and gaps between variables, such as the following equation:

\[
y_t = \bar{y}_t + \hat{y}_t
\]

\[
z_t = \bar{z}_t + \hat{z}_t
\]

\[
r_t = \bar{r}_t + \hat{r}_t
\]

And the last is the equation of identity that reflects the relationship that comes from such a simple economic theory: equation (3.30) and (3.31) that define the real interest rate as the difference between the nominal interest rate and CPI inflation expectations at a subsequent quarter.

\[
r_t = i_t - \pi_t^{CPI}
\]

\[
r_t^{US} = i_t^{US} - \pi_t^{CPI, US}
\]

Equation (3.32), which defines the relationship real exchange rate, \(z_t\) at the rate of nominal, \(s_t\) which is defined as the Indonesian currency (Rupiah) is compared to the U.S. Dollar, are added to the CPI \(P_t^{CPI, US}\) in the United States, less the CPI, Indonesia \(P_t^{CPI}\). If there is an increase in the value \(z_t\), meaning that the real depreciation in Indonesia has occurred against the U.S. dollar.
\[ z_t = (s_t + P_{t}^{CPI,US}) - P_{t}^{CPI} \]  

Equation Rest of The World

With the assumption that the Indonesian economy is relatively small open economy equations Rest of the World was modeled by an AR (1)

\[ \tilde{y}_{t} = \rho \tilde{y}_{t-1} + \epsilon_t^{yt} \]  
\[ y_t^{US} = \rho_{t^{US}} y_{t-1}^{US} + (1 - \rho_{t^{US}})(\pi_{t^{US}} + \pi_{CPI,US,ys}) + \epsilon_t^{US} \]  
\[ \pi_t^{CPI,US} = \rho_{\pi^{CPI,US}} \pi_{t-1}^{CPI,US} + (1 - \rho_{\pi^{CPI,US}})\pi_{CPI,US,ss} + \epsilon_t^{CPI,US} \]

3.4.2 Credibility Equations

New features in this model is credibility variables. Credibility variables used in this model is 1-INCREDt, so variables that are explicitly used is variable INCREDt or a variable that represents how credible is the central bank. Variable INCREDt worth one (1) meaning the central bank has no credibility at all, otherwise if INCREDt value 0 then the central bank has full credibility.

In principle, adding credibility done by changing the inflation expectations variable \( \pi_{t+1}^{CPI} \) perfect foresight previously assumed to be variable inflation expectations, contain elements of penalties depending on the credibility of central banks, or in the equation is written as

\[ E_t \pi_{t+1}^{CPI} = \pi_{t+1}^{CPI} + cpiplus \cdot INCREDt \]  

Where as previously described, the parameters cpiplus illustrates how much additional maximum inflation is added to the variable inflation expectations if the central bank has no credibility. For example, if the central bank has no credibility at all mean that the variable INCREDt valuable one and the value cpiplus 0.5, then the expectations of inflation worth 0.5% higher than inflation expectations that are Perfect Foresight.

In this paper, we modeled two types of credibility, namely exogenous and endogenous. ARIMBI with exogenous credibility is modeled with a simple way is to model the variable INCREDt into the AR (1) toward the value of steady state is zero, or in other words assumed credibility would be increased from time to time to the credibility of management (full credible)
While for the model with endogenous credibility is modeled by adding the past performance of the attainment of inflation to its target into the equation above

\[
INCREd_t = \rho_{INCREd} INCREd_{t-1} + e_t^{INCREd}
\]

\[ (3.37) \]

In endogenous approach, we try to incorporate credibility which does not always increase from time to time, but depending on his past performance.

3.5 Measurement of Monetary Policy Credibility

In development and employing ARIMBI with Imperfect Credibility, we need to know the value of central bank credibility on current conditions as an initial value. From the perspective of forecasting, the credibility value is entered as the initial value at the time where the data the actual date was available. For example, when going to perform forecasting begin 2009Q2, then the credibility indices have been measured would be the initial value in 2009Q1.

Index measurement credibility of Bank Indonesia would be proceed in two approaches, Valentin and Rozalia (VR, 2008) and Cecchetti and Krause (CK, 2002). Inflation target data is used for annual data 2002-2009 at both the target-setting by the BI as well as by the Government with input from the central bank. As for the inflation expectations used three data namely: Business Survey (Survey SKDU BI), Consensus Forecast (CF) and Actual Inflation. Therefore, we would obtain six BI credibility index as the results. Previous research (Harmanta, 2009) using Bayesian estimation of DSGE models of small open with the data period 2000-2008 produces an index figure of 0.4. Generally it is believed that the current monetary policy credibility of Bank Indonesia is not completely perfect (imperfect credibility). But in the long term, coupled with the communication / transparency / consistency of Bank Indonesia, the credibility of monetary policy is believed to be increased slowly and surely.
4. RESULTS AND ANALYSIS

4.1 Initial Credibility Index

As already mentioned above, the index measuring the credibility of monetary policy is conducted using, VR2008 and CK 2002. Especially for the measurement of CK in 2002 made adjustments over the previous limit of very loose 20% to 15%. It is with consideration of Indonesia which is a developing country so that the business environment is relatively more uncertain compared to developed countries. Based on historical data of Indonesia, the highest CPI (yoy) in Indonesia are 17.11% in 2005 and has never reached 20%.

Using expectations data (Survey SKDU BI, Consensus Forecast and Actual Inflation), we obtain measurement results for BI Credibility Index BI as follows:

<table>
<thead>
<tr>
<th>No</th>
<th>Data for Expectation</th>
<th>Credibility Index (VR 2008)</th>
<th>Credibility Index (CK 2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Survey SKD- BI</td>
<td>0.604</td>
<td>0.664</td>
</tr>
<tr>
<td>2</td>
<td>Consensus Forecast</td>
<td>0.789</td>
<td>0.841</td>
</tr>
<tr>
<td>3</td>
<td>Actual Inflation</td>
<td>0.581</td>
<td>0.740</td>
</tr>
</tbody>
</table>

Table 4.1 shows that the use of inflation expectations data and how different measurement indices would provide vary results, ranging from 0.581 till 0.841. The measurement results showed that the credibility of monetary policy in Indonesia during the period 2000 - 2009 has not completely perfect (imperfect credibility). Based on the results of these measurements and taking into account other previous results (among others: Harmanta (2009) who found 0.41 and 0.51 number of companies that inflation expectations anchored to the target), then for the next section we use conservative number 0.50 as the initial value of credibility.
4.2 Assumption of Steady State Variables

Several important assumptions and conditions in simulation and forecasting for aggregate macroeconomic variables in the study are as follows.

- Long-term inflation target to be achieved with the implementation of the ITF in Indonesia amounted to 3% + 1% (see eg Monetary Policy Report of Bank Indonesia).

- Medium term inflation target in Indonesia is up to 2014-2015 with 4.0% (plus minus 1%), in line with the economic recovery process in order to achieve economic growth of about 7.0 % - 7.5% in the year 2014-2015 as targeted by government.

- In line with the measurement of the credibility of monetary policy as mentioned earlier (based on the measurement method in the style of Cecchetti and Krause (2002), SKDU Survey results and some results of previous studies (Harmanta, 2009), the initial value of the credibility of monetary policy is about 0.5.

- To see the impact of monetary policy credibility of the dynamics of macroeconomic variables, especially in the medium term inflation target length with minimal cost, there are three scenarios the credibility of monetary policy, namely: (i) the credibility of the baseline with the initial value of 0.5, (ii) less credible with initial value of 0.1, and (iii) is more credible with the initial value of 0.9.

- Disinflation strategy for achieving low and stable inflation: (i) the long disinflation of the time required to reach the target medium-and long-term inflation, and (ii) the cost of disinflation: Sacrifice Ratio, that is the output loss that occurred for each decline in inflation by 1%

The simulation results of policies and projections in this study are as follows.

4.3 Simulation Results of Exogenous Credibility

The simulation results and projections of macro variables with some degree of exogenous credibility is presented in the graph below.
Based on the graph above shows that the baseline scenario with the assumption that monetary policy credibility of the initial value of 0.5 and considering the existence of inflationary pressures began Quarter-10 (Q-10) is approaching the upper limit of the inflation target in line with the global and domestic economic recovery, interest rates (the optimum Taylor rule based on the endogenous ARIMBI) needs to be raised startly on Q-8 and then could be lowered gradually began Q-12. On one hand, the path of inflation is likely anchoring to 4.0% + 1% in Q-24. On the other hand, path of interest rates would provide economic growth about 5.5% to 6.4% in next few quarters before going to achieve economic growth around 7.0 - 7.5% in Q-24. In line with the path of interest rate and the trajectory of inflation and GDP, exchange rates would slightly appreciated than start stay steadily on Rp. 9300-9750 / USD in medium and long term.

In the less credible scenario with the initial assumption of lower credibility value to 0.1, the path of inflation is higher than the baseline in which inflation in Q-9 to Q-12 would approach the upper limit of the target. Hence, inflation start in Q-13 would pass through the upper limit of the
inflation target. Considering the existence of a higher inflation pressure compared to baseline, central bank should increase interest rates higher than the baseline to achieve medium-term inflation target of 4% (plus minus 1%) in Q-24. Path to higher interest rates would lead to lower economic growth compared to the baseline to about 5.5% to 6.2% in up to Q-12. In overall cost of disinflation, the scenario is less credible monetary policy would cause the Sacrifice Ratio (output loss that occurred for the decline in inflation of 1%) higher than baseline. In the medium term - long or less credible scenario also causes the trajectory is more weaken the exchange rate compared to baseline.

On the more credible scenario assuming higher initial credibility value to 0.9, the path of inflation is lower than the baseline in which inflation moved closer to the midpoint or lower limit of the inflation target. Consider the trajectory of inflation is lower than the baseline and has been anchored relative to the inflation target, the current interest rate of could be maintained until Q7, before it could be lowered gradually. Path to lower interest rates would lead to higher economic growth compared to the baseline to about 5 – 6% in next few quarters. From cost of disinflation perspective, the scenario of a more credible monetary policy would cause the Sacrifice Ratio (output loss that occurred for the decline in inflation of 1%) is lower than the baseline. In the medium - long more credible scenario would cause the trajectory which has further strengthened the exchange rate compared to baseline.

4.4 Simulation Results of Endogenous Credibility
In the baseline scenario with the initial assumption of 0.5 and consider the credibility of inflation pressure from Q-10 which approximates the upper limit of the inflation target, interest rates (optimum based on the Taylor rule in ARIMBI endogenous) needs to be raised gradually since Q-6 and then could be lowered gradually began Q-11. With these interest rate path, consequently, the path of inflation targets is likely to be achieved towards 4.0% in medium term. This interest rate path would also bolster the economic growth around 5.5% to 6.2% in next few quarters before going to achieve economic growth steadily around 7.0% - 7.5%. In line with the path of interest rate and the trajectory of inflation and GDP, exchange rates would stronger (appreciation) around Rp. 9150-9550/ USD.

In the less credible scenario, the initial assumption of credibility is 0.1. Trajectory of inflation is higher than the baseline in which inflation in the year 2011 would approach the upper limit of the inflation target. Considering the existence of a higher inflation pressure compared to baseline, central bank should increase interest rates higher than the baseline to achieve the inflation target term medium for 4%. Indeed, path to higher interest rates would lead to lower economic growth compared to the baseline. In cost of disinflation perspective, less credible scenario would cause Sacrifice Ratio (output loss that occurred for the decline in inflation of 1%) higher than baseline. In the medium-long term, less credible scenario also causes the trajectory is more to weaken the exchange rate compared to baseline.

On the more credible scenario, we impose initial assumption for credibility is 0.9. Trajectory of inflation is lower than the baseline in which inflation and moved closer to the midpoint or lower limit of the inflation target. Considering the lower inflation trajectory than the baseline and has been anchored relative to the inflation target, the current interest rate could be maintained up to Q-7, before it could be lowered gradually. Obviously, path to lower interest rates would lead also to higher economic growth compared to the baseline (around 5.5 % to 6.5% in next few quarters). From cost of disinflation perspective, the more credible scenario would cause lower Sacrifice Ratio (output loss that occurred for the decline in inflation of 1%) than the baseline. In
the medium-long term, the more credible scenario would cause strengthened the exchange rate compared to baseline.

4.5 Simulation Results : Comparison of Baseline and Late Scenario

To see whether the timing of interest rate policy response affect the dynamics of key macroeconomic variables, we simulate a late response rate (Scenario late) compared to baseline (optimum response rates), as shown in the chart below.

In the late scenario, with the assumption that monetary policy credibility of the initial value equal to the baseline of 0.5, delay in the hike of policy response rate would cause the trajectory of inflation is higher than the baseline. As we could see from Graph 4.3, inflation near the upper
limit of the inflation target in up to next eight quarters and pass the upper limit of the inflation target start Q-9. In order achieving medium-term inflation target (4% in Q-24) and considering the inflation trajectory is higher than the baseline, interest rates need to be raised higher than the baseline before it could be reduced gradually since Q-16. These higher interest rates path would affect medium-term economic growth which is lower than the baseline. In term of cost of disinflation, the late scenario would yield higher Sacrifice ratio (output loss that occurred for the decline in inflation of 1%) than the baseline, especially in the medium term. In the medium-long term, the slow response of monetary policy would lead to a better path to weaken the exchange rate compared to baseline.

Based on the simulation results above, this study shows that the delay in the response rate would cause higher inflation path and could even exceed the inflation target. Consequently, bringing down inflation back to the target required very high interest rates. Obviously, this in turn would impact on slowing economic growth. Trade off inflation and higher output has an impact on the increasing Sacrifice ratio thus for every effort to decrease inflation requires a higher output loss. Implications of this findings, Bank Indonesia need to maintain consistency in responding to inflation pressures in a timely manner with an optimum amount of interest. Hence, delay in response of monetary policy would affect the higher cost of disinflation.

4.6 Periods for Disinflation Process

Related to focus on the length of disinflation, simulation and projection length of disinflation towards medium-term target (4%) and long-term target (3%) are described in Table 4.8 below.

<table>
<thead>
<tr>
<th>Credibility Type</th>
<th>Periods for Disinflation Process</th>
<th>Medium Term (4%)</th>
<th>Long Term (3%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exogen</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial cred = 0.1</td>
<td>25 quarters</td>
<td>48 quarters</td>
<td></td>
</tr>
<tr>
<td>Initial cred = 0.5</td>
<td>19 quarters</td>
<td>40 quarters</td>
<td></td>
</tr>
<tr>
<td>Initial cred = 0.9</td>
<td>11 quarters</td>
<td>24 quarters</td>
<td></td>
</tr>
<tr>
<td><strong>Endogen</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial cred = 0.1</td>
<td>31 quarters</td>
<td>64 quarters</td>
<td></td>
</tr>
<tr>
<td>Initial cred = 0.5</td>
<td>19 quarters</td>
<td>56 quarters</td>
<td></td>
</tr>
<tr>
<td>Initial cred = 0.9</td>
<td>11 quarters</td>
<td>22 quarters</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.8 shows that the length of disinflation to ancor to medium-term inflation target is strongly influenced by the degree of monetary policy credibility. The scenario with the initial baseline value of 0.5 monetary policy credibility, either exogenous or endogenous, it takes less
than 19 quarters to reach an inflation of 4% in medium term. If the initial value of credibility decreased to 0.1, then the process of disinflation to 4% as medium term target requires a longer period which are 25 quarters (exogenous) or 31 quarters (endogenous). Conversely, if the initial value increased to 0.9, then process of disinflation to medium term requires only a shorter time period, 11 quarters (exogenous) or 25 quarters (endogenous). Similarly, disinflation to 3% as long term target requires a shorter time of 22-24 quarter if the credibility of the initial value of 0.9. In less credible situation (index is set to 0.1), it takes longer time to 48 quarters (exogenous) or 64 quarter (endogenous) to achieve 3% inflation. In baseline credibility index (0.5), it takes 40 quarters (exogenous) or 56 quarter (endogenous) to achieve long term inflation target, 3%.

If we compare endogenous and exogenous approach, it shows that exogenous monetary policy credibility on the one side would provide convenience, but the results less realistic. This is because exogenous credibility could not capture the rewards - punishments on the attainment of inflation targets as well. In contrast, modeling of endogenous monetary policy credibility on the one side would be more complex, but it provides more realism. It is argue that endogenous credibility possibly could catch the reward - punishment against inflation target better because the credibility of monetary policy are explicitly captured by the deviation of inflation to the inflation target. For example, the greater endogenous credibility of monetary policy, the smaller deviations of inflation from its target thus there are rewards that cause the length of disinflation to 3% would faster than exogenous approach. Conversely, smaller the endogenous credibility, higher deviations of inflation from its target then there are punishments that cause the length of disinflation to 3% would be slower than exogenous approach. This finding is briefly summarised in the following matrix.

<table>
<thead>
<tr>
<th>Items</th>
<th>Exogen</th>
<th>Endogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple</td>
<td>V</td>
<td>-</td>
</tr>
<tr>
<td>Better Punishment-Reward Mechanism</td>
<td>-</td>
<td>V</td>
</tr>
</tbody>
</table>

Based on projected results and simulation credibility of monetary policy as stated above, this study specifically shows that:

- Inflation expectations of economic agents is strongly influenced by central bank monetary policy credibility. More credible monetary policy, faster inflation expectations anchored to the inflation target thus greater chance that actual inflation would be anchored to the target. This in turn would accelerate the disinflation process to low and stable inflation in medium–long term.
• Disinflation cost is strongly influenced by central bank monetary policy credibility. The more credible monetary policy, the lower the cost of disinflation (reflected in the Sacrifice ratio) to achieve low and stable inflation and in the medium term - long. This in turn would minimize the trade off of output - inflation.

• More controlled inflation at a low and stable level would provide conducive conditions to sustainable economic growth and controlled exchange rates volatility.

• Slow response of monetary policy than optimum conditions (baseline) may cause higher inflation path. Hence, it would lead to longer on achieving the target, higher interest rates, and higher cost of disinflation.
5. CONCLUSIONS AND POLICY IMPLICATIONS

- ARIMBI with Imperfect Credibility is theoretically coherent, and reasonable fit with the data to match the Indonesian economy after the implementation of the ITF, and has the ability to be used as a forecasting and policy simulation (FPAS).

- The result of calculating the degree of credibility of monetary policy indicates that monetary policy in Indonesia has not fully credible (imperfect credibility) with a value of approximately 0.5 (from a scale of 0 to no credibility and scale of 1 to perfect credibility).

- Projection and simulation results show that the disinflation to the target low and stable inflation in Indonesia was influenced by the credibility of monetary policy. The more credible monetary policy, the disinflation process towards the target low and stable inflation would be more quickly achieved. In addition, endogenous monetary policy credibility is more realistic than exogenous approach.

- Projection and simulation results show that the costs of disinflation to the target low and stable inflation in Indonesia (the cost of disinflation), which is measured based on the Sacrifice Ratio, is strongly influenced by the credibility of monetary policy. The more credible monetary policy, the smaller the ratio of Sacrifice, which means every effort to decrease inflation would cause not too large output loss. The implication is that central bank face a smaller trade-off between stabilizing inflation and stabilizing output.

- The slow response of monetary policy than optimum conditions (baseline) would cause higher inflation path, so that it might lead to a longer achieving the target with higher interest rates and higher cost of disinflation.

- In terms of strategies for achieving the target low and stable inflation in Indonesia, the results showed that the monetary policy conditions are not fully credible (imperfect credibility), then the central bank tends to make the process of gradual disinflation. This is because if monetary policy is not fully credible, then the central bank's efforts to quickly achieve low inflation in a short time would have implications on interest rate increases very high (too tight) so it would create very large fluctuations on output and exchange rate.

- Research shows that inflation expectations greatly influenced by the credibility of monetary policy. The implication is that the management of inflation expectations is very important, although not easy, because it requires a credible monetary policy. This condition could be constructed by continuing to demonstrate its commitment to inflation target consistently.

- The simulation results support the mandate of the Bank Indonesia Act No.23 of 1999 and No.3 of 2004 requires the Bank Indonesia to publicly announced inflation target and inflation is the overriding objective of monetary policy through the implementation of inflation targeting framework (ITF). Implementation of the ITF is an effort to enhance the credibility of
monetary policy through commitment to achieving the inflation target so that economic agents would calculate their activities based on the rate of inflation and disinflation program.

- Related to its limitations and further research opportunities, the dynamics of the credibility of monetary policy is modeled in a linear fashion. Looking ahead, non-linear credibility would be challenging as it may capture effects of punishment - reward in better and realistic way.
REFERENCES:


