QUARTERLY ANALYSIS:
THE PROGRESS OF MONETARY, BANKING AND PAYMENT SYSTEM
Quarter I - 2013
Author Team of Quarterly Report, Bank Indonesia

MEASURING THE TIME INCONSISTENCY OF
MONETARY POLICY IN INDONESIA
Rini Rahmahdian and Perry Warjiyo

THE EFFECT OF CENTRAL BANK INDEPENDENCE
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The Bulletin of Monetary Economics and Banking (BEMP) is a quarterly accredited journal published by Department of Economic Research and Monetary Policy Bank Indonesia. The views expressed in this publication are those of the author(s) and do not necessarily reflect those of Bank Indonesia.

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Indonesia’s economy in the first quarter 2013 growth slowed compared to the previous quarter. Economic growth stood at 6.02% (yoy), lower than the previous quarter grew by 6.11% (yoy). A source of slowing growth came from domestic demand amid declining export performance. Slowing growth in household consumption was due to the decrease in purchasing power as a result of an increase in inflationary pressures, especially food. In addition, government consumption growth is relatively low, due to the limited uptake of spending, especially spending on goods. A decline also occurred in investment performance, particularly non-construction that is influenced by limited domestic and international demand outlook. Decline in investment performance is in line with the decline in business optimism. In non-construction investment, there is reduced performance in machinery investment, in line with the slowdown in the imports of capital goods. In contrast, exports showed improvement, supported by strengthening expectations of global economic recovery and rising volume of world trade. Response to slowing domestic demandsaw a contraction in imports. Sources of downward import pressure are from the imports of raw materials and capital goods, mainly raw materials for the industrial and passenger vehicle industry which has seen a slowdown and moderation in response to motor vehicle sales.

On the external side, the external balance of the economy has improved as expected. Current account deficit in the first quarter of 2013 stood at 2.4% of GDP, down from 3.5% of GDP in the previous quarter. Repair to the current account deficit is caused by the improvement of the balance of trade driven by a sharp decline in imports, particularly consumer goods, while non-oil exports of some commodities remained in positive growth. Meanwhile, capital accounts and financial (TMF) in the first quarter of 2013 recorded a deficit in line with the decline in capital inflows because of the deteriorating global economic conditions and rising inflationary pressures in the country. With these developments, international reserves at the end of March 2013 amounted to 104.8 billion U.S. dollars, which is equivalent to 5.7 months of imports and government foreign debt payments.

During the first quarter of 2013, the exchange rate was still experiencing downward pressure, although more moderate than the previous quarter. The moderate downward pressure was driven by inflows of foreign capital into the economy of Indonesia. In addition, the relatively moderate downward pressure was a result of the Bank Indonesia policy of maintaining the stability of the exchange rate in accordance with the fundamental conditions, through the
strengthening of foreign exchange intervention mechanism, the application of term deposits (TD) and the deepening of the foreign exchange currency market. On the average, the exchange rate depreciated by 0.7% (qtq) to Rp.9.680 per U.S. dollar from Rp.9.613 to the U.S. dollar in the previous quarter. Meanwhile point-to-point, the rupiah depreciated 0.82% (qtq) and closed at Rp.9.718 per U.S. dollar. Despite this volatility, in the rupiah was still controlled. The rupiah’s volatility is relatively lower when compared to the region.

Consumer Price Index (CPI) inflation increased on first quarter 2013 compared to the previous quarter, driven by rising prices of food groups. CPI inflation stood at 2.43% (qtq) or 5.90% (yoy), higher than the previous quarter at 0.78% (qtq) or 4.30% (yoy). The main source of inflation came from food volatility due to the limited supply of strategic food commodities, especially various spices and horticultural products. Meanwhile, core inflation was relatively stable despite the pressures of the food volatility. Stable core inflation was supported by the low pressure of the external factors due to slowing global commodity prices and exchange rate stability, balanced conditions for demand and supply, and subdued inflation expectations. Meanwhile, inflationary pressures from administered prices increased moderately due to an increase in the Electricity Tariff (TTL) on January 1, 2013.

Stability of the financial system and banking intermediation remains strong in the first quarter of 2013. Solid performance of the banking industry is reflected in the high capital adequacy ratio (CAR), which is well above the minimum 8%, and the ratio of gross non-performing loans (NPL) that was maintained fewer than 5%. Meanwhile, credit growth slowed until the end of March 2013 to 22.2% (yoy) in line with the slowdown in the domestic economy. Working capital and investment loans still showed high growth at 23.7% (yoy) and 23.2% (yoy), respectively. Meanwhile, consumer credit grew more slowly to 18.9% (yoy). Loan disbursements were more directed to the productive sectors.

The payment system implementation as the financial system’s infrastructure is an important factor to support the financial system and monetary stability. In addition, the payment system also plays an important role to facilitate economic activity and business. During the first quarter of 2013, the reliability of the payment system infrastructure remained well preserved. This was reflected in the implementation of a secure and smooth payment system. Payment system reliability is indicated by the availability of payment systems in meeting the appropriate service level that has been set. Bank Indonesia is consistently working to improve the performance of the payment system as the lifeblood of Indonesia’s economy. This effort has shown good results, with the increasing role of payment systems in supporting economic activity.
MEASURING THE TIME INCONSISTENCY OF MONETARY POLICY IN INDONESIA

Rini Rahmahdian
Perry Warjiyo

Abstract

This study measured the time inconsistency of monetary policy in Indonesia using the asymmetric preference parameter in linear exponential loss function of the central bank. Asymmetric central bank preference becomes an important issue since many of the results on the time inconsistency problem under symmetric preferences may no longer hold under asymmetric preferences. Using two sub-samples, i.e. before and after the implementation of central bank independence act, the conditional mean and the conditional variance of the output gap were estimated and then proceed to estimate the reduced form of the model. The results showed the existence of an asymmetric preference parameter before the Bank Indonesia independence act, which indicated the presence of a time inconsistency problem of monetary policy. This finding implies Bank Indonesia put a negative weight instead of positive weight on the output gap prior to its independency. However, after the implementation of central bank independence, the monetary policy of Bank Indonesia has been consistent with symmetric policy preference over price stability and output.

Keywords: Time inconsistency, discretionary, monetary policy, asymmetric central bank preference, output gap, inflation bias.

JEL Classification: E52, E58

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I. INTRODUCTION

Seminal papers by Kydland and Prescott (1977), Barro and Gordon (1983) and Rogoff (1985) are the main references on time inconsistency literature. Until now, the topic of dynamic inconsistency remains an interesting debate to be analyzed in the context of monetary policy based on the game theoretical model. Time inconsistency refers to the difference in the actual policy responses taken from the optimal policy response announced by the central bank after a decision based on public expectations. The difference in policy response is generally motivated by the desire of the central bank to encourage a higher level of output.

As an illustration of a time inconsistency problem, suppose that the central bank announced its pledge to achieve a specific inflation target, and the public believed this, and then formed inflation expectations based on the announcement. In these conditions the central bank has an incentive to not fulfill its promise to pursue the possibility of achieving a growth rate of greater output, with the consequent higher inflation pressures. But in the end the public will know about this reneging on the inflation promise so that they will adjust to higher inflation expectations. If the sequence of events is repeated, there will be what is called inflation bias, i.e. a situation where an increase in real output does not happen but inflation is higher than the level that it should be.

In Indonesia, the inflation target set by Bank Indonesia often cannot be achieved. The inflation rate is still difficult to converge towards the inflation target announced by the monetary authorities. Since the year 2000, actual inflation in the range of the target inflation occurred only twice, in 2004 and 2007 by 6.4% and 6.6%, with the inflation target to 4.5% -6.5% in 2004 and 6% ± 1% in 2007. Later in the period 2003, 2006 and 2009, although the achievement of actual inflation was lower than the target, the value was below the inflation target range established. The presence of actual inflation deviation from its target indicates that inflation is not optimal situation because it will cause social harm in the community (Warjiyo, 2010).

Harmanta (2009) also reported a slowdown in inflation to the target set by the government and Bank Indonesia, both in the period before and after the ITF. On average, the rate of inflation after the era of the ITF is 7.5%, only a slight decline compared to the era before the ITF with an average inflation rate of 7.9%. This fact raises the question of why inflation in Indonesia tends to be at a fairly high level and slows down towards the inflation target of the monetary authority. Some researchers (including Alamsyah, 2008 and Yanuarti, 2007) assumed that it was due to the persistence of inflation that is still quite high in Indonesia.

If it is true, then is the high persistence of inflation derived from the inertia of the previous inflation because of the behavior of economic agents that tend to be backward looking? Solikin (2004) showed that the New Keynesian Phillips Curve (NKPC) equation which was formed in the ITF inflationary era is dominated by the forward looking behavior of agents. Yanuarti (2007) and Alam (2008) by using a different study also reinforced Solikin findings (2004). They found that the degree of persistence of inflation caused by the behavior of backward looking expectations in the era of the ITF tends to decrease.
Harmanta (2009) reported the persistence of high inflation in Indonesia caused by a monetary policy that was not fully credible (imperfect credibility). Imperfect credibility is the slow pace of inflation expectations caused by economic agents and the actual movement of inflation towards the target. The study also reinforced previous studies conducted by Revenna (2005). Revenna conducted a survey of 82 countries, and in the study of monetary policy, put Indonesia in the category of “low credibility” because of its inability to achieve the inflation target.

The issue of credibility of monetary policy is closely related to time inconsistency problems (Goeltom, 2005). Time inconsistent policy will potentially lead to the low credibility of monetary policy, so that economic agents will form expectations of higher inflation than the target announced by the authorities. If the time inconsistency problem of monetary policy refers to a lack of credibility of monetary policy, then the question arises whether the low credibility of monetary policy in Indonesia indicates a time inconsistency problem in monetary policy of Bank Indonesia? Goeltom (2005) stated that between the period of 1990-2003 Indonesian monetary policy still faced time inconsistency problems of that is not optimal, sometimes too loose and too tight sometimes.

Studies on the topic of central bank institutions are an issue that surfaced at the time and not a lot of research has been done, especially in the case of Indonesia. The study of time inconsistency of monetary policy in Indonesia is still very limited. Studies that have been done by Budiyanti (2009) found the presence of the time inconsistency problem of Indonesian monetary policy in periods before and after the 1997 economic crisis. Budiyanti (2009) used a standard linear quadratic model of Barro-Gordon in explaining the time inconsistency problem of monetary policy in Indonesia. This model basically assumes that the central bank’s preference for the output gap is symmetry (symmetric central bank’s preference). In other words, the central bank is considered indifferent to the positive and negative output gap.

But in its development, the assumption of symmetric preference has received criticism from academics and theoretical and practical monetary practitioners (McCallum, 1997 and Blinder, 1998). From the empirical research it is also increasingly questionable to assume of a standard model with a linear quadratic symmetric time preference to explain the inconsistency (Cukierman (2000), Ruge-Murcia (2001, 2002), Surico (2003), Tambakis (2004), Gredig (2007), Ikeda (2009), and others). Cukierman (2000) questioned whether the positive and negative deviations of output from its potential value in the same amount, will be in the same proportions? And whether the central bank is really indifferent to the negative output gap and the output gap positive?

Asymmetric preference becomes an important issue and is a worthy topic of study, especially with regard to the research on symmetric preference for preferences that hold no asymmetry. There are at least three strategic issues defined as problems in this study, first, whether there are asymmetric preference parameters that indicate a time inconsistency problem of monetary policy in Indonesia for periods before and after the independence act of Bank Indonesia? If yes, then the question is, whether there are differences in the amount
of asymmetric preference, which indicates the difference in the degree of time inconsistency of monetary policy before and after the independence act of Bank Indonesia? Second, how the monetary policy implications of the time (in) consistent or policy with a different degree of time inconsistency in the period before and after the independence act of Bank Indonesia influences the behavior of the output gap in determining the inflation rate in Indonesia? Third, how does the performance (achievement) of inflation in Indonesia before and after the independence of Bank Indonesia in the context of the policy of the time (in) consistent or in the presence of different degrees of time inconsistency?

The period of analysis is divided into two sub-samples, i.e. the period before the independence of Bank Indonesia (1990:1-1999:4) and the period after the independence of Bank Indonesia (2000:1-2009:4). This is due to fundamental changes in the institutional and implementation of monetary policy in Indonesia in 2000, which marked the changing status of the Bank Indonesia from dependent to independent. Independence of Bank Indonesia in the Act legislated in Bank Indonesia No. 23 of 1999 as amended by Act 3 of 2004 which explicitly confirmed that monetary policy is focused on a single goal achieving price stability. The division of the sub-sample also refers to Rogoff (1985) which states that the granting of independence to the central bank can overcome the time inconsistency problem. Thus the expected degree of time inconsistency will also be different in the period before and after the independence of Bank Indonesia.

II. THEORY

2.1. Time inconsistency of Monetary Policy Theoretical Review

A policy is said to be time inconsistent if the policy is optimal in a period, \( t_0 \), but not optimal at another period, \( t_1 \) (Bofinger, 2001). Time inconsistency refers to the difference in the optimal policy measures that have been announced by the central bank after the taking of a decision based on expectations (Kydland Prescott, 1977). Policies that are time inconsistent will occur when there is new information in the economy.

**Kydland and Prescott Model**

Kydland and Prescott (1977) analyzed time inconsistency to indicate that the general rule is better than discretion in the formulation of policy. Assuming there are only two periods of policy, the objective function of the policy maker is:

\[
U = U(x_1, x_2, \pi_1, \pi_2)
\]
where $U$ is the preference of policy makers, $x$ an economic agent’s decision variables, and $\pi$ is an instrument variable of policy makers. Furthermore, it is assumed that economic agents consider the policies formulated by the economic decision-making authority in the following:

$$x_1 = x_1(\pi_1, \pi_2)$$  \hspace{1cm} (2)

$$x_2 = x_2(x_1, \pi_1, \pi_2)$$  \hspace{1cm} (3)

To perform optimization across time, the decision of the two variables of policy instruments are carried at period 1.

$$U(.) = U(x_1(\pi_1, \pi_2), x_2(x_1(\pi_1, \pi_2), \pi_1, \pi_2), \pi_1, \pi_2)$$  \hspace{1cm} (4)

Optimal conditions with rule $(\pi^*, \pi^*)$, obtained through the first order condition as the following:

$$\frac{\partial U(.)}{\partial \pi_2} = \left[ \frac{\partial U}{\partial x_1} \frac{\partial x_1}{\partial \pi_2} + \frac{\partial U}{\partial x_2} \frac{\partial x_2}{\partial \pi_1} \right] + \left[ \frac{\partial U}{\partial x_2} \frac{\partial x_2}{\partial \pi_2} + \frac{\partial U}{\partial \pi_2} \right] = 0$$  \hspace{1cm} (5)

For policies that are discretionary, policy makers in period 1 would determine $\pi^*$, and $\pi^*_2$, like the step above. But in the second period of realization $\pi$ and $x$ are already there. So in period 2 policy makers will decide again:

$$U = U(x_1, x_2, \pi_1, \pi_2)$$  \hspace{1cm} (6)

subject to:

$$x_2 = x_2(x_1, \pi_1, \pi_2)$$  \hspace{1cm} (7)

$$x_1 = x_1$$  \hspace{1cm} (8)

$$\pi_1 = \pi_1^*$$  \hspace{1cm} (9)

From the first order derivative conditions for the period 2 with discretion will result in policy $\pi_1^{**}$ as the following:

$$\frac{\partial U}{\partial x_2} \frac{\partial x_2}{\partial \pi_2} + \frac{\partial U}{\partial \pi_2} = 0$$  \hspace{1cm} (10)

The first order derivative condition (FOC) on this discretion will only be the same as the FOC rule above if:

$$\frac{\partial x_1}{\partial \pi_2} \left[ \frac{\partial U}{\partial x_1} + \frac{\partial U}{\partial x_2} \frac{\partial x_2}{\partial x_1} \right] = 0$$  \hspace{1cm} (11)
But in reality this condition difficult to meet, so the optimal solution by rule \((\pi^*_1, \pi^*_2)\) will be different from the optimal solution discretion \((\pi^*_1, \pi^*_2)\). And because the solution to the rule \((\pi^*_1, \pi^*_2)\) maximizes inter-temporal utility, then the solution to the discretion \((\pi^*_1, \pi^*_2)\) be not optimal. This is due to discretionary policy in period 2 that does not consider the effect of the decision in period 1\((x_1, \pi_1)\).

**Barro and Gordon Model**

Barro and Gordon (1983) analyzed the *time inconsistency* in monetary policy through *game-theory* a la Nash equilibrium between the central bank and the private sector in the economy. The Barro-Gordon model assumes the central bank is able to manage the process of economic and monetary policy directed to social welfare which also incorporates community preferences. Society only has the action of forming parameter inflation expectations. *Time inconsistency* will arise due to: (a) the community forming expectations of inflation at the beginning of the period and is held until the end of the game, and (b) the central bank has full discretion in determining the strategy all the time. In this situation, the inflation target that is set at the beginning of the period will not necessarily be optimal at the end of the period, and will result in social losses for the central bank and the public.

Mathematically, Barro-Gordon models are formulated as follows - the central bank minimizes the loss of social welfare function:

\[
L = [b(U - U^*)^2 + \pi^2] \tag{12}
\]

where \(b > 0\) and the initial inflation target \(\pi^* = 0\). Unemployment is assumed to follow the expected *augmented Phillips curve* as follows:

\[
U = U^* - a(\pi - \pi^e) \tag{13}
\]

with \(a > 0\) and \(U^* = kU^n\), where \(0 < k < 1\). Furthermore, central banks have assumed control of inflation through monetary policy, so that the inflation rate will be in line with the growth in money supply \((\pi = \mu)\). In this condition there is no problem in the transmission of monetary policy. With these assumptions, the central bank minimizes the social welfare function following loss:

\[
Z = \{b[(1 - k)U^n - a(\pi - \pi^e)]^2 + \pi^2\} \tag{14}
\]

By determining the conditions of the first order derivative, we obtain the optimal rate of inflation \(\pi^{**}\) as follows:

\[
\frac{\partial Z}{\partial \pi} = -2ab[(1 - k)U^n - a(\pi - \pi^e)] + 2\pi = 0 \tag{15}
\]
\[
\pi^{**} = \frac{ab(1-k)U^n}{1+a^2b} + \frac{a^2b}{1+a^2b} \pi^e
\]  
(16)

\[
\pi^{**} = \frac{ab(1-k)U^n}{1+a^2b} + \theta \pi^e
\]  
(17)

Solution \( \pi^{**} \) in the above shows the time inconsistency, in which target setting \( \pi^* = 0 \) is not optimal at the end of the period. There is an expected augmented Phillips curve leading to the optimal inflation rate as influenced by inflation expectations. Because in general inflation expectations \( \pi^e > 0 \), then the optimal inflation rate is also greater than 0 (\( \pi^{**} > 0 \)). Even if inflation expectations \( \pi^e = 0 \), optimal inflation is still greater than 0 (\( \pi^{**} > 0 \)). This is due to the social cost parameter \( (b) \) and the phenomenon of unemployment \( (k) \) and the deviation of inflation from its target \( (a) \). The inflation rate greater than null \( (\pi^{**} > 0) \) can be sourced from inflation surprise, bias and inflation rule, as outline below.

**Inflation Surprise**

Inflation can still occur despite the central bank setting an initial target inflation \( \pi^* = 0 \), along with this, the central bank does not work to eliminate the deviation of inflation from its target due to the condition of the real sector, or in other words if the central bank is pro-growth. In these conditions the actual inflation is:

\[
\pi^s = \frac{ab(1-k)}{1+a^2b} U^n
\]  
(18)

Social cost of inflation is:

\[
L^s = \left\{ b \left[ (1-k)U^n - \frac{a(ab(1-k)U^n)}{1+a^2b} \right]^2 + \left[ \frac{(1-k)U^n}{1+a^2b} \right]^2 \right\}
\]  
(19)

\[
L^s = \frac{b[(1-k)U^n]^2}{1+a^2b}
\]  
(20)

**Inflation bias**

Although community expectations are rational and the function of the central bank losses and the Philips curve are known, the initial target inflation \( \pi^* = 0 \) will not be credible. In these conditions the interaction between central banks and economic agents follow the Stackleberg Game Theory. Inflation expectations will be equal to the central bank’s target, \( \pi^e = \pi^* \). Thus the actual inflation rate and social losses in a row is:

\[
\pi^{REH} = ab (1-k)U^n
\]  
(21)

\[
L^{REH} = b[(1-k)U^n]^2 + [ab(1-k)U^n]^2
\]  
(22)

\[
L^{REH} = b(1 + a^2b)[(1-k)U^n]^2
\]  
(23)


**Inflation Rule**

Barro and Gordon (1983) argued that with rational expectations and behaviors follow the \textit{Stackleberg Game} as above, then the social loss will be reduced by giving the rule to the central bank that inflation $\pi = 0$ and the rate of growth of money supply $= \mu$. In this condition, the rate of inflation and social loss rule is:

\begin{equation}
\pi^{RULE} = 0
\end{equation}

\begin{equation}
L^{RULE} = b[(1 - k)U^n]^2
\end{equation}

The above analysis shows that the lowest social cost is a \textit{surprise inflation} condition and the highest inflation in the \textit{inflation bias}, while the \textit{inflation rule} is in between. Thus, in the context of the game theory, the Barro-Gordon model results in an \textit{apriliner's dilemma} because it produces the optimal strategy for both players (central banks and the public) with adverse results to both.

**Rogoff (1985)**

Rogoff (1985) stated that in order to overcome the problem of \textit{time inconsistency}, then monetary policy should be delegated to an independent central bank and a conservative. An independent central bank is \textit{inflation averse} and would be able to reduce the average inflation, but it will increase the variability of output. It means that a conservative central bank can reduce \textit{inflation bias} caused by \textit{time inconsistent} monetary policy, but on the other hand, it has a lesser role in stabilizing output. In this concept the public are assumed to have two options to achieve the goal of price stability, namely: achieving its own (with the formation of the government) or delegating monetary policy to a conservative central bank with the task of focusing on price stability.

If done alone (mandate to the government), then the government will minimize the following loss function:

\begin{equation}
\min L = b(y_t - y^*)^2 + (\pi_t - \pi^*)^2
\end{equation}

\begin{equation}
s.t. \text{Philips Curve : } y_t - y^p = a(\pi_t - \pi^p) + \epsilon_t
\end{equation}

Furthermore, to facilitate the analysis, it is assumed that $\pi^* = 0$ and $y^p = 0$. Thus the loss function will be:

\begin{equation}
L_G = b(y_t - y^*)^2 + \pi_t^2
\end{equation}
Next the substitution of the constraint functions for the function objectives is done, and the optimization is performed to obtain the optimal inflation rate.

\[ L_G = b(a(\pi_t - \pi^e) + \epsilon_t - y^*)^2 + \pi_t^2 \]  
(29)

\[ \frac{\partial L_G}{\partial \pi_t} = 2ab[a(\pi_t - \pi^e) + \epsilon_t - y^*] + 2\pi_t = 0 \]  
(30)

\[ 2a^2b\pi_t - 2a^2b\pi^e + 2ab\epsilon_t - 2aby^* + 2\pi_t = 0 \]  
(31)

\[ \pi_t(1 + a^2b) - a^2b\pi^e + ab\epsilon_t - aby^* = 0 \]  
(32)

\[ \pi^{**} = \frac{a^2b\pi^e}{1+a^2b} + \frac{aby^*}{1+a^2b} - \frac{ab\epsilon_t}{1+a^2b} \]  
(33)

Because the expectations were formed before the government took the policy, then the \( \pi_t = E_{t-1}(\pi_t) = aby^* \), so that the rate of inflation and output are respectively:

\[ \pi_t^{**} = aby^* - \frac{ab}{1+a^2b} \epsilon_t \]  
(34)

\[ y_t^{**} = \frac{1}{1+a^2b} \epsilon_t \]  
(35)

From the two equations above, we can obtain the variance of inflation and output respectively as follows:

\[ \text{var } \pi_t^{**} = \left( \frac{ab}{1+a^2b} \right)^2 \sigma_\epsilon^2 \]  
(36)

\[ \text{var } y_t^{**} = \left( \frac{ab}{1+a^2b} \right)^2 \sigma_\epsilon^2 \]  
(37)

Thus, if the monetary policy mandate given to the government, can be concluded as:

1) There will be inflation bias, since \( \pi_t^{**} > 0 \)

2) The higher the preference for output stabilization (b), the higher inflation will be, which \( \frac{\partial \epsilon_t^{**}(\pi_t)}{\partial b} = aby^* > 0 \), and \( \frac{\partial \text{var } \pi_t^{**}}{\partial b} > 0 \)

3) Provide monetary policy mandate to the government’s pro-growth, it will not increase output on average, because the average output is 0 (because \( y^P = 0 \)), so that \( E(y^{**}) = 0 \) but will only reduce output volatility, where \( \frac{\partial \text{var } y_t^{**}}{\partial b} < 0 \)

Implications of Rogoff (1985) is that in order to achieve the goal of price stability in the sense of low inflation, then choose a conservative central bank that is more inflation averse. If monetary policy is delegated to a conservative central bank, the rate of inflation and output respectively are as follows:
is a conservative central bank preference for output stabilization, the value of which is lower than the preference of the government to stabilize output (b), because the more conservative central bank is inflation averse, while government is more pro-growth, so $0 < \hat{b} < b$. Thus, delegating monetary policy to a conservative central bank will be able to achieve a lower inflation rate than if the government mandated monetary policy.

### 2.2. Symmetric versus Asymmetric Central Bank Preference

**Symmetric Central Bank Preference**

Symmetric central bank monetary policy preference describes preferences that assume the central bank weighs the same policy towards deviations of the positive and negative output (unemployment) and/or inflation from its target. In the monetary policy preferences of symmetry of the output gap, the central bank is assumed to be indifferent between the positive output gap and negative output gap. If there is a positive deviation of output from its potential value by 1% or if there is a negative deviation in the same amount (1%), it will lead to increased loss to the central bank in the same amount. Therefore, a positive output gap and the negative output gap with the same proportion are not favored by the central bank.

According to this model, the inflation bias will occur as a result of the central bank’s desire to achieve the level of output that exceeds its potential value or to achieve lower unemployment than the natural rate. Based on the Barro-Gordon model, monetary policy preferences are symmetric with respect to the output gap, and as the central bank sets a target level of potential output, the inflation bias is null.

Monetary policy preferences of symmetry is mathematically described using a standard model consisting of a linear quadratic loss function of the central bank in a quadratic form and function of linear aggregate demand and aggregate supply.

$$L = \frac{1}{2} \left[ (\pi_t - \pi^*)^2 + \lambda y_t^2 \right]$$ (40)

Where $\pi_t$ is the actual inflation, is the target inflation, $\pi^*$ is $y_t$, the output gap (deviation of actual output from potential output) and $\lambda$ is the preference parameters of monetary policy on output stabilization.
Asymmetric Central Bank Preference

Asymmetric preference illustrates the different treatment of the central bank (asymmetry) in the face of a recession and boom or in response to positive and negative deviations of output (unemployment) and/or inflation from its target. In contrast to the symmetric central bank preferences as described by standard linear quadratic function, the asymmetry of monetary policy preferences is described by the central bank loss function in the form of a linear exponential (linex).

\[
L_t = \frac{1}{2} (\pi_t - \pi^*)^2 + \lambda \left[ \exp(\gamma y_t) - \gamma y_t - 1 \right] \tag{41}
\]

The linex function has several important properties, such as: first, it allows for different policy weights for the positive deviation and negative deviation of actual output from its potential value. This condition is indicated by the value \( \gamma \neq 0 \). Parameter \( \gamma < 0 \) implies that the negative gap is treated with greater weight than positive gap. Otherwise \( \gamma > 0 \) indicates a positive gap meaning that the policy responded with a weight greater than the negative gap. Suppose \( \gamma < 0 \), if the output exceeds the target or potential value (positive gap), the linear part of the function progressively become larger. Consequently, loss will increase linearly with increasing output. Conversely, if the output is below potential (negative gap), the exponential will dominate functions that cause harm withexponential increases due to lower output. Therefore, the negative deviation from its target output of weighted policy is greater than the positive deviation in the central bank’s loss function. In other words it can be interpreted that the central bank different weights of monetary policy at the time of contraction and expansion of output or at the time of recession and boom. Conditions where \( \gamma \neq 0 \), shows the time inconsistency problem in monetary policy. Second, it refers to the standard model for the case of the linear quadratic \( \gamma \rightarrow 0 \). If \( \gamma = 0 \), then using the L’hospital rule, this function will be the same as the standard linear quadratic function that refers to the Barro-Gordon model that is widely used in the literature of time inconsistency.

Graphically, the difference between symmetric preference and asymmetric preference can be described as follows:
The dashed line in the figure is the central bank’s loss function in the preferences that are symmetric, while the solid red line is the central bank loss function for asymmetry preference. The symmetric loss function (quadratic) shows that if there are positive and negative deviations of output from its potential value in the same amount, it will give the amount of the loss that is equally as great. So that the positive and negative output gap will be responded to the same weighted policy. But in the asymmetric function, if there is a positive deviation of output from its potential (positive output gap), then the central bank losses will increase linearly. But if the output gap is negative, then the central bank losses will increase exponentially. Thus, in the context of the linear function, central bank preferences are asymmetric to the output gap, where the negative output gap will be responded with a policy of greater weight than the positive output gap by the central bank in an effort to reduce losses.

2.3. Previous studies

Ireland (1993) examined whether the time inconsistency problem of the Barro-Gordon model (1983) to explain the behavior of inflation in the United States. Although the data rejected the predictions of the short-term dynamic between inflation and unemployment, the model was able to explain the long-term dynamic prediction in which the relation of the two variables is linear and has a positive co-integration.

Ozlale and Ozkan (2003) conducted a study on the time inconsistency problem of monetary policy in Turkey over the past two decades. By using the quadratic loss function of Barro-Gordon, this study indicated the time inconsistency problem of monetary policy in Turkey in the short and long term. The research also indicated that Turkish monetary authorities directed monetary policy to achieve price stability rather than output stabilization.
Sachida, Divino and Cajueiro (2005) tested the Barro-Gordon model to explain the behavior of inflation and unemployment the United States divided into five periods of observation, the period of Martin I (1951:2-1960:4), the period of Martin II (1961:1-1969:4), the period of office of Burn and Miller (1970:1-1979:2), Volcker regime (1979:3-1987:2) and Greenspan period (1987:3-2005:2). In addition the study also classified an outline of the analysis periods, i.e. the period before Volcker regime (1951:2-1979:2) and after Volcker’s appointment as governor of the Federal Reserve (1979:3-2005:2). Results showed that the Barro-Gordon model was able to explain the behavior of inflation and long-term unemployment in the Burn leadership and Miller, Greenspan periods, after the appointment of Volcker, and for the overall analysis (full sample). While in the short term, the Barro-Gordon model was only significant at Greenspan’s period of office. These findings are contradictory to the view that Greenspan’s anti-inflation policy was very strong.

For the case of Indonesia, Budiyanti (2009) analyzed the implications of time inconsistency of monetary policy in Indonesia using the method of maximum likelihood with the Kalman filter algorithm. By using the quarterly data of inflation and output period 1983-2008 and divide the analysis period into two sub periods, the test results showed that there is a time inconsistency problem of monetary policy in the long term period before and after the crisis, but only short-term time inconsistency occurred in the period before the crisis.

The Barro-Gordon Model time inconsistency as described previously explained that the inflation bias in the economy was caused by the central bank that was too ambitious to reduce unemployment below the natural rate or to stimulate output to exceed its potential level. Although some previous studies presented demonstrate the validity of the Barro-Gordon model in some countries, the assumption of Barro-Gordon in the development raised doubts and questions by many academics and monetary theoretical, practical and empirical practitioners.

Ruge-Murcia (2002) tested the Barro-Gordon model’s predictions using data inflation and unemployment the United States. By establishing a common model of game theory with asymmetric preferences referring to Barro-Gordon model and an alternative model of Cukierman as a special case. This test assumed that when the target is at the natural rate of unemployment, the coefficient of unemployment has zero expectations. In this condition the model of Cukierman applies. Furthermore, if the preference parameters are established in accordance with the quadratic loss function, the coefficient of the conditional variance is zero, then the Barro-Gordon model applies. The likelihood ratio test indicated that the restrictions required by the Barro-Gordon model rejected by the data, but the Cukierman model accepted it. The test results indicated that the behavior of U.S. inflation is best explained by a model in which the central bank has asymmetric unemployment preferences, rather than explained by the Barro-Gordon model with quadratic preferences and target unemployment below the natural rate. Although the preference asymmetry parameter cannot be identified by the reduced form coefficients, the results of this study are consistent with the view that the Federal Reserve gave greater weight to
policy with a positive deviation of unemployment from its target than when the deviation was negative. These findings are also in line with Dolado et al. (2000) who found that the Federal Reserve reacted more strongly against the negative output gap than the positive output gap.

Surico (2003) measures the time inconsistency of monetary policy of the United States when the central bank preferences were asymmetric. Issues time inconsistency and inflation bias are described as regime-specific. Regime change is expected to cause changes in the degree of time inconsistency and the average inflation bias. Therefore Paolo divided the study period into two sub-samples of the period before Paul Volcker was the governor of the Federal Reserve and the period when Paul Volker served as governor. The results showed that the target inflation and average inflation bias in the regime before Volker is 3.42% and 1.01%. This number decreased significantly over the past two decades to 1.96% for the inflation target and the average inflation bias was almost nonexistent. The studies showed that this is due to the stabilization policy preferences of greater output and asymmetry before the Volcker regime, and this was not the case at the time Volcker regime. Although other factors such as creating better policy and better conditions for supporting supply shock also plays an important role in lowering the degree of time inconsistency and the average inflation bias, only the Paolo study described the quantitative results of the empirical findings of inflation behavior in the United States.

Kim and Seo (2007) examined whether the Bank of Korea’s preference is consistent with the assumption of quadratic preferences that describe monetary policy in most standard time inconsistency literature. This study estimated the reaction function and asymmetry parameter preference against the inflation gap, the output gap, and the inflation targeting period in Korea. The empirical results showed that the asymmetry of the inflation preference parameters is statistically significant. Furthermore, the study also indicated that the Bank of Korea monetary policy gives excessive weight to the positive deviation of inflation from its target in the event of a negative deviation.

Ikeda (2009) did time varying estimates of Monetary Policy (TVMP) in the Euro area using monthly data from the period 1999:1 to 2008:9. The test results showed that the loss function of the European Central Bank (ECB) often deviates from quadratic forms and the ECB does not look like the inflationary conditions caused by the expansion of output. Furthermore, estimates of preference implies the importance of the independence of the ECB fiscal policy of each member state and the importance of business cycle synchronization in the euro area since the ECB does not allow expansion of the economy at the expense of price stability in the Euro area.

### III. METHODOLOGY

#### 3.1. Variables and Data

Technically, the data used in this study include(i) inflation, (ii) conditional mean output gap, dan (iii) conditional variance output gap. Output gap is the deviation of real output from its
potential output, measured with Hoderick-Prescott filter (available from Tjahjono, Munandar, and Waluyo, 2010). Inflation is defined as change of Consumer Price Index. The data for conditional mean and conditional variance output gap are not directly available, hence estimated from the output gap. The calculations for conditional mean and conditional variance output gap are not immediately available and will be described in the next section.

The data covers the time 1990:1 to 2009:4. Sources of data obtained from Bank Indonesia, Indonesia Statistic (BPS), and other sources.

Any data collected directly or calculated will go through stationarity testing. Stationarity means that the data at any point of time does not correlate with the data at a different point in time. Nachrowi and Usman, 2006) stated that the collection of the data is stationary if the mean and variance of the time series data do not systematically change over time, or some experts claim that the average and its variance are constant. Using data that is not stationary will likely lead to spurious regression. There are many ways to detect stationarity. A popular one is stationary Augmented Dickey Fuller Test (ADF test). The framework used in this test is to compare the value of the test statistic with the critical value obtained from the table. The null hypothesis that the series has a unit root is rejected if the value of the test statistic obtained is greater (in absolute terms) than the critical value table. This research used stationarity tests applying the ADF test. Furthermore, if there was any structural break, then testing stationarity using the ADF test was equipped with Philips Peron Test (as the Philip Peron Test is better for testing structural breaks).

3.2. Empirical Model

The model used in this study is a model of linear exponential (linex) containing the policy preferences of the asymmetry parameter. The model refers to work of Cukierman (2000), Ruge Murcia (2002), and Surico (2003). The behavior of economic agents form expectations based on the Augmented Phillips Curve:

\[
\pi_t = \theta (\pi_t - \pi_t^e) + u_t, \theta > 0
\]

\(y_t\) is the output gap which is the deviation of actual output from potential value. \(\pi_t\) inflation is a period t and \(\pi_t^e\) is the expectation inflation period t formed in period t-1. \(u_t\) is a supply shock that could potentially happen under the autoregressive \(u_t = \rho u_{t-1} + \varepsilon_t\), where \(\rho \in [0.1]\) and \(\varepsilon_t\) is i.i.d shock with zero mean and constant variance \(\sigma^2_t\).

Furthermore, the private sector has rational expectations, which is expressed by the following equation:

\[
\pi_t^e = E_{t-1} \pi_t
\]
$E_{t,t-1}$ indicates the formation of inflation expectations for period $t$ based on the information available in period $t-1$. Furthermore, the central bank is assumed to have full and direct control of inflation by minimizing the following function:

$$\min_{\{\pi_t\}} E_{t-1} \sum_{t=0}^{\infty} \delta^T L_{t+T}$$ (44)

Where $\delta$ is the discount factor. To bring forth asymmetric preference parameters, loss function is specified in the form of the linear exponential.

$$L_t = \frac{1}{2} (\pi_t - \pi^*)^2 + \lambda \left[ \frac{\exp(y y_t) - y y_t - 1}{y^2} \right]$$ (45)

Where $\lambda > 0$, parameter $\lambda$ is the relative weight of monetary policy on output stabilization. $\gamma$ is the asymmetric preference parameter of monetary policy on output stabilization. If there is no asymmetric preference parameters in the monetary policy to stabilize output then $\gamma = 0$; so by using L’hopital rule, the equation loss function (45) can be expressed in terms of the following standard linear quadratic:

$$L = \frac{1}{2} \left[ (\pi_t - \pi^*)^2 + \lambda y_t^2 \right]$$ (46)

Therefore, according to Ruge-Murcia (2002) it is very important to test whether $\gamma$ is significantly different from zero or not to show the time inconsistency of monetary policy.

Time inconsistency of monetary policy arises because the asymmetry of policy preferences are driven by the desire to achieve the central bank’s output that exceeds its potential value, as represented by the parameter $\gamma$. The level of conservatism of the central bank can be indicated by the amount of $\lambda$ and $\gamma$. The more conservative the central bank’s monetary policy preference, the smaller the output stabilization ($\lambda$), and the preferences for policymakers for output symmetry would be indicated by the low value of the absolute $\gamma$.

Further minimization of equation (45) with the constraint equation (42) which is the Philips Curve Equation and the additional constraint equation (43) which is the assumption of rational expectations, is used to obtain the expression of the following equation:

$$(\pi_t - \pi^*) + E_{t-1} \left\{ \frac{\lambda \theta}{y} \left[ \exp(y y_t) - 1 \right] \right\} = 0$$ (47)

To be able to identify the value $\gamma$, a transformation equation is done to form a linear exponential equation (47) by using a first order Taylor Expansion to obtain the following equation expression:

$$(\pi_t - \pi^*) + \lambda \theta E_{t-1} y_t + \frac{\lambda \theta y}{2} E_{t-1} y_t^2 + \epsilon_t = 0$$ (48)


By rearranging the above equation, the reduced form is obtained by the following equation:

$$\pi_t = \pi^* + \alpha E_{t-1}y_t + \beta E_{t-1}y_t^2 + \varepsilon_t$$

Where:

$$\alpha = -\lambda \theta \quad \text{and} \quad \beta = -\frac{\lambda \theta y}{2}$$

The next stage is to eliminate the expectation sign. According to Ruge-Murcia (2002), the expected value in the above equation can be replaced with actual values by establishing conditional mean and conditional variance of the output gap, so that the obtained expression yields the following equation:

$$\pi_t = c + \alpha E_{t-1}y_t + \beta \sigma_{y,t}^2 + \varepsilon_t$$

Where $E_{t-1}y_t$ is conditional mean of the output gap, and $\sigma_{y,t}^2$ is the conditional variance of the output gap. Average inflation target $\pi^*$ is assumed to be normally distributed around a constant $c$, and $\varepsilon_t$ is the reduced form disturbance.

### 3.3. Estimation Techniques

In this study, empirical testing was done using the equation reduced form (50). Tests using the reduced form (50) raised several problems, including the data expectation from the output gap and the conditional variance which is not readily available. Therefore, some preliminary testing stages were required to obtain the expected value of the output gap (conditional mean of the output gap) and the conditional variance before estimating reduced form models.

Consider this, the empirical testing was conducted by a Two-Step Ordinary Least Square (TSLS). The first stage is to assess the conditional mean and conditional variance output gap. The second stage is the mean regression model in reduced form (50) using the estimation results in the first stage. Testing was initially done for the whole sample period (full sample: 1990:1-2009:4). Furthermore, the estimated period was divided into two sub-samples of before the independence of Bank Indonesia (1990:1-1999:4) and after the independence of Bank Indonesia (2000:1-2009:4). The division of sub-sample aims to discern the degree of time inconsistency of monetary policy before and after the independence of Bank Indonesia.

### Conditional Mean Output Gap Estimates

Expected value of the output gap was estimated by means of smoothing the output gap by using the time series Box-Jenkins Autoregressive Integrated Moving Average (ARIMA). This method is excellent for predicting the data that have a pattern that is less clear, because it does
not assume the shape of a particular data pattern. The Box-Jenkins ARIMA model focuses on a combination of principles, i.e. regression and smoothing methods (smoothing). ARIMA (p, d, q) is a combination of AR (p) and MA (q), where p is the order of the autoregressive, d is the order of integration, and q is the order of the moving average. The selection of the ARIMA model (p, d, q) or ARMA (p, q) will be determined by the degree of integration or stationarity of the output gap. If the data at the level of the output gap stationary, the estimated expected value of the output gap is done with ARMA (p, q). But if the output gap is integrated in first differences or higher order, then the assessment will be done by ARIMA (p, d, q).

To estimate the ARIMA model, there are several steps that must be done. First, identify the model or the degree of integration of data and stationarity order of the ARIMA. Second, the estimated parameters of the model have been based on the results of the identification. Third, is the diagnostic checking and selection of the best model based upon several criteria: (i) coefficients that were statistically significant (in terms of statistics and t or p-value), (ii) random error or white noise (indicated by the Q statistic exceed the 5% confidence level (Q statistic > \( \alpha \))), and (iii) the smallest standard error regression.

**Conditional Variance Estimation of Output Gap**

Conditional variance estimated the output gap by drafting a model specification using ARCH / GARCH. With reference to the Ruge-Murcia (2002), the conditional variance was assessed by the lag of the regression output gap. So this variable will explain how the lag output gap will help predict the rate of inflation in a non-linear manner. But modeling using ARCH / GARCH is only valid in the framework of time series where the output gap is conditionally heteroscedastic or if changes over time. Therefore, before estimating the conditional variance using the ARCH / GARCH, the Langrange multiplier (LM test) must first be applied to determine if the model contains an ARCH effect. If the LM test is significant or there are ARCH effects, the models have problems in heteroscedasticity, and thus the ARCH / GARCH modeling would be valid.

**IV. ANALYSIS AND RESULTS**

4.1. Estimation of the Conditional Mean Output Gap

The expected value of the output gap is obtained by smoothing the output gap using the ARIMA (p, d, q), where p is the order of the autoregressive, d is the order of integration, and q is the order of the moving average. The data for the output gap used is estimated by the method of Hodrick Prescott filter.

Based on the stationarity test results, the output gap is already stationary at the integrated level on the order of 0 I (0), so the order of d is 0 (d = 0). This indicated that the model to be used is Autoregressive Moving Average (ARMA). Furthermore, to get the maximum order of p
and q (AR (p) and MA (q)) will be seen from the number of autocorrelation coefficients that are significantly different from zero. Order maximum AR (p) partial autocorrelation is seen from the line, while the maximum order MA (q) is seen from the line of autocorrelation. From the test results it was known that maximum order of AR is 1 and the maximum order for the MA is 3. So that the model to be estimated is the ARMA (1,1), ARMA (1,2), and ARMA (1,3). Estimation parameter results from the model according to identification are presented in Table 1 below:

The next stage was to determine the best ARMA model in accordance with the criteria mentioned earlier. The selected model was ARMA (1,1). Model ARMA (1,1) was chosen because it had a residual white noise. Of the three ARMA model specifications that were tested, only the ARMA (1,1) which had residual white noise. Therefore the conditional mean value of the output gap will be estimated using the fitted value ARMA (1,1).

### 4.2. Estimation of Conditional Variance

Conditional variance was estimated with regression to the output gap against its lag. Thus, this variable will explain how the lag of the output gap will help predict the rate of inflation in non-linear manner. But this prediction is only valid in the framework of time series where the output gap is conditionally heteroscedastic or if \( \sigma^2_{yt} \) changes over time. If \( \sigma^2_{yt} \) is constant, then the coefficient \( \beta \) cannot be identified. Therefore it is very important to test whether the conditional variance is time-varying. For this purpose, the output gap to 4 of its lag periods is regressed using OLS. Further testing of the \( LM \) (Langrange Multiplier) was used to detect whether

<table>
<thead>
<tr>
<th>Model ARMA</th>
<th>Parameter</th>
<th>Value Estimation Parameters</th>
<th>p-value from T Ratio</th>
<th>Description (S/TS*)</th>
<th>Probability Q</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1,1)</td>
<td>Constant</td>
<td>-0.052</td>
<td>0.668</td>
<td>0.001</td>
<td>S</td>
<td>0.119</td>
</tr>
<tr>
<td></td>
<td>AR(1)</td>
<td>0.043</td>
<td>0.889</td>
<td>TS</td>
<td>0.045</td>
<td>0.202</td>
</tr>
<tr>
<td></td>
<td>MA(1)</td>
<td>-0.052</td>
<td>0.711</td>
<td>0.035</td>
<td>TS</td>
<td>0.138</td>
</tr>
<tr>
<td>(1,2)</td>
<td>Constant</td>
<td>-0.142</td>
<td>0.991</td>
<td>0.660</td>
<td>TS</td>
<td>0.138</td>
</tr>
<tr>
<td></td>
<td>AR(1)</td>
<td>0.583</td>
<td>0.043</td>
<td>TS</td>
<td>0.138</td>
<td>0.597</td>
</tr>
<tr>
<td></td>
<td>MA(1)</td>
<td>-0.052</td>
<td>0.000</td>
<td>S</td>
<td>0.138</td>
<td>0.597</td>
</tr>
<tr>
<td>(1,3)</td>
<td>Constant</td>
<td>0.007</td>
<td>0.000</td>
<td>TS</td>
<td>0.138</td>
<td>0.597</td>
</tr>
<tr>
<td></td>
<td>AR(1)</td>
<td>0.468</td>
<td>0.000</td>
<td>S</td>
<td>0.138</td>
<td>0.597</td>
</tr>
<tr>
<td></td>
<td>MA(1)</td>
<td>0.583</td>
<td>0.043</td>
<td>S</td>
<td>0.138</td>
<td>0.597</td>
</tr>
<tr>
<td></td>
<td>MA(2)</td>
<td>0.016</td>
<td>0.971</td>
<td>S</td>
<td>0.138</td>
<td>0.597</td>
</tr>
<tr>
<td></td>
<td>MA(3)</td>
<td>0.016</td>
<td>0.780</td>
<td>TS</td>
<td>0.138</td>
<td>0.597</td>
</tr>
</tbody>
</table>

* S = Significant, TS = Not Significant
the model contains ARCH effects or not. If there are ARCH effects, the null hypothesis with no conditional heteroscedastic was rejected. So the use of ARCH/GARCH would be valid.

The results of the test statistic F and TR² had a p-value of 0.0013 and 0.0016 that were less than 5% confidence level indicating that the models contain ARCH effects. Thus modeling methods ARCH/GARCH was valid. Furthermore, the conditional variance of the output gap was estimated using a GARCH (1,1), as all the ARCH-LM test were significant, meaning the coefficient of the modeling GARCH (1,1) is better.

The next stage was to assess the effect of the ARCH model of GARCH (1,1) to determine whether the model specification used to be able to capture all of the output gap ARCH effects. Table 2 shows the results of testing of ARCH effects using OLS and GARCH (1,1).

<table>
<thead>
<tr>
<th>Estimation method</th>
<th>Indicator Testing</th>
<th>Value</th>
<th>p-value</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLS</td>
<td>F-statistic</td>
<td>3.423</td>
<td>0.013</td>
<td>There are ARCH effects</td>
</tr>
<tr>
<td></td>
<td>Obs*R-squared</td>
<td>12.217</td>
<td>0.016</td>
<td>There are ARCH effects</td>
</tr>
<tr>
<td>GARCH (1,1)</td>
<td>F-statistic</td>
<td>0.534</td>
<td>0.711</td>
<td>There are no ARCH effects</td>
</tr>
<tr>
<td></td>
<td>Obs*R-squared</td>
<td>2.225</td>
<td>0.694</td>
<td>There are no ARCH effects</td>
</tr>
</tbody>
</table>

* S = Significant, TS = Not Significant

The test results showed that the residuals no longer contain ARCH effects, which means that the model was able to capture the whole issue of heteroscedasticity in the output gap. Thus, the conditional variance to the output gap was estimated using GARCH (1,1).

4.3. Stationarity Test

A modern technique for detecting stationarity is the unit root test. One popular test is the *Augmented Dickey Fuller test stationary (ADF test)*. The framework used in this test is to compare the value of the test statistic with the critical value obtained from the table. The null hypothesis is, the series unit root is rejected if the value of the test statistic obtained is greater (in absolute terms) than the critical value table. This research used the ADF stationarity test for testing the unit root to determine the level of each variable used. To complete the testing, stationarity using *Augmented Dickey Fuller* unit root test was also carried out using *Philips Peron*. This is because the occurrence of a structural break in the economy before the independence of Bank Indonesia, in 1997:3 to 1998:3. If the economy was experiencing a structural break, the stationarity test results using Philip Peron is better. Here is a summary of the results of the stationary tests using ADF and Philip Peron.
Both testing methods gave the same conclusion, that all series are integrated on the same level, where all the variables were used in the stationary level. So testing that requires time series data must be stationary were met.

4.4. Empirical Tests

Estimation Results

Empirical tests were performed using the reduced form (50). But because of the occurrence of a structural break in the Indonesian economy caused by the 1997 economic crisis, the crisis dummy variable was added to the reduced form for the test period of the overall sample (full sample) and the period before the independence of Bank Indonesia. The value of the dummy variable is 1 at the time of crisis, and 0 at the time of no crisis. Thus the specification of the model used for testing the entire sample period (full sample) and the pre-independence period are as follows:

$$\pi_t = c + \alpha E_{t-1} y_t + \beta \sigma_y^2 + \delta dkrisis + \varepsilon_t$$ (51)
As for the period after the independence of Bank Indonesia reduced model without the dummy form is as follows:

\[
\pi_t = c + \alpha E_{t-1}y_t + \beta \sigma^2_{y_t} + \epsilon_t
\]  
(52)

To correct the problem of heteroscedasticity and autocorrelation in the error term, the Newey-West estimator was used to calculate the standard error of the covariance matrix (Greene, 2008).

<table>
<thead>
<tr>
<th>Period</th>
<th>Coefficient</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>α</td>
<td>β</td>
<td>Δ</td>
<td></td>
</tr>
<tr>
<td>Full Sample (1991:1-2009:4)</td>
<td>7.703**</td>
<td>-1.660</td>
<td>0.010**</td>
<td>29.372**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.941)</td>
<td>(0.980)</td>
<td>(0.001)</td>
<td>(8.823)</td>
<td></td>
</tr>
<tr>
<td>Before Independence (1991:1-1999:4)</td>
<td>7.832**</td>
<td>-2.228**</td>
<td>0.004**</td>
<td>33.004**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.494)</td>
<td>(1.053)</td>
<td>(0.001)</td>
<td>(3.765)</td>
<td></td>
</tr>
<tr>
<td>After Independence (2000:1-2009:4)</td>
<td>7.766**</td>
<td>1.785</td>
<td>0.064</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.083)</td>
<td>(1.204)</td>
<td>(0.060)</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Number in parentheses is the standard error
* And ** indicate significance at the 1% and 5% degree of confidence

**Time Inconsistency of Monetary Policy with Asymmetric Preferences**

The test results showed that in the period before independence, Bank Indonesia faced a time inconsistency problem of monetary policy. This is evident from the significance of the coefficient \( \beta \). The significant coefficient \( \beta \) indicates that the key parameter \( \gamma \), which is the asymmetric preference parameter, was significantly different from zero. So it can be said that Bank Indonesia monetary policy preferences in the period before independence was asymmetric in nature to the output gap. Detection of the presence of an asymmetric preference parameter indicates that the monetary authority had a policy preference that was asymmetric in response to the economy in recession and boom. This means that Bank Indonesia gives weight and different treatment policies in response to current economic conditions during periods of contraction (negative output gap) and expansion (positive output gap).

The value \( \beta > 0 \) an asymmetric preference parameter which implies \( \gamma < 0 \) (because \( \lambda \) and \( \theta > 0 \)). This condition means that Bank Indonesia in the period before independence was not indifferent between the negative output gap and a positive output gap. The negative output gap is relatively less favored than the positive output gap. So the monetary authority has an incentive to give greater weight to policy negative deviation of the value of potential output (the negative output gap) than when the economy is experiencing a positive deviation (positive output gap). Or in other words it can be said that Bank Indonesia is more focused on the output gap in a recession.
This is understandable, because when the economy contracted where the output gap is negative, and with reference to the central bank’s loss function in the context of linex, the central bank losses would increase exponentially. While when a boom occurs, there is a positive output gap, and the central bank loss function in the context of linex only increases linearly. Thus, the central bank has an incentive to focus on the output gap in a recession to stimulate economic growth in the short-term to minimize losses. This condition indicates that the monetary authorities have an asymmetry preference (i.e. the central bank has an asymmetric preference) to the output gap, by giving greater policy weight to the negative output gap than the positive output gap. But this action is very inflationary, because monetary policy in the long-run is not believed to affect economic growth. As a result, the output remains at initial levels, while inflation continues to go higher.

This condition is very relevant to the portrait before the independence of monetary policy. Where in this period, according to the Law No. 13 Year 1968 on the central bank, Bank Indonesia has diverse goals (multiple objectives), namely: first, organize, preserve, and maintain the stability of the rupiah, and secondly, encourage smooth production and development to expand employment opportunities in order to improve the living standard of the people. Achievement of these objectives are not always consistent and often overlap. With these dual goals, Bank Indonesia monetary policy preferences are asymmetry of the output gap, because in addition to preserving price stability, Bank Indonesia also acts as an agent of development, which is obliged to provide employment. So when the economy slows, Bank Indonesia has the incentive to add additional policies to stimulate employment and output, thereby potentially compromising the goal of price stability. With the policy adjustments made by the monetary authorities in response to the prevailing economy, Bank Indonesia’s monetary policy is seen as discretionary and time inconsistent.

These findings corroborate previous research conducted by Budiyanti (2009) who found that in the period before the crisis (1990-1997) Bank Indonesia faced a time inconsistency problem in the short-term and long-term. The results are also consistent with Goeltom (2005) which stated that Bank Indonesia monetary policy period 1990-2003 still faced time inconsistency problems, as seen from the monetary policies that are sometimes too tight and sometimes too loose.

Turning to the sub-sample after the independence of Bank Indonesia, the time inconsistency problem of monetary policy in this period was no longer detectable, as seen from the value of the \( \beta \) coefficient which was not statistically significant. The insignificant Coefficient \( \beta \) implied that the asymmetric preference parameter \( \gamma \) is equal to zero. This means that Bank Indonesia monetary policy preferences were symmetric to both the output gaps (positive and negative). In other words it can be said that Bank Indonesia was indifferent to both a positive output gap and a negative output gap. Symmetric preferences with respect to the output gap reflects a consistent monetary policy and commitment in achieving low inflation, by reducing the element of discretion in responding to economic conditions (boom or recession). Thus, monetary policy
in the period after the independence of Bank Indonesia was seen to be symmetric and consistent with the goal of achieving low inflation.

This finding is thought to be very relevant to the status of the independence of Bank Indonesia. The independence of Bank Indonesia was marked by the birth of a law expressing requirement for monetary policy to focus on achieving the goal of price stability as a sole objective, regardless of the intervention of other parties. With a policy preference that has symmetry in this period, it was also shown that there was improved performance using a monetary policy framework for inflation targeting. Thus monetary policy preferences that are symmetric and focuses on low inflation can reduce accommodative elements or avoid the temporal inconsistency problem. This finding is consistent with Rogoff (1985) which stated that in order to overcome the problem of time inconsistency, the monetary policy should be delegated to an independent conservative central bank. A conservative central bank is a central bank that prefers low inflation (inflation averse).

As has been mentioned before, time inconsistency is closely related to the credibility of monetary policy (Goeltom, 2005). The more consistent monetary policy, the more credible the policy is in the perception of economic agents. The results of empirical testing found that after a period of monetary policy independence is time consistent, in fact, also this was also followed by increased credibility of monetary policy by Bank Indonesia. Harmanta (2009) reported that the credibility of monetary policy of Bank Indonesia increased after the implementation of the ITF, although not fully credible (imperfect credibility). This is understandable given the full implementation of the ITF was relatively short.

**Effect of Output Gap for Inflation**

The test results showed that the effect of the output gap on inflation was significantly negative in the period before independence. That is, the wider the output gap, the lower the inflation; whereas the smaller the gap between actual and potential output, the higher the inflation. In the context of monetary policy and time inconsistent preferences, with asymmetric monetary policy, the monetary authority gave greater weight to the policy of the negative output gap. This shows that when the deviation from potential output is negative, it will be responded to by an expansionary monetary policy to push output back to potential or at least to minimize the negative gap. Of course, this expansionary policy will push the inflation rate higher. As a result, the central bank’s asymmetric preference would lead to growing pressure of the negative output gap in the rapid inflation.

The test results also indicated that the effect of the output gap on inflation is non-linear. This reflects the *Philips curve* is not linear in case of Indonesia in accordance with Solikin (2004). Strong evidence of the existence of non-linearity of the *Philips curve* is also found in the research by Laxton et al. (1995), Clark et al. (1996), Debelle and Laxton (1997), and Fisher
et al. (1997). Solikin (2004) reported that the non-linearity is partly due to the limited capacity (capacity constraints) reflected in the more powerful influence of excess demand shocks (excess demand) for inducing inflationary shocks of the excess supply (excess supply) in efforts to reduce inflation.

Meanwhile, in the period after the independence of Bank Indonesia, the effect of the output gap on inflation was not seen again, which is explained by coefficient $\alpha$ that was not statistically significant. This is presumably due to the reduction in monetary policy preferences towards output stabilization ($\lambda$) within the framework of inflation targeting. This condition explains that monetary policy with commitment may result in an inflation rate that will be independent of the pressure of the output gap. These findings indicate a change of behavior in Indonesia’s Phillips curve according to Solikin (2004). Solikin (2004) found that the presence and behavior of the Phillips curve would change from time to time, in line with changes in the structure of economic fundamentals. In particular, Solikin’s study reported that the formation pattern of expectations and linearity in the Phillips curve experienced a significant difference (change) between periods before and after the crisis.

Coefficient $\alpha$ and $\beta$ were not significant which reflects the Indonesia Central Bank as an increasingly conservative (hawkish) central bank. The level of conservatism of the central bank according to Rogoff (1985) can be explained by the parameters $\lambda$ and $\gamma$. A conservative central bank is characterized by a reduction in monetary policy preferences on output stabilization (where $\lambda$ becomes smaller and smaller) and a symmetry of the monetary policy preferences ($\gamma$ the lower).

**Inflation**

The test results showed that the achievement of inflation on average in the period after independence was lower than the average inflation period before independence. Where there are no other influencing factors, the inflation rate period before independence was 7.77%, which is lower than the pre-independence period at 7.83%. But the level of the inflation was not very encouraging, as there was only a very small decrease. This reflects the slow pace of the decline in inflation in Indonesia. Several previous studies have also reported a similar case, where the decline in inflation towards the target announced by the monetary authorities was assessed as sluggish. Harmanta (2009) reported slow progress in Indonesia in inflation caused by monetary policy that was not fully credible (imperfect credibility). The low credibility of monetary policy to encourage people form expectations of higher inflation that exceeds the actual inflation target announced by the monetary authorities. Table 5 shows that the value of public inflation expectations are always higher than the announced targets, except in 2003 and 2007 in which inflation expectations were lower than the target.
Inflation measured by the CPI was formed by three components, namely inflation (core inflation), administered prices and volatile foods. Figure 2 illustrates the decomposition of inflation on in Indonesia for the period of pre-crisis, crisis period, pre ITF and ITF full implementation period.

The graph shows that the inflationary component of administered prices and volatile food tends to fluctuate more than core inflation. Core inflation is relatively more stable and showed a slight tendency to decline in the period after the independence of Bank Indonesia (pre-ITF and ITF implementation) when compared with the previous period. Of the three components, core inflation can only be controlled by monetary policy, while administered price is the price of

<table>
<thead>
<tr>
<th>Year</th>
<th>Target CPI</th>
<th>Expectation CPI</th>
<th>Actual CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>6.00</td>
<td>10.61</td>
<td>9.35</td>
</tr>
<tr>
<td>2001</td>
<td>7.25</td>
<td>14.29</td>
<td>12.55</td>
</tr>
<tr>
<td>2002</td>
<td>9.50</td>
<td>12.12</td>
<td>10.03</td>
</tr>
<tr>
<td>2003</td>
<td>9.00</td>
<td>8.04</td>
<td>5.06</td>
</tr>
<tr>
<td>2004</td>
<td>5.50</td>
<td>7.38</td>
<td>6.40</td>
</tr>
<tr>
<td>2005</td>
<td>6.00</td>
<td>9.75</td>
<td>17.10</td>
</tr>
<tr>
<td>2006</td>
<td>8.00</td>
<td>9.20</td>
<td>6.60</td>
</tr>
<tr>
<td>2007</td>
<td>6.00</td>
<td>7.47</td>
<td>6.60</td>
</tr>
<tr>
<td>2008</td>
<td>5.00</td>
<td>7.75</td>
<td>11.06</td>
</tr>
<tr>
<td>2009</td>
<td>4.00</td>
<td>4.90</td>
<td>2.78</td>
</tr>
</tbody>
</table>

Source: Harmanta, Bathaluddin, and Waluyo (2010)
some strategic commodities regulated by the government, such as the price of fuel, electricity, and LPG among others. Meanwhile, inflationary pressure from volatile food is determined more flexibility on the supply side, and is particularly vulnerable to natural phenomena such as climate change, crop failure, and natural disasters.

<table>
<thead>
<tr>
<th>Period</th>
<th>CPI</th>
<th>Core Inflation</th>
<th>Volatile Food</th>
<th>Administered Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (excl. Crisis)</td>
<td>8.47</td>
<td>7.93</td>
<td>8.84</td>
<td>11.44</td>
</tr>
</tbody>
</table>

Source: Harmanta, Bataluddin, and Waluyo (2010)

Table 6 provides an overview that is not much different from Figure 2. Inflation in the period after independence (pre-ITF and post-ITF) is dominated by inflation that cannot be controlled by monetary policy (administered prices and volatile foods). The magnitude of the effect of administered prices and volatile foods on the inflation target achievement for the period after the independence of Bank Indonesia saw significant inflation for this period. This was likely contributed by (i) the plan to reduce subsidies and the price adjustment of strategic commodities (fuel, electricity, LPG, etc.) to market mechanism and (ii) the frequent disruptions in supply and distribution of basic commodities (rice, sugar, wheat, chilli, cement, spices, etc.). As for the inflation that can be controlled by monetary policy (core inflation) a decreasing trend was evident as compared to the period before independence (pre-crisis). This showed that a good performance of monetary policy in the period after the independence of Bank Indonesia, and commitment to the sole purpose of achieving price stability.

V. CONCLUSION

This study provides some conclusions, firstly, asymmetric preference parameters were detected for the Bank Indonesia monetary policy period before their independence which indicates a time inconsistency problem of monetary policy preferences that are asymmetrical to the output gap. Whereas in the period after independence, monetary policy was time consistent with symmetry in monetary policy preferences. Second, the time inconsistent monetary policy in the period before independence caused large negative output gap pressure on inflation, while monetary policy after independence was consistently able to remove the effect of the output gap on inflation. Third, the consistent application of ITF in the period after independence was able to direct and achieve a lower rate of inflation, although the decline seemed slow and not as expected.
The three above conclusions have several implications: first, the need for Bank Indonesia to increase consistency. In connection with the empirical facts that have been presented, the effectiveness of the achievement of the ultimate objective of monetary policy for the sole objective of price stability will depend on the extent of Bank Indonesia’s commitment to avoid temporal inconsistency trouble in pursuing the development of low and stable inflation. Monetary policy should be done more consistently with clear rules and that reduces the accommodative element (discretion). Monetary policy was consistent with the ITF has proven to be able to reduce inflation, although inflation target was satisfactorily achieved. To further enhance public confidence in the reputation of Bank Indonesia, Bank Indonesia needs to further improve the consistency of monetary policy committed to the sole purpose of achieving price stability. The second implication is the need to improve coordination. Given that not all components of inflation can be influenced by monetary policy (administered prices and volatile food), it is necessary to coordinate monetary policy consistent with other government policies to reduce inflationary pressure from administered prices and supply constraints. Therefore, coordination established between the government and Bank Indonesia needs to be improved in order to achieve the goal of price stability. In addition to minimizing the amount of inflationary pressures stemming from increases in administered prices and volatile foods, policy coordination is essential for strengthening synergies in the management of the overall economy. The third implication is the need to improve communication. Management of inflation expectations are very important in the framework of the new monetary policy (inflation targeting framework), given the magnitude of the effect of inflation expectations as a factor causing inflation. Because the dominant formation pattern of public expectations of inflation are still backward looking, more transparent monetary policy is needed to reduce the information asymmetry between Bank Indonesia and the economic agents. Bank Indonesia needs to improve the communication of monetary policy, in order to direct the public expectations to be more anticipatory (forward looking) as required by an inflation targeting framework. The main objective of strengthening the communication strategy is to gradually help lower inflation expectations that lead to the achieving inflation target that have been set.
REFERENCE


Cukierman, Alex, 2000, *The Inflation Bias Result Revisited*. Tel-Aviv University.


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THE EFFECT OF CENTRAL BANK INDEPENDENCE ON PRICE STABILITY: THE CASE OF INDONESIA

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Prof. Prasanna Gai

Abstract

This paper investigates the relationship between central bank independence (CBI) and inflation in Indonesia during 1970-2006. Using partial adjustment Ordinary Least Square (OLS) and Engel Granger Error Correction Model, the result shows that legal CBI index inversely affect the inflation, while the turnover of governor is not significant. This result emphasizes Bank Indonesia to strengthen its independency in order to achieve his inflation target.

Keywords: Central bank independency, Inflation, Error Correction Model.

JEL Classification:C32, E58.

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I. INTRODUCTION

Indonesia had been severely affected by Asian economic crisis in 1997. At that time, Indonesia experienced multidimensional economic problems including large current account deficit and exchange rate depreciation. An increase in uncertainty pushed the capital out, followed by liquidity problem in many banks. As the lender of last resort, Bank Indonesia provided liquidity borrowing for the banks, nevertheless, these led to increase in money supply and trigger hyperinflation.

One possible source of the crisis in 1997 is that the central bank was not independent. In previous political regime (Order Lama), the central bank always financed the government budget deficit by printing money. During the new regime (Order Baru), the central bank was mandated to support the government’s goals to sustain economic growth and to reduce unemployment. Accordingly, it was very difficult for the Bank Indonesia to pursue price stability as its main objective. Later in 1999, Bank Indonesia became legally independent, along with the rising awareness and also theoretical and empirical evidencethat independent central bank is required to achieve price stability. This was also a recommendation of the IMF for economic recovery after the crisis. Through Law No.23/1999 the central bank responsibility had been more focus from multiple objectives to single objective of price stability.

The basic theory of the central bank independence is inflation bias theory. Inflationary bias reflects price instability that will determine the basic prices of all economic activities. It will affect the economy through the purchasing power of the national currency. With unstable prices, people worry about the real value of their money being discounted by inflation. Furthermore, unstable price will increase uncertainty and create economic instability.

However, appointing a conservative central banker to pursue the price stability is debatable since many researchers find different results. Some researchers suggest that the central bank independence can create low inflation, while the other found no correlation between Central Bank Independence (CBI) and inflation. Generally, a negative correlation between legal CBI index and inflation is found in the industrial countries while in the developing countries, it is not significant. On the other hand, the governor turnover of central bank as informal indicator of CBI is generally positively correlated to inflation in the developing countries but it is not significant in the industrial or developed countries.

The purpose of this research is to investigate the relationship between CBI and inflation in Indonesia using annual data from 1970 to 2006. This research uses two indicators of CBI; legal index and TOR constructed by Cukierman, Webb and Neyapty (CWN) (1995). We use two models; Ordinary Least Square (OLS) by using partial adjustment model and Engel Granger Error Correction Model (EGECM) to identify the impact of CBI on inflation, and to investigate the long-run equilibrium of inflation.

The reminder of the paper is structured as follows. Section I is theoretical adjustment for central bank independent. In section II, the research presents previous empirical evidence of
the central bank independence effect on price stability. Section III discusses the result found in Indonesia. The last section is conclusion and policy implication.

II. THEORY

2.1. Basic Model of Central Bank Independency

Inflation bias occurs under discretionary monetary policy where central bank is controlled or at least intervened by government. Within this condition, if central bank knows public expectations, he tends to create inflation surprise to increase seignorage income and to push real economic activity; employment and output. However, in the next period people will no longer believe the central bank and set higher expectations. Inflation will be higher than it should have been as inflation is a function of expected inflation. In this case, the central bank is perceived to not be credible, hence it will be more difficult to manage inflation.

There are three reasons why central banks should be independent; first, public choice theory explains that central banks get political pressure from a government to finance the government budget deficit through easy money policy (Eijffinger 1997). Second, when fiscal authority is dominant, monetary authorities will not be able to control government budget deficit, hence the supply of money become endogenous. This condition is possible when the central bank is not independent (Sargent and Wallace, 1981 cited in Eijffinger 1997). Third, there is a ‘time inconsistency’ problem, where the policy is no longer optimal to respond the original plan (Kydland and Prescott, 1977; Barro and Gordon, 1983; Rogoff, 1985).

One solution for the inflation bias is to delegate monetary policy to an independent ‘conservative’ central banker (Rogoff, 1985; Barro and Gordon, 1984; Walsh, 2003). Central bank is independent when he is free from political pressure or government intervention, including free from the government’s temptation to increase seignorage by increasing money supply, (Alesina and Summers (1993). Moreover, independent central bank should only has single objective; price stability, which implies that central banks focus more on inflation than output growth. Within this framework, the central bank can formulate monetary policy to achieve price stability, independent from any political interference (Ahsan, 2006; Pollard, 1993).

The central bank is also not allowed to buy government’s obligation in primary market. This means the government is not permitted to borrow money from the central bank. The government should choose ways within his authorities such as raising taxes, issuing bills, or borrowing from conventional banks to finance its expenditure rather than borrowing from the central bank.

Before looking at the various result of empirical evidence, this paper provides basic model of inflation bias and CBI. We use Rogoff model (1985) as starting point. This model compares the loss function between discretionary monetary policy and conservative central banker (by
rule). Inflation under the discretionary monetary policy is analyzed by Barro and Gordon (1983) adopting the Lucas-Island supply function.

\[ y_t = y_n + a(\pi_t - \pi_e^t) + \varepsilon_t \]  

(1)

where \( y_t \) is output; \( y_n \) is natural rate of output; \( \pi_t \) is inflation; \( \pi_e^t \) is expected inflation; and \( \varepsilon_t \) is real shock.

Output in this model is a function of labor and capital (Cobb Douglas). When actual inflation is greater than expected inflation, the real wages will drop since the expected real wage is lower and the firm will absorb employees. On the other hand, whenever actual inflation is less than expected one, the real wages will increase and firm will reduce employees.

Under discretionary monetary policy, the central bank minimizes the following social loss function:

\[ L = \frac{1}{2} \pi_t^2 + \frac{\lambda}{2} (y_t - y_n - k)^2 \]  

(2)

Where \( \lambda \) is society’s preference for output, and \( k \) is constant. Parameter \( k \) is imperative in this model. Under discretionary monetary policy, on stabilizing output and inflation, the central bank will set the output to be around \( y_n + k \), while inflation will fluctuate around zero.

A simple relationship between inflation and the actual policy instrument adopted by policy maker gives:

\[ \pi_t = \Delta m + v \]  

(3)

where \( \Delta m \) is the growth rate of money supply (first difference of the log nominal supply of money), and \( V \) is the velocity shock. In setting \( \Delta m \), this model assumes that expected inflation is given, supply shock \( (\varepsilon) \) is observable by central bank but not velocity shock \( (\nu) \); and also \( \varepsilon \) and \( \nu \) are uncorrelated.

Initially, private sector set wages based on expected inflation. The private agent must commit to the nominal wage contract before the central bank set the growth rate of nominal money supply. Under discretionary monetary policy, the central bank care about output and tries to reduce output variation by choosing inflation. In this case, the central bank has the opportunity to create inflation different from private agent’s expectation.

The effect of discretionary policy on inflation rate is obtained by substituting equation (1) and (3) into the central bank loss function (2), then take first order condition with respect to money growth:
Equation (4) shows that aggregate supply shock occurs since the central bank wants to minimize output variability (λ) around its target and then result in high inflation. There is a tradeoff between inflation and output variability. The more a central bank wants to minimize output variability (λ), the greater inflation will be (Δm). Private sectors will use this equation as their expectation. Therefore, optimal policy depends on expected inflation of private agent’s. The expected inflation is formed from observing the aggregate supply shock (ε) as follows:

\[ \pi^e = E[\Delta m] = \frac{a^2 \lambda \pi^e + a \lambda k}{1 + a^2 \lambda} \]

π^e = aλk > 0, substitute this into (3) and use (4) to get equilibrium rate of inflation under discretionary policy:

\[ \pi^d = \Delta m + \nu = a \lambda k - \left(\frac{a \lambda}{1 + a^2 \lambda}\right) e + \nu \]

Equation 5 shows that positive average inflation rate equals to aλk. The determinant of inflation bias is distortion (k), the effect of money supply on output (a) and the weight of central bank to pursue output objective (λ). When private agents are able to anticipate this rate completely, it will have no effect on output.

If monetary policy is delegated to an independent central bank (conservative), central bank puts weight on inflation, and inflation will be:

\[ \pi^d(\delta) = \Delta m + \nu = \frac{a \lambda k}{1 + \delta} a \lambda k - \left(\frac{a \lambda}{1 + \delta + a^2 \lambda}\right) e + \nu \]

This equation implies that inflation bias will be lower since 1+δ>1 or δ>0, and this tends to reduce the loss function. However, the coefficient of aggregate supply shock (ε) is also lower, implying the central bank does not respond sufficiently to aggregate supply shock (ε). In other words, when the central bank cares more about inflation than output stabilization, inflation
bias will be lower. Yet, this will lower output stabilization. Based on this result, many researchers conclude that lower average inflation can be achieved by assigning a conservative independent central bank; however at the cost of lower output stabilization. Thus, a trade-off between lower average inflation and high output variability is expected to occur.

Berger, Haan and Eijffinger (2001) use another simple equation to explain the theory of central bank independency (see equation 7). This model adopts the same loss function equation and Lucas-Island supply function, and also inflation under rational expectation as in Barro and Gordon model. Under discretionary policy type of central bank, inflation is:

\[ \pi_t = \chi y_t^* - \frac{\chi}{\chi + 1} \mu_t \]  

(7)

The first right hand side term is inflationary bias. When a country has high inflationary bias, it implies that a government pushes big surprise on inflation. The second term is the degree of stabilization of output shock that will affect inflation. Loss function becomes:

\[ L^{cb} = \frac{1 + \epsilon}{2} \pi_t^2 + \frac{\lambda}{2} (y_t - y_t^*)^2 \]  

(8)

However, when a central bank is independent or conservative, inflation will be:

\[ \pi_t = \frac{\chi}{1 + \gamma \epsilon} y_t^* - \frac{\chi}{1 + \gamma \epsilon + \chi} \mu_t \]  

(9)

Comparing inflation rate under discretionary policy in equation (7) and conservative (independent) central bank in equation (9) shows that inflation can be lower under independent central bank than discretionary policy. The key parameter is \( \gamma \) and \( \epsilon \). When both values are positive, inflation rate will be lower. This means that by delegating monetary policy to a conservative central banker will create positive value of \( \gamma \) and \( \epsilon \), thus inflation will be lower. Conversely, when \( \gamma \) or \( \epsilon \) is equal to zero, the central bank has the same preference of inflation aversion as the government, implying independency of central bank does not matter. This is in line with Eijffinger and Hoebericht (1998):

\[ M_t = \gamma L^{cb} + (1 - \gamma) L^G, \]

where \( \gamma \) is the degree of CBI, and as \( \gamma=1 \), the central bank is fully independent.

However, a conservative central banker alone is not sufficient to achieve price stability since it provides too little response on the shock. Lohmann (1992) argues that appointing a central banker to fight inflation is better idea, but discharges him when the shock is too large. This way, the central banker will stay responsive to output stabilization. Walsh (1995) provides
alternative solution for inflation bias problem which is known as ‘Optimal Walsh Contracts’. He suggests providing bonus for the central banker when inflation is successfully reduced, instead of appointing a central banker. This approach is more contractual than institutional solution.

### 2.2. Empirical Evidence

Empirically, whether higher degree of CBI is associated with the lower inflation is still controversial among economists. The empirical evidence shows that there is a negative relationship between the degree of CBI and average inflation such as Grilli et al. (1991), Cukierman et al. (1992), Alesina and Summer (1993), Berger (2000) Jacome (2007), Hayo and Voigt (2005), Hicks (2004), Eijffinger et al. (1998).

The correlation between CBI and inflation is described in Figure 1. Switzerland and Germany with a high CBI degree have low inflation. In Japan, Canada and Netherlands, their moderate CBI degree is associated with average inflation. Similarly, New Zealand with low CBI has high inflation. Thus, the higher degree of CBI is associated with lower inflation rate, vice versa.

![Figure 1](https://example.com/figure1.png)

Nonetheless, Luna (2003) claims that there is no correlation between CBI and inflation. Using cross-country panel data among 23 OECD countries, he suggests that low inflation can be achieved without delegating monetary policy to an independent central bank. A low inflation is more related to exchange rate target rather than a conservative central bank. Using institutional reform as a proxy for CBI, he detects that price stability was achieved after the implementation of independence reform only for Spain, Greece, New Zealand, Portugal and Italy.
In contrast to Luna, Jong (2002) result finds a negative correlation between CBI and inflation in OECD countries. He suggests that the negative correlation appears because of cultural factors where people do not like uncertainty. An unclear correlation is found by Campilo and Miron (1996) but their result contrast with Luna (2003). Their panel regression across countries shows that exchange rate regime is not important to determine inflation. The more important factors are economic fundamentals such as openness and optimal tax.

Pollard (1993) has the same result but finds that an independent central bank will harm economic growth. He argues that an independent central bank can increase policy conflict with a government since they have difference preferences; and if this is evident, the economic growth will be lower.

Economists not only focus on whether CBI promotes price stability, but also whether it responds to economic performance. Waud (1995) points out that CBI will improve the trade-off between inflation and economic performance as assumed in Philip curve. An independent central bank can create low inflation and low growth as well. However, Fisher (cited in Eijffinger (1997)) argues that the tradeoff occurs only in the short term. In the long term, the Philip curve is vertical, implying monetary policy will only influence inflation; hence there is no clear correlation between CBI and output.

Those various outcomes may be originated from different measures of CBI. Seminal work of Bade and Parkin’s (1988) measures the relationship between the central bank and government as ‘budgetary’. They create an index based on the institutional relationship between central bank and government.

Grilli, Masciandaro and Tabellini (1991) presented another index known as the GMT Index, based on political and economic independence measures. Using government deficit that financed by central bank, they found negative correlation between CBI and inflation.

Cukierman, Webb and Neyapti (1992) introduce the CWN index. They divide the measurement into two categories; Central Bank Independence (CBI) legal index and the rate of turnover of the central bank governor (TOR). The legal CBI index is significantly negative correlated with inflation in developed countries, but is insignificant for developing countries. TOR is positively correlated in less developed countries but uncorrelated in industrial countries.

The measurement of CBI adopted in many empirical studies has augmented the diversity of the substantial result to explain the effect of CBI on inflation. Alesina and Summer (1982) and Jacome (2001, 2007) adopting the expansion index of GMT and CWN results a negative correlation between the CBI and inflation. Panagiotidis (2005) confirms the same result using the CWN index for the case of Greece.

Voig (2005) adopts the degree of de facto of central bank as measurement of CBI and finds negative correlation between CBI and inflation. However, TOR as an informal proxy for CBI provides a positive correlation.
Campilo and Miron (1997) actually found the same result as Cukierman (1992) but reached a different conclusion. They claim there is no correlation between CBI and inflation because they find that CWN index was negatively significant only in high income countries and positively insignificant in developing countries. When they pooled the sample together, the result is unclear. This is similar with Cukierman (1992) who found the index is only significant in developed countries.

The other reason why empirical evidence provides different results is different exchange rate regime. A country with fixed exchange rate regime will lose its independence; conversely, strong effect of CBI on inflation can be found on a country under the floating exchange rate (Cukierman 2001).

Empirical model and estimation technique are other possible source for different result. Many previous studies find there is a positive or no correlation between CBI and inflation because they use an econometric methodology that does not account for error in the proxies of index. Consequently, the results show spurious estimation. For example Campilo and Miron (1997) and Ismihan and Ozkan (2004) estimate inflation directly on the proxy of CBI using ordinary least square (OLS) without calculating the error on the CBI index. They find there is no significant relationship between CBI and inflation.

Brum (2002, 2006) suggests that the problem in such estimations can be solved by analysis of the covariance structure. This method calculates an error in CBI index. Thus, the estimation will produce an unbiased estimator. Based on the empirical evidence, Brum (2002) uses this method to estimate Campilo and Morin (1997) and Ismihan and Ozkan (2003) model, and find CBI is significant negatively correlated with inflation even in developing countries sample. Hicks (2004) uses the ARIMA process and produces a negative correlation between CBI and inflation.

III. METHODOLOGY

3.1. Variable and Data

The dependent variable (inflation) is proxied with Consumer Price Index (CPI). Independent variables contain of legal index of central bank independence (legal CBI), turnover of central bank governor (TOR), money supply (M1), exchange rate (ER) and lag CPI; the latter three are control variables. All data are annual from 1970 to 2006.

The inflation rate was measured as the log of annual percentage in Consumer Price Index (CPI). The CPI data were taken from International Financial Statistic (IFS) based on CPI for 17 capital cities from 1970 to 2006 by using the base year of 1993.

The independence index covers both low (close to zero) and high degree of independence (close to one). This way, this research is able to include all data from 1970 until 2006 without
having to divide them in two categories before and after independence law (Law No. 23/1999) was released.

The legal index of central bank independence for Indonesia was formulated by Cukiermen, Webb and Neyapty (CWN Index). This index is measured based on 16 characteristics, generated from the relationship between the Bank Indonesia and the government. The characteristics are categorized into four main clusters; first is Chief Executive Officer (CEO), which contains proxies for governing period and dismissal of the central bank governor, who appoints the governor, and his/her capability to hold another office. Second is the policy formulation variable; contains proxies for who formulate policies, final decision involvement, and the degree of the central bank’s participation in formulating the government budget. The third is central bank objective variable; contains question whether central bank has single objective (price stability) or multiple objectives (price stability, growth, unemployment). The fourth is the limitation of central bank’s lending to government; contains proxies for advances and securitizes lending, the authority of central bank to regulate the term of maturity of lending, the potential borrowers from central bank, the type of lending limitation, the maturity of loan, interest rate of the loan, and prohibition of central bank to buy government securities in primary market.

Using these 16 variables, the index of CBI is calculated with scaling method. The scale lies between 0 (zero) and 1 (one). For the period of 1970 to 1998, we use index calculated by Cukiermen, Webb and Neyapty (1995) for some developed and developing countries including Indonesia. Legal CBI index from 1999 to 2006 were primary data, collected through survey in Bank Indonesia. The set of questions are the same as in CWN index.

Another indicator used in this research as the measurement of independence is turnover of central bank governor (TOR). CWN suggest turnover of central bank governor as an informal indicator to measure independence. This idea based on the assumption that the higher governor turnover, the greater the possibility of central bank’s dependence on the political authority. This assumption occurs only in developing countries, and not in countries with stable authoritarian government such as Denmark and United Kingdom, (Cukiermen 1995).

The turnover of the central bank governor (TOR) is measure based on the average change of the governor in years. More specifically, Cukiermen (1995) noted the formula as:

\[
\text{Average Annual Turnover of central bank governor} = \frac{\text{Number of years}}{\text{Number of governor changes}}
\]

2 The calculation is available on the author upon request.
The critical value of average annual TOR lies between 0.2 and 0.5. This is due to the electoral cycle in every four or five years. If electoral cycle is less than four years, the probability of the threshold is higher than 0.5; conversely, it will be lower than 0.2 when the electoral cycle is more than five years. For Indonesia case, the threshold of turnover rate before 1970 was unstable, hence lies probably between 0 and 0.6. After 1970, the critical range is probably between 0 and 0.2.

The first control variable used in this research is narrow money as proxy for money supply. The second control variable is an exchange rate variable which is predicted also has a significant correlation with inflation. Both money supply and exchange rate data are gathered from International Financial Statistic (IFS). Another variable is inflation expectation, proxied with lag of log CPI, which is expected to have a positive correlation with current inflation.

### 3.2. Estimation Technique

Initially we identify the correlation between two indicators of central bank independence included in the model using Spearman’s correlation. Gujarati (1995) suggests that all explanatory variables should be independent each other or they have low correlation. If they are strongly correlated, they are not be able used as independent variables together. Conversely, if they are weakly correlated, we can put them together as independent variables. The next step is estimating the equation using Ordinary Least Square (OLS):

\[
P_I = c + \alpha_1 \text{LegalCBI} + \alpha_2 \text{TOR} + \alpha_3 \text{Log(m1)} + \alpha_4 \text{Log(er)}
\]  

(10)

Panagiotidis (2005) estimates transformation inflation on indicators of CBI (Legal CBI and TOR) and dummy (capturing different regimes such as Bretton Wood System, Flexible Exchange Rate mechanism and Maastricht regime). On the other hand, this paper estimated inflation on both indicators of CBI and money supply and exchange rate as control variables.

Estimating equation (10) using OLS probably subject to spurious estimation when the included variables have unit root. Following Enders (2004), the alternative is first-difference form. Furthermore, to anticipate the autocorrelation issue, we put lag of inflation to see correlation of change in previous inflation on change in current inflation. Lag of inflation is reasonable theoretically, since we can see the relationship between expected inflation and inflation. These considerations will lead us to the following empirical model:

\[
dPI_i = c + \alpha_1 d(P_I(-1)) + \alpha_2 d(\text{LegalCBI})_i + \alpha_3 d(\text{TOR})_i + \alpha_4 d(\text{Log(m1)})_i + \alpha_5 d(\text{Log(er)})_i + \varepsilon_i
\]  

(11)
Based on Gujarati (1995) and Wooldridge (2006), we can use this model as long as there is no serial correlation, heteroscedasticity and multicollinearity problem. Although \( d(PI(-1)) \) depends on \( \varepsilon_{t-1} \) and all previous disturbance terms, it is not correlated to the current error term \( \varepsilon_t \). Therefore, as long as \( \varepsilon_t \) is serially independent, \( d(PI(-1)) \) will also independent or uncorrelated to \( \varepsilon_t \).

The model satisfies the OLS assumption especially for no correlation between explanatory variables and stochastic disturbance term. We check the serial correlation problem with Godfrey- Breusch Test known as the LM-test. We use white heteroscedasticity test for the heteroscedasticity problem and see the correlation test for the multicollinearity problem.

Further stationarity check on the error of equation (12) is important to find out whether the variables in equation are cointegrated, meaning there is a long run relationship among the variables on the model, (Enders, 2004). There are two types of ECM we can use; Engel Granger Error Correction Model (EGECM) and Wickens-Breusch Error Correction Model, as explained below.

For the Engel Granger ECM, first we estimate the residual error term: \( \varepsilon_t = y_t - \alpha_1 x_t - \alpha_2 y_{t-1} \) and, \( \Delta \varepsilon_t = \beta_1 \varepsilon_{t-1} \) then a simple ECM can be formulated as \( \Delta y_t = \alpha_1 + \alpha_2 \Delta x_t + \alpha_3 \varepsilon_{t-1} + \eta_t \). If we assume Autoregressive Distributed Lag (1):

\[
y_t = \alpha_0 + \alpha_1 y_{t-1} + \beta_0 x_t + \beta_1 x_{t-1} + \varepsilon_t
\]  \( (12a) \)

\[
y_t - y_{t-1} = \alpha_0 + \alpha_1 y_{t-1} - y_{t-1} + \beta_0 x_t + \beta_1 x_{t-1} + \varepsilon_t
\]  \( (12b) \)

\[
dy_t = \alpha_0 + (\alpha_1 - 1) y_{t-1} + \beta_0 (x_t - x_{t-1}) + \beta_0 x_{t-1} + \beta_1 x_{t-1} + \varepsilon_t
\]  \( (12c) \)

\[
dy_t = \alpha_0 + (\alpha_1 - 1) y_{t-1} + \beta_0 dx_t + (\beta_0 + \beta_1) x_{t-1} + \varepsilon_t
\]  \( (12d) \)

\[
dy_t = \alpha_0 + \beta_0 dx_t - (\alpha_1 - 1) \left[ y_{t-1} - \left( \frac{\beta_0 + \beta_1}{\alpha_1 - 1} \right) x_{t-1} \right] + \varepsilon_t
\]  \( (12e) \)

\[
dy_t = \alpha_0 + \beta_0 dx_t - \lambda \varepsilon_{t-1} + \varepsilon_t
\]  \( (13) \)

The equation (13) is the typical Engel Granger Error Correction Model, where \( -\lambda \varepsilon_{t-1} \) is known as error correction term and \( \lambda \) is speed of adjustment parameter. The larger value of \( \lambda \), the greater the adjustment of previous deviation to the long run equilibrium; conversely, the lower value of \( \lambda \) imply small short-run adjustment of deviation back to equilibrium. Following above procedure, we can specify our empirical model of Engel Granger ECM as:
The effect of central bank independence on price stability: the case of Indonesia

The second error correction specification is Winkens-Breusch Error Correction model. This model can explain long-run relationship between dependent and independent variable, and furthermore provide alternative valid way to test misspecification of presumed model. Recalling equation (13b):

\[ d(PI)_t = \alpha_0 + \beta_0 d(CBI)_t + \beta_0 d(TOR)_t + \beta_1 d(\log(ml))_t + \beta_2 d(\log(er))_t + \lambda EC_{t-1} + \epsilon_t \]

(14)

The second error correction specification is Winkens-Breusch Error Correction model. This model can explain long-run relationship between dependent and independent variable, and furthermore provide alternative valid way to test misspecification of presumed model. Recalling equation (13b):

\[ y_t - y_{t-1} = \alpha_0 + \alpha_1 y_{t-1} - y_{t-1} + \beta_0 x_t + \beta_1 x_{t-1} + \epsilon_t \]

\[ y_t - \alpha_1 y_t = \alpha_0 + \alpha_1 y_{t-1} - \alpha_1 y_t + \beta_0 x_t + \beta_1 x_t + \beta_1 x_{t-1} + \epsilon_t \]

\[ (1-\alpha_1) y_t = \alpha_0 - \alpha_1 dy_t + (\beta_0 + \beta_1) x_t - \beta_1 dx_t + \epsilon_t \]

\[ y_t = \frac{\alpha_0}{1-\alpha_1} - \frac{\alpha_1}{1-\alpha_1} dy_t + \frac{\beta_0 + \beta_1}{1-\alpha_1} x_t - \frac{\beta_1}{1-\alpha_1} dx_t + \epsilon_t \]

\[ y_t = \lambda_0 - \lambda_1 dy_t + \lambda_2 x_t - \lambda_3 dx_t + \epsilon_t \]

(15)

Following this equation, the empirical model of Winkens-Breusch is specified as:

\[ PI_t = \lambda_0 + \lambda_1 d(PI)_t + \lambda_2 d(CBI)_t + \lambda_3 d(TOR)_t + \lambda_4 d(\log(ml))_t + \lambda_5 d(\log(er))_t \]

\[ \lambda_6 (CBI)_t + \lambda_7 (TOR)_t + \lambda_8 (\log(ml))_t + \lambda_9 (\log(er))_t + \epsilon_t \]

(16)

Since there is endogeneity problem in the model, we need to use Two Stage Least Square (TSLS); hence a set of instrumental variables (IV).

IV. RESULT AND ANALYSIS

Preliminary inspection shows all variables in first difference (inflation, central bank independence index, governor turnover, money supply and the exchange rate) are stationary. The residual of the model is also stationary, which confirm the presence of cointegration among the variables. We also test the correlation between legal CBI index and TOR (turnover of central bank governor) by using Spearman’s correlation test. The result shows both indicators are weakly correlated (0.28).
The estimation result is presented below. We have checked the model is free from serial correlation problem using Breusch-Godfrey Serial Correlation LM Test (F-statistic = 0.632533 and p = 0.538934). The hypothesis of there is no serial correlation in the model cannot be rejected at 5 percent level tested by using Breusch-Godfrey Serial Correlation LM Test (see table 3). Using correlogram Q-statistics and White’s test, we also confirm the model is free from heteroscedasticity problem.

Most of the variables are statistically significant at 5 percent level except TOR and the lag of inflation. The value of indicates that the variation of independent variables can explain 88.16 percent of the dependent variable’s variation.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.084955</td>
<td>0.027666</td>
<td>-3.070776</td>
<td>0.0046</td>
</tr>
<tr>
<td>D(PI(-1))</td>
<td>-0.124883</td>
<td>0.080302</td>
<td>-1.555153</td>
<td>0.1308</td>
</tr>
<tr>
<td>D(CBI)</td>
<td>-0.844977</td>
<td>0.146587</td>
<td>-5.764348</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(TOR)</td>
<td>0.244953</td>
<td>0.207011</td>
<td>1.183286</td>
<td>0.2463</td>
</tr>
<tr>
<td>D(LOG(M1))</td>
<td>0.255763</td>
<td>0.125883</td>
<td>2.031749</td>
<td>0.0514</td>
</tr>
<tr>
<td>D(LOG(ER))</td>
<td>0.524653</td>
<td>0.055112</td>
<td>9.519822</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared: 0.881640, Adjusted R-squared: 0.861233, S.E. of regression: 0.070402, Akaike info criterion: -2.314395, Sum squared resid: 0.143735, Schwarz criterion: -2.047764, Log likelihood: 46.50191, F-statistic: 43.20299, Durbin-Watson stat: 1.673317, Prob(F-statistic): 0.000000

| Dependent Variable: D(PI) |
| Note: Method Least Square, 35 included observations from 1972 - 2008. |

The estimation result shows the legal central bank independence (CBI) inversely related to inflation, which is typically a characteristic of developed countries. This is the opposite of common findings; where for developing countries, the correlation between legal CBI and inflation is insignificantly negative. We obtain similar result when using Engel Granger Error correction model; both indices of central bank independence are also negative and significant, with similar magnitude (minus 0.78).
The negative coefficient of CBI shows the lower independency, the higher inflation will be. The lower the degree of independence is, the weaker the central bank to refuse government intervention. On this situation, the Central Bank simply implements policy set by the government. Fiscal authority is more dominant than monetary authority. Based on Sargent and Wallace (1981) if the fiscal authority is dominant, the monetary authority will be forced to work under the government instruction. Thus, inflation will be higher since the government focuses more output or unemployment. Before Central Bank Independence Act No 23/1999, this is evident for the case of Indonesia.

Prior the implementation of this law, Bank Indonesia (BI) institutionally and practically depended on government. Bank Indonesia also had other target such as promoting economic growth and reducing unemployment beside its core target on stabilizing price and Rupiah. Because of these many objectives, Bank Indonesia functioned as government’s cashier or a part of government, including as agent of development. With this twin functions, BI was more difficult to realize its target, thus, the inflation was high. For example in period 1970-1984 the average inflation rate was 18 percent annually. Indeed, in 1972 until 1973, inflation was 25.80, 30.63 and 41.03 percent respectively (IFS, 2008).

Figure 2 shows the co-movement of inflation and interest rate from 1974 to 2006. In 1970s, the inflation rate was still high and the government took tight money policy. The result is inflation reduced below the level of 1960s but still above 10 percent. In 1974, inflation rate was 41.03 percent, mainly due to multi objective of central bank; stabilizing price and as agent of development, which provide unlimited liquidity for the government.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-0.087866</td>
<td>0.025741</td>
<td>-3.413459</td>
<td>0.0019</td>
</tr>
<tr>
<td>D(CBI)</td>
<td>-0.784542</td>
<td>0.126515</td>
<td>-6.201202</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(TOR)</td>
<td>0.256597</td>
<td>0.192545</td>
<td>1.332657</td>
<td>0.1927</td>
</tr>
<tr>
<td>D(LOG(M1))</td>
<td>0.254733</td>
<td>0.116107</td>
<td>2.193959</td>
<td>0.0361</td>
</tr>
<tr>
<td>D(LOG(ER))</td>
<td>0.511670</td>
<td>0.051436</td>
<td>9.947756</td>
<td>0.0000</td>
</tr>
<tr>
<td>RESOLS(-1)</td>
<td>-0.366300</td>
<td>0.121117</td>
<td>-3.024357</td>
<td>0.0051</td>
</tr>
</tbody>
</table>

Table 2: Estimation Result: Engel Granger Error Correction Model

| R-squared         | 0.894532    | Mean dependent var | -0.001933 |
| Adjusted R-squared| 0.876954    | S.D. dependent var  | 0.186933  |
| S.E. of regression| 0.065572    | Akaike info criterion| -2.460323|
| Sum squared resid | 0.128991    | Schwarz criterion   | -2.196403 |
| Log likelihood    | 50.28582    | F-statistic         | 50.88936  |
| Durbin-Watson stat| 1.970609    | Prob(F-statistic)   | 0.000000  |

Dependent Variable: D(PI)
Note: Method Least Square, 36 included observations from 1971 - 2006.
In 1980s the inflation performance was stable with inflation below 10 percent and interest rate of around 15 percent. This achievement was obtained through stabilization and rehabilitation program, followed by financial deregulation and the monetary program such as enabling conventional banks to set their own interest rate. In 1988, government issued a deregulation packet known as ‘Pakto’88’, providing easier procedures to set up new bank and eventually lead to large increase number of banks.

Before 1999, there are several evident of the non-independency of Bank Indonesia. One of them is the weakening of Bank Indonesia’s power when the government formed the monetary council, comprising the governor of the Bank of Indonesia, the minister of trade and the minister of finance (Raharjo 2002). This will restrict the flexibility of Bank Indonesia to formulate its own monetary policy, and also reflecting the non-independency on formulating its target. Within this framework, Bank Indonesia as the monetary authority was allowed to have various monetary policies; however the implemented policy is subject to government agreement (Bank Indonesian report, 1966-1984).

Another case was in October 1996 and April 1997, when the Chief Executive Officer (CEO) of BI advised the governing President Suharto to liquidate some banks, but refused (Aris Munandar 2004). The government argued this bank liquidation would create economic instability due to the start of election, and eventually Bank Indonesia gave dispensation to those banks to operate. One year ahead, 1997, the Asian financial crisis occurred.

Beside external factor, the source of economic crisis in 1997 is the government budget deficit financed by foreign debt. As part of the government, Bank Indonesia always signed every debt contract for the government (Sitorus 2007). The amount of debt (private and official loan) increased every year (see Table 3), and when the Rupiah depreciated, Indonesia suffer...
from a sudden increase of foreign debt. The effect of foreign debt to inflation is similar with the effect of moneyprinting. Theoretically, financing deficit through foreign debt will reinforce inflation in the long term, particularly under fixed exchange rate regime (Harkness, Uriarte 1985; Budina, 2001). Without independency, Bank Indonesia will not be able to control the government budget deficit.

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>-</td>
<td>20.938</td>
<td>69.872</td>
<td>88.172</td>
<td>89.172</td>
<td>107.824</td>
<td>124.398</td>
<td>128.941</td>
<td>136.173</td>
<td>150.875</td>
</tr>
<tr>
<td>Official</td>
<td>2487</td>
<td>15021</td>
<td>47982</td>
<td>53664</td>
<td>57156</td>
<td>63926</td>
<td>65309</td>
<td>60016</td>
<td>55869</td>
<td>66944</td>
</tr>
<tr>
<td>Private</td>
<td>461</td>
<td>3142</td>
<td>10261</td>
<td>16281</td>
<td>14029</td>
<td>24441</td>
<td>33123</td>
<td>36694</td>
<td>44469</td>
<td>54728</td>
</tr>
</tbody>
</table>


Trough law No 23/1999, BI is independent. Under this regulation, appoint and dismissal of central bank chief executive officer is decided by the discretion of central bank board of governor. Under this law, Bank Indonesia is prohibited to buy the government securities in the primary market to avoid an increase in the money supply. Moreover, this act also guarantee the target independency of Bank Indonesia; single objective of price stability.

Post this legal independence, the inflation rate decreased. The Bank of Indonesia exercised tight money policy and successfully reduce inflation rate from 77.63 percent in 1998 to 2.1 percent in 1999. Average of inflation was around 8 percent from 1999 to 2004. In 2005, the economy suffered from high inflation (17.11 percent), due to the oil price increase. This was the highest inflation rate during the post crisis period 1997/1998. In 2006 Bank Indonesia implemented Inflation Targeting Framework (ITF), and successfully reduced inflation close to its target of 6 percent and the exchange rate was Rp 8500 per USD. Nevertheless, this level of inflation was still higher than other developing countries such as Malaysia and Thailand of only around 2 percent.

Many attempts had been made by Bank Indonesia to provide better policy conduct. First is switching the government spending from non-budgetary to budgetary side. Second is converting interest rate subsidy for liquidity credit into government budget (Djiwandono, 2001) and third is directly intervening the foreign exchange market to stabilize Rupiah. The latter is also exercised by Monetary Authority of Singapore (MAS) and Government of Singapore Investment Corporation (GSIC). The result is the appreciation of Rupiah (Achjar, 2001).

The second measure of central bank independency is the governor turnover. AS presented earlier, the coefficient of central bank turnover (TOR) is statistically insignificant, which contradict
to initial hypothesis, even has correct positive sign. Generally, the higher frequent of central bank governor turnover, the lower degree of independence and the higher inflation will be (Cukiermen, Webb and Neyapyt, 1995). A positive correlation between TOR and inflation is because political instability affects the central bank instability as well, since the election of central bank’s governor is affected by political transition. The indicator TOR is relatively stable before the crisis, 1997. The election cycle of 5 years for the central bank is similar with the cycle of government election. During the transition process (reformation, 1998-1999), the position of a central bank governor was major concern of political party; as when Suharto was replaced by B. J Habibie, J. Soedradjad Djiwandonowas also replaced by Syahril Sabirin (Sabirin 2008) at the same time.

Worth to mention that even the central bank independence exist by law, Bank Indonesia needs de-facto independence; the government intervention made by Abdurahman Wahid (the fourth president of Indonesia) to replace the elected Governor Shahril Sabirin in 2000 is one of the sample. Such intervention will lead to political instability and weaken the Indonesian currency. The governing period of 5 years is too short the central bank to form long-term policies in order to achieve price stability (Panagiotidis, 2005). A possible option for Indonesia is to run the governor election in every 10 years as in Federal Reserve of United States, or every 7 years as Deutsche Bundesbank in Germany.

As presented on Table 2, the Engel Granger Error Correction model confirms the long-run relationship among inflation, exchange rate, money supply and the central bank independence. The speed adjustment coefficient is 0.37, showing a quite fast correction of inflation deviation to its long long-run equilibrium. As in standard model, the Engel Granger ECM also explains the legal CBI index inversely affect inflation while TOR is positive insignificant. The short-run change in both control variables are also significant in affecting inflation; a short run increase of money supply will increase inflation significantly, while short-run depreciation of Rupiah will raise inflation.

Even though the result of estimated model is different from common findings in developing country, but we can find similar result in Greece, where legal CBI is negatively and significantly correlated to inflation, (Panagiotidis, 2005). He also found that TOR is also positively correlated to inflation in lower significant level.

V. CONCLUSION

This research analyzes the relationship between the central bank independence (CBI) and inflation in Indonesia by using two indicators; legal CBI index and turnover of central bank governor (TOR). The conclusion of this paper is the central bank independency inversely affects the inflation. The implication is straightforward for the Bank Indonesia to strengthen its independency to achieve low targeted inflation.
There are several limitations of this paper; first, it is important to internalize the Central Bank Independence Act No. 23, 1999, directly into the model and find out how the implementation of this law affect the marginal effect of CBI on inflation; second, related to estimation technique, it is important to apply other method such as Wickens-Breusch model, which believed can work better.
REFERENCES

Ahsan, 2006. ‘Central Bank Independence & Governance (CBIG) and Inflation in Asia Pacific’.
Arismunandar 2004, ‘Refleksi 50 Tahun Bank Indonesia: Menuju Independensi Demi Pencapaian Misi dan Visi(Reflection of 50 Years of The Bank of Indonesian: Independence in Pursuing Vision and Mision)’.


Fransisco, 2003. ‘Time-Inconsistent Monetary Policies: Recent Research’, FRBSF Economic Literature


Rahardjo, 2000. ‘Independensi Bank Indonesia dalam Kemelut Politik (Bank Indonesia’s Independence in Political Turbulence)’.


Swasono, 2000. ‘Independensi Bank Indonesia Yang Terbukti Runyam (The difficulty of Indonesian Central Bank)’.


Uriarte, 1985. ‘Transnational Banks, and the Dynamics of Peruvian Foreign Debt and Inflation.’.


THE ISLAMIC CAPITAL MARKET VOLATILITY: A COMPARATIVE STUDY BETWEEN IN INDONESIA AND MALAYSIA

Muhammad Syafii Antonio
Hafidhoh
Hilman Fauzi

Abstract

This study attempts to examine the short-term and long-term relationship among selected global and domestic macroeconomic variables from each country (Fed rate, crude oil price, Dow Jones Index, interest rate, exchange rate and inflation) for Indonesia and Malaysia Islamic capital market (Jakarta Islamic Index (JII) and FTSE Bursa Malaysia Hijrah Shariah Index (FHSI). The methodology used in this study is vector error correction model (VECM) for the monthly data starting from January 2006 to December 2010. The result shows that in the long-term, all selected macroeconomic variables except Dow Jones Index variable have significantly affect in both Islamic stock market FHSI and JII, while in the short-term there is no any selected macroeconomic variables that significantly affect FHSI and only inflation, exchange rate and crude oil price variables seem to significantly affect JII.

Keywords: Islamic Stock Market, Jakarta Islamic Index, FTSE Hijrah Shariah Index, VAR/VECM

JEL Classification: E52, E44

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I. INTRODUCTION

The Islamic capital market has played an important role in the shape of world financial system evolution, and rapidly developing in recent decades. Currently, the Islamic capital market is no longer a trend among Muslim countries only. The development of the Islamic finance industry with 15 percent per year of growth throughout the world is stirring interest to open such capital market services in capitalist and liberal countries.

In every economy, the capital market is a milestone and an indicator of economic growth of a country. The capital market plays an important role as an investment tool that is useful for development. In addition to investing in the capital market, the value of stock prices becomes a very important consideration. However, in line with economic globalization, stock prices are not only influenced by domestic economic conditions and events, but also economic turmoil and external factors. Therefore, it is crucial for the government to create conducive investment climate, which is highly associated to the improvement of domestic macroeconomic conditions. The more stable the macroeconomic conditions, the more investors feel secure and comfortable to invest their funds. This is certainly related to investors’ investment options when faced with the return and risk options that will be enjoyed or suffered on the funds invested.

As Muslim-majority countries, Indonesia and Malaysia did take the opportunity to establish Islamic-based capital markets. Malaysia started the Islamic Index in 1992, while Indonesia established the Jakarta Islamic Index (JII) eight years later, in 2000. However, if we look at the Islamic capital market movement in Indonesia and Malaysia, i.e. Jakarta Islamic Index (JII) and the FTSE Bursa Malaysia Hijrah Shariah Index (FHSI), both indexes shared similar patterns of movement during the period 2006 to 2010 (Figure 1.1). This is possible because both indexes were responding to several global macroeconomic variables and events.
This paper is motivated by the different of many empirical researches about the effect of macroeconomic variables on the stock market, and the curiosity of similar movement between Islamic stock price indexes in Indonesia and Malaysia. The purpose of this research is to examine the effects of global and domestic macroeconomic variables on the Islamic capital market in Indonesia and Malaysia. The case study of Malaysian Islamic capital market is included in this study since Malaysia and Indonesia has some similarities in natural resources, geographical location and the use of a dual banking system to supports their economies.

The next section of this paper presents theory and literature study, section three present the data and methodology, while result and analysis is presented on section four. Last section provides the conclusion of this research and the policy implication.

II. THEORY

There are many macroeconomic variables that proven to have great impact on capital market, one of them is world oil price. Fluctuation in world oil prices affects almost all aspects of economic activity, which is transmitted in several ways (Surjadi, 2006). Firstly, fluctuating oil prices affect the term of trade and shift the income from oil importing countries to oil exporting countries. Secondly, through inflation effect where the rise of input cost will lead to price increases.

Wang et al (2010) showed that based on historical data, the fluctuation in oil prices has a huge impact on the economy and capital markets. When the oil price increases, the economy usually falls into recession and stock market collapses. This is in line with Kendall (1953) in his random walk theory that fuel prices increase is bad news for the market in general which will negatively affect the stock prices and companies engaged in that sector (Samsul, 2006: 269).

The second variable is the interbank interest rates, and one with significant them is the Fed rate set by The Federal Open Market Committee (FOMC). Fed rate amount is determined by economic conditions that occur in the United States. The Federal Reserve Publication, states that the said the U.S. economy and the global economy are connected to various channels. Economic development in the United States has a major impact on production, employment and price sectors throughout the world. Similarly, the activities of the Federal Reserve and international economics affect each other. Fed policy considers U.S. international transactions, dollar exchange rate movements, and other economic developments. On the other hand, activities of the Fed also affect the international economy, foreign exchange transactions and the value of dollar, which in turn affects the world’s financial stabilization (The Federal Reserve Publication).

Wongswan (2005: 10-11) stated that U.S. monetary policy (the Fed Funds rate) can affect stock prices in other countries through several channels:

1) The increase in the Fed rate will increase the discount rate, which affects the expectations of dividends, and will likely decrease the level of stock prices in the U.S.. Since the Fed rate
affects global interest rates, then it is possible for the Fed rate increase to cause an increase in domestic interest rates, which in turn could lead to lower stock prices.

2) Fed rate changes can be used as a measure of economic activity in U.S. On one hand, the Fed rate increase can result in sluggish economic activity, but on the other hand, a high Fed rate also signals a strengthening U.S. economy. In general, U.S. economic activity will affect global activity allowing for an influence on capital markets.

3) Fed rate changes will affect foreign exchange rates, and the exchange rate in turn can affect stock prices through the components of the discount rate or the expected future cash flow, or through both. The influence depends on the ability to adapt to changing global interest rates.

4) Fed rate changes affect the global stock market through portfolio adjustment in multiple markets that are connected such as global mutual funds, hedge funds and brokerage firms.

Based on interest rate parity theory and portfolio adjustment theory, changes in global interest rates will affect investors’ investment decisions. Higher global interest rate than domestic interest rate will lead to capital outflows as investors assess it more profitable to invest abroad than to invest in-country. Therefore, increases in global interest rates accompanied by reduction in domestic interest rates will negatively affect the domestic capital market conditions.

The third macroeconomic variable, the Dow Jones Index, is one of the major indexes in the U.S. covering 30 of the largest multinational companies in the America. This index is able to describe the performance of the American economy. Thus, a strengthening Dow Jones Index reflects improved performance of the U.S. economy. One of the main concerns of Indonesia’s exports is the important attention paid to the condition of the U.S. economy. Economic growth in the United States can encourage the growth of Indonesia’s economy through exports or in the form of capital inflows from both foreign direct investment or through the capital market.

The process of globalization has increased the level of relations of interdependence among countries, and has even lead to the unification of the world economy, so that the boundaries among countries in a variety of business practices or business are no longer apply. Economic globalization occurred in finance, production, investment and trade activities which then affect the system of economic relations among nations. Globalization is characterized by the depletion of the investment limits or markets, nationally, regionally and internationally (Halwani, 2005: 193-194).

The two keywords in globalization are interaction and integration that refers to the economic interaction between countries and their level of integration. Economic interaction between countries includes trade flows, production and finance; while integration refers to how the local or national economy of each country is effectively connected as an integral part of a single world economy (Thoha in Mustikaati, 2007). In relation to the stock market, economic
integration is the union of stock exchanges of the world. As the index has the largest market capitalization in the United States, fluctuations in Dow Jones Industrial Average Index (DJAI) through economic integration could affect the stock price movement on the stock exchanges around the world. Like when Asian stock exchanges are weakened due to the falling Wall Street shares and world shares because of the effect of the global financial crisis in the U.S. (Hariyanto in Mustikaati, 2007).

Inflation is also one of important macroeconomic variable with great effect both on real and financial sector. It reflects the aggregate increase in prices of goods or services during a given period. The inflation rate is measured using changes in the general price level (where the consumer price is usually used) and the producer price index or implicit gross domestic product deflator (GDP deflator), which measures the average price of all weighted items by the quantity of goods actually purchased (Karim. 2008: 135-136).

Rafiq al-Masri referring to Karim (2008: 139) states that according to Islamic economists, inflation results in a bad impact for the economy because it caused interference on the function of money as a store of value, causing consumptive behavior and direct investment in the things that are non-productive such as land, buildings, precious metals etc. Meanwhile, according to Slifer and Carnes and referring to Sriwardani (2009), theoretically there is a negative relationship between inflation and stock price performance. Inflation is assessed to reduce the real value of a company as well as dividends; so that increasing inflation rate would lead to weakening stock prices. Conversely, if the rate of inflation decreases then share prices will be strengthened (and vice versa).

The next macroeconomic variable is exchange rate; the ratio of two different currencies. The exchange rate system has a variety of forms; however the floating exchange rate system is widely used in many countries. In this system, the exchange rate is set based on demand and supply of foreign exchange (Halwani. 2005: 157-161). The stability of the exchange rate would be obtained if there is no destabilizing speculation. This condition leads to a decrease in exports and negatively affects the balance of payments. The worsening balance of payments will certainly affect the reserves. Reduced reserves will reduce investor confidence in the domestic economy and ultimately have a negative impact on the performance of stocks in the capital market (Octavia, 2007).

Based on interest rate parity and portfolio adjustment theory, it states that exchange rate changes will affect the investor’s decision to invest. Expectations of rising exchange on domestic currency for foreign currency will boost stock prices, because investors find it more advantageous to invest in the country compared to invest abroad.

Related to exchange rate and inflation, the interest rate is another macroeconomic variable, which is related directly to the real sector, particularly investment. In investment theory, Keynes stated that the investment function has a negative slope which means that the lower the interest rates, the larger the investment, no matter how low interest rates, if the investment
generates smaller profit than the interest rate, the investment rate will remain lower or limited. Therefore, Keynes described the relationship between interest rate and investment as follows (Putong, 2009: 277):

Although it is normative, interest rate is not the instrument used in Islamic financial transactions but in practice, the influence of the interest rate is still quite large. Several studies conducted by Nazwar (2008) and al-Faizin (2010) showed that significant interest rate negatively affects the performance of Islamic stocks.

2.1. PREVIOUS STUDIES

Sriwardani (2009) observed the comparison between global macroeconomic indicators and the Indonesian Composite Stock Price Index (JCI) and the Jakarta Islamic Index (JII). The macroeconomic indicators used were world oil prices, Fed rate and Dow Jones Industrial Average Index for global indicators; and the exchange rate and inflation as a macroeconomic indicators of Indonesia. With weekly time series data from July 2000 until September 2008 and vector autoregression (VAR) analysis resulted in a conclusion that among the five indicators observed affecting JCI and JII, the one indicator that significantly affects the JCI and JII is the Dow Jones Industrial Average Index.

A second study by Fahrudin (2006) looked at the effects of inflation, money supply, exchange rate and interest rate on the JII. The results showed, inflation has a negative influence on JII; money supply positively affects JII although insignificant; and interest rate has a negative effect on the JII.

Bun Lenny and Edy Sarwo Handoyo (2008) conducted a study on the effect of variable interest rate, exchange rate of Rp / USD and world oil prices on the Composite Stock Price Index (CSPI). They found that during the period January 1, 2006 until June 30, 2008, CSPI was significantly influenced by world oil prices and variable interest rate, while the exchange rate of Rp/USD had no significant effect at a confidence interval of 95 percent.

A similar study conducted by Mu-Lan Wang, Ching-Ping Wang and Tzu-Ying Huang (2010), examined the stock index in the United States, Japan, Germany, China and Taiwan on the impact caused by fluctuations in world oil prices, gold prices and the exchange rate of the dollar against their respective countries. The conclusions found the three macroeconomic variables affect stock indexes in Japan, Germany, China and Taiwan, but have no effect on stock indexes in the United States.
The Islamic Capital Market Volatility: A Comparative Study Between Indonesia and Malaysia

III. METHODOLOGY

There are two models in this research; they are Indonesia’s Islamic capital market model represented by Jakarta Islamic Index (JII) and the Malaysian Islamic capital market model represented by the FTSE Bursa Malaysia Hijrah Shariah Index (FHSI). Research for the Indonesia’s Islamic capital market used seven variables, so in VAR / VECM model, there are seven equations that can be processed as models for each variable observed. The following equations below are obtained in the research of syari’ah index movement in Indonesia.

\[
\begin{align*}
\text{JII}_t &= A_0 + A_1 \text{JII}_{t-1} + A_2 \text{OIL}_{t-1} + A_3 \text{FED}_{t-1} + A_4 \text{DOW}_{t-1} + A_5 \text{CPII}_{t-m} + \\
& \quad A_6 \text{BIR}_{t-n} + A_7 \text{ERI}_{t-o} + \varepsilon_t \\
\text{OIL}_t &= A_0 + A_1 \text{JII}_{t-1} + A_2 \text{OIL}_{t-1} + A_3 \text{FED}_{t-1} + A_4 \text{DOW}_{t-1} + A_5 \text{CPII}_{t-m} + \\
& \quad A_6 \text{BIR}_{t-n} + A_7 \text{ERI}_{t-o} + \varepsilon_t \\
\text{FED}_t &= A_0 + A_1 \text{JII}_{t-1} + A_2 \text{OIL}_{t-1} + A_3 \text{FED}_{t-k} + A_4 \text{DOW}_{t-1} + \\
& \quad A_5 \text{CPII}_{t-m} + A_6 \text{BIR}_{t-n} + A_7 \text{ERI}_{t-o} + \varepsilon_t \\
\text{DOW}_t &= A_0 + A_1 \text{JII}_{t-1} + A_2 \text{OIL}_{t-1} + A_3 \text{FED}_{t-k} + A_4 \text{DOW}_{t-1} + \\
& \quad A_5 \text{CPII}_{t-m} + A_6 \text{BIR}_{t-n} + A_7 \text{ERI}_{t-o} + \varepsilon_t \\
\text{CPII}_t &= A_0 + A_1 \text{JII}_{t-1} + A_2 \text{OIL}_{t-1} + A_3 \text{FED}_{t-k} + A_4 \text{DOW}_{t-1} + \\
& \quad A_5 \text{CPII}_{t-m} + A_6 \text{BIR}_{t-n} + A_7 \text{ERI}_{t-o} + \varepsilon_t 
\end{align*}
\]

Note: \( r \) (interest rate), \( Irf \) (inflation rate), \( Er \) (exchange rate), \( OIL \) (world oil prices), \( Fed \) (Fed rate) dan \( Dow \) (Dow Jones Index), \( NS \) (Not significant effect), \( S \) ( Significant effect)
There are also seven equations that are able to identify the seven variables used for the Malaysia Sharia capital market model. Malaysian domestic macroeconomic variables used in the model of the Malaysia Sharia capital market are the Malaysia interest rate, ringgit per US Dollar exchange rate and the Malaysian inflation rate. Associated global macroeconomics variables used are the Dow Jones index, global oil price and the FED rate. Therefore the equations are as follow:

\[
FHSI_t = A_0 + A_1 FHSI_{t-1} + A_2 OIL_{t-1} + A_3 FED_{t-1} + A_4 DOW_{t-1} + A_5 CPI_{t-1} + A_6 BIR_{t-1} + A_7 ERM_{t-1} + \epsilon_t
\]

\[
OIL_t = A_0 + A_1 FHSI_{t-1} + A_2 OIL_{t-1} + A_3 FED_{t-1} + A_4 DOW_{t-1} + A_5 CPI_{t-1} + A_6 Bnmr_{t-1} + A_7 ERM_{t-1} + \epsilon_t
\]

\[
FED_t = A_0 + A_1 FHSI_{t-1} + A_2 OIL_{t-1} + A_3 FED_{t-1} + A_4 DOW_{t-1} + A_5 CPI_{t-1} + A_6 MYR_{t-1} + A_7 ERM_{t-1} + \epsilon_t
\]

\[
DOW_t = A_0 + A_1 FHSI_{t-1} + A_2 OIL_{t-1} + A_3 FED_{t-1} + A_4 DOW_{t-1} + A_5 CPI_{t-1} + A_6 MYR_{t-1} + A_7 ERM_{t-1} + \epsilon_t
\]

\[
CPIM_t = A_0 + A_1 FHSI_{t-1} + A_2 OIL_{t-1} + A_3 FED_{t-1} + A_4 DOW_{t-1} + A_5 CPI_{t-1} + A_6 MYR_{t-1} + A_7 ERM_{t-1} + \epsilon_t
\]

\[
MYR_t = A_0 + A_1 FHSI_{t-1} + A_2 OIL_{t-1} + A_3 FED_{t-1} + A_4 DOW_{t-1} + A_5 CPI_{t-1} + A_6 MYR_{t-1} + A_7 ERM_{t-1} + \epsilon_t
\]

\[
ERM_t = A_0 + A_1 FHSI_{t-1} + A_2 OIL_{t-1} + A_3 Gold_{t-1} + A_4 DOW_{t-1} + A_5 CPI_{t-1} + A_6 MYR_{t-1} + A_7 ERM_{t-1} + \epsilon_t
\]

We use VAR/VECM method to test the above model. Below are the steps in testing the VAR/VECM model.
IV. RESULT AND ANALYSIS

4.1. IMPULSE RESPONSES FUNCTION (IRF) OF SHARIA CAPITAL MARKET IN INDONESIA

Impulse Response Function in the Indonesian sharia capital market showed responses of the JII on shocks that occurred upon Indonesia and global macroeconomic indicators for 150 periods of observation. This analysis showed how long a period is needed for JII to return to long term equilibrium as shocks occurred as shown by the macroeconomic indicators.

Sharia Stocks Price Movement (JII) Response on Oil Price Shock

The JII response to shock in oil prices showed that in first period, JII responded positively to the shock, meaning that when the increase of oil prices occurred in the short term, the JII increased as well. This condition happened because in the short term, the increase of the world oil prices triggered the positive sentiment of mining stocks investors which significantly affect the movement of JII. This is not in accordance with the theory of random walk for the stocks in general, which states that the information on oil prices may push the negative sentiment for the investor in the capital market (Samsul, 2006).

Nevertheless, the occurrence of this positive response from investors can happen in the Indonesian capital market where the mining sector dominates trade transactions in the Indonesian stock market by 39.7 percent, which is much bigger than other sectors. Lenny and Handoyo (2008) agreed with this analysis and stated that investors in the Indonesian capital
market are dominated by foreign investors and most of the investors invest their capital in mining sector, therefore when there is an increase in oil price then stock prices in the mining sector will increase, resulting in an impact to the stock price index in Indonesia.

**Sharia Stocks Price Movement (JII) Response on FED Rate Shock**

The JII response over the FED shock was different in the short term and the long term (see diagram 4.4). In the short term, the JII responded negatively to the FED shock. This negative response on the JII was feared due to the actions of speculators in the stock market seeking profits through capital gains. This speculation is responsive to the difference in interest rates at home and abroad. The FED interest rate continued to decline from a range of 5 percent to 0.2 percent to encourage speculators seeking profits in countries with interest rates relatively high, such as Indonesia.

The responsiveness of investors to the foreign interest rate was also against the backdrop of a high percentage of foreign investors in the Indonesia capital market which reached 60 percent of investors in this market. The JII negative response to FED shocks in the short term is in accordance with the theory of portfolio adjustment and interest rate parity which states that if the interest rate in Indonesia is higher than the interest rate abroad it will encourage capital inflow into Indonesia (Halwani, 2005).

**Sharia Stocks Price Movement (JII) Response On Dow Jones Index (DOW) Shock**

The result showed that the shock that occurred in Dow Jones Index (DOW) was responded positively by the JII, even though it was not rapid, with a standard deviation 0.000386 and stabilized at period 113 (see attachment 7). This means that when there is an increase in the DOW, it will be responded by as increase of the JII. The positive response of the JII is in line with the theory of economic integration in financial market which states that there is a positive correlation and integration of stock exchanges around the world, so if a crash occurs abroad, then it may trigger a crash in the domestic country.

The integration between the Dow Jones Index (DOW) and the Jakarta Islamic Index (JII) can be seen from the fluctuation of both indexes, where the DOW decrease during the global financial crisis in USA was later followed by a weakening JII. After that, the JII strengthened again as the USA economy recovered with a strong Dow Jones Index after global financial crisis in 2008. The results are consistent with the results of research conducted by Sriwardani (2009) which states that a positive response of the JII to DOW shocks is due to the correlation between the two indexes.
**Sharia Stocks Price Movement (JII) Response on BI Rate (BIR) Shock**

The results showed that the JII responds to shocks on the BI rate (BIR). The JII seems to respond negatively over shock that occurred on the BIR with standard deviation - 0.069935 and stabilized at period 100 (see attachment 7). This result shows that an increase on BIR will in turn push the weaknesses of the JII, except if there is a change in the BIR.

The JII response on BIR shock occurs because the change in interest rate information is important for the investors especially in the relation to investment return. In the random walk theory, a negative response from JII occurs because the increase of BIR is viewed as bad news for the investor in the Indonesian capital market (Samsul, 2006). The negative sentiment from investors naturally occurs because investors argue that the increase of BIR may trigger an increase of banking deposit interest rate, therefore investment in the form of deposit in banking which has minimum risk is considered more favorable than investing in a high risk capital market. This analysis is in line with the theory of capital asset pricing model (CAPM) that explains that the increase of interest rate which is free-risk (deposit interest rate) may decrease the benefit which is expected for the stocks.

**Sharia Stocks Price Movement (JII) Response Towards IDR (ERI)**

In the first period, the JII positively responded to shock that occurred on the ERI. The positive response of JII is caused because in the short term, IDR depreciation may trigger positive sentiment for the investor in the capital market. According to the random walk theory, IDR depreciation is considered good news because it is able to increase price competitiveness of products that are produced in Indonesia for the international trade. Through the decrease of IDR compared to the international exchange rate (USD), it may cause the price of Indonesian products to drop, making it cheaper and therefore increase export demand of domestic products. In addition, the increase of a company’s export will obviously increase the corporate income and eventually increase the dividend (Samsul, 2006).

**Sharia Stocks Price Movement (JII) Response On Indonesia Inflation Shock (CPII)**

The results showed that the JII positively responds to shocks that occurs on the CPII with a standard deviation of 0.022151, and reaches a long term equilibrium in the period 104 (see attachment 7). The positive response of the JII on the shocks means that when the CPII increases, there will be an increase on the JII as well. This response occurs due to Indonesian inflation that is quite controlled so that it will not generate any worries from domestic or foreign investors. The stability of inflation is pointed out as the increase of Indonesia’s economic growth by the investor. Along with this analysis, Maysami et al (2004) explained that the positive response of the stock index on inflation can be occur because the government plays an active role in
anticipating the price escalation as a result of economic conditions in recovering after crisis. Besides, Marshal (1992) also explained that if inflation is caused by a shock of the amount of money in circulation, the monetary authority will block it by decreasing the interest rate. The decrease of interest rate may encourage investors to transfer ownership of their assets in stocks or bonds and increase the demand for equity investments which in turn will raise the price of the stock.

For more details on the response of every domestic and global variables on the movement of sharia capital market price in Indonesia can be seen on the graph below (Attachment 1.1)

4.2. IMPULSE RESPONSES FUNCTION OF MALAYSIA SHARIA CAPITAL MARKET

Sharia Stocks Price Movement Response (FHSI) On World Oil Price (OIL)

The results showed the FHSI negatively responded to shock that occurs in world oil price (OIL). The diagram shows that JII negatively respond to shocks with a standard deviation -0.025049 and starts to reach the equilibrium at period 40 (see attachment 7). The FHSI’s negative response to shocks means that when the shocks occur on the world oil price, the FHSI will result in a weakening index.

The FHSI negative response on the world oil price is similar to the JII responses on similar variable shocks. The similar result indicates that the FHSI and JII investor behavior are relatively same where investors consider the increase of the oil price as a bad news for the capital market; therefore investors negatively respond the changes. However, the FHSI response on OIL shock is relatively faster into long term stability compared to the JII response where FHSI is able to reach long-term stability on period 40 with the standard deviation -0.025049, while the JII response can just reach the stability point at period 98 with a higher standard deviation -0.075996.

The result reflects that in the long term, the impact of OIL towards the JII is bigger than the impact on FHSI. The difference in both countries can happen because Indonesia continues imposing a fuel-oil subsidy for diesel and premium fuel, and the subsidies are enjoyed by all - the private sector, public sector, poor communities and the rich, therefore placing a burden on government for larger budgets. The high fiscal burden leads to a budget deficit that may distort the perception of the national economy. The negative response of stock price indexes on world oil price shocks was also obtained by the research of Sriwardani (2009), Wang et al (2010) and IAE (2004).

Movement Response of Sharia Stocks Price (FHSI) on Fed Rate Shock (FED)

From diagram 4.10, it is shown that shock occurring on the Fed rate (FED) is responded positively by the FHSI with a standard deviation of 0.059348, and the response starts to reach long term
stability on period 53 (see attachment 7). The positive response of the FHSI on the FED shocks means when there is an increase in FED, there will be a trigger to strengthen the FHSI. If we see the result of the IRF on the Indonesia sharia capital market, it can also be seen that the result of the IRF is similar between the Indonesia and Malaysia sharia capital markets on FED shocks. The similar response of both sharia indexes indicate investors’ behavior on sharia stocks market in Indonesia and Malaysia towards FED shocks are relatively the same, therefore investor behavior reacts to the changes and differences of domestic and foreign countries interest rates.

Nevertheless, the FHSI responds to FED shocks with a higher standard deviation that reaches 0.059348, while the JII reaches standard deviation 0.001829. This means that the movement of FHSI in the long term towards changes of the FED is relatively more reactive than the JII. The higher response of FHSI than JII occurs because Malaysia has a higher degree of economic integration (closer to USA) than Indonesia. Malaysia is an important trade partner for USA. The USA private investment cumulative value in Malaysia reached over USD 10 billion which is 60 percent of investment on oil, gas, and petrochemicals; while the rest is in the manufacturing sector. In line with the research, Wongsman (2005) stated that the change in Fed interest rate is representative from the USA economic condition and would affect the world economy. However, Yusuf and Majid (2007) have a different result indicating that the FED is a variable that does not significantly influence the stock price index in Malaysia.

**Sharia Stocks Price Movement (JII) Response (FHSI) Towards Dow Jones Index (DOW) Shock**

The results showed that shock occurring in the Dow Jones Index (DOW) was responded positively by the FHSI with the standard deviation 0.016231 and stabilized at period 54 (see attachment 7). The FHSI positive response in the shock that occurred on the DOW means that when an increase happens it will be responded by an increase of the FHSI; and vice-versa, a decrease on the DOW would result in a weakening FHSI.

Even the responses of the JII and FHSI on DOW shocks were relatively similar; and the response of the FHSI is higher than the JII. This situation is possible because FHSI and DOW have a level of integration in the financial sector that is stronger than the level of integration between the JII and DOW. The higher integration of the FHSI and the DOW occurred because the investment of foreign investors in the Malaysia sharia capital market, one of the world’s major Islamic capital market. Changes in the Dow Jones index which is representative of the condition of the world economy and the stock market would have more of an impact on the Malaysia Sharia Capital Market (FHSI) compared to the Indonesia Sharia Capital Market (JII). This analysis differs from the research of Achsani (2000) that examined the market response to shocks from other markets, which showed that if there was a shock in US stock exchange, the regional stock exchanges would not be influenced in responding to it, and that minor responses would be seen in Singapore, Hongkong Japan, Taiwan, and New Zealand. Conversely,
if a shock occurs in Singapore, Australia, or Hongkong, it would be transmitted to virtually all stock exchanges in the Asia Pacific region, including Malaysia.

**Sharia Stocks Price Movement (JII) Response (FHSI) Towards Shock Interest Rate (MYR)**

The results showed that a shock that occurs on the Malaysian interest rate (MYR) is responded negatively by the FHSI with a standard deviation -0.026704, and it tends to stabilize in period 41 (see attachment 7). This result means a decrease that occurs on MYR would push a strengthening FHSI. The IRF FHSI result of a domestic interest rate shock is equal to the IRF JII result. Similarly, interest rate shocks have a big influence on sharia capital markets in Indonesia and Malaysia. In accordance with these results, Keynesian theory states that investment is negatively related to the interest rate. Furthermore, the theory of capital asset pricing model (CAPM) also explains that the increase in the risk-free interest rates would reduce the expected rate of return on stock investments, so that rising interest rates will cause a decline in interest in investing in the stock market.

Normatively, variable interest rates should not have a significant effect on the movement of Islamic capital markets as researched by Yusof Majid (2007) who found that the interest rate does not significantly influence the Malaysian Islamic capital market (RHBII). But contrary to this notion, some researchers still found results showing a strong influence of interest rate shocks on Islamic capital market movements, e.g. al-Faizin (2010) and Sriwardani (2009) who examined the impact of interest rates on the Indonesian Islamic capital market.

**Sharia Stocks Price Movement (JII) Response (FHSI) Towards Ringgit Exchange rate Shock (ERM)**

The results showed shocks that occurred on the ringgit exchange rate (ERM) was responded positively by FHSI with a standard deviation 0.006248 and remained stable in the period 43 (see attachment 7). This result shows that when ringgit depreciation occurs, it will be respond with a stronger FHSI stock price index. A positive response of FHSI on the ERM shock occurs because the variation on the exchange rate has a strong relationship with a company’s import-export activities. The fall in the exchange rate of the ringgit compared to foreign currencies caused a decline in export commodity prices in foreign currency, so that this condition increased the demand for Malaysian exports. The increase in the value of exports would eventually result in increased corporate income, thus increasing the dividend investor section and ultimately have an impact on the stock price increases. The positive response of stocks price on the exchange rate shock can also be seen from research by Dimitrova (2005) in USA, Yusof and Majid (2007) in the UK, and Aydemir and Demirhan (2009) in Turkey on KLCI and RHBII in Malaysia. However,
these results contradict the results of research by Ibrahim and Yusoff (2001) which showed significant negative exchange rate effects on the KLCI in Malaysia.

**Sharia Share Price Movement Response (FHSI) Against Malaysia Inflation Shock (CPIM)**

The results showed that a shock in Malaysia domestic inflation (CPIM) was responded positively by the FHSI with standard deviation 0.030762 and stabilized at period 43 (see appendix 7). This means that when there is an increase in the inflation then it will respond with the strengthening of the FHSI. The IRF FHSI results from the domestic inflation shock is similar to the results of IRF JII, and this condition occurs because the rate of inflation in Indonesia and Malaysia are relatively stable and in line with the monetary policy objectives of each central bank where inflation information is rated as good news by investors (random walk theory).

Positive responses can also be caused by many other variables that affect the stock price index that are not included in the model, making this model an imperfect representation of the actual conditions of the capital markets. It can be seen from R-square value results of JII and FHSI VECM models, where the R-square value of JII models is 0.641391, that the independent variable in the model is only able to describe 64 per cent of model while the rest is explained by other variables. Similarly, where the R-square value of the FHSI model is 0.291445, it means a variety of domestic and global macroeconomic variables in the model only explains 29 percent of FHSI variation.

**4.3. ANALYSIS RESULT OF FORECAST ERROR VARIANCE DECOMPOSITION (FEVD)**

Variance decomposition analysis explains how large a role or a portion of an economic variable to other economic variable shocks, thus indirectly the strengths and the weaknesses of each variable in influencing other variables can be known in a long term period.

Results of the FEVD in Indonesia showed that global and domestic macroeconomic variables influenced forecasting on the Jakarta Islamic Index (JII) in 150 observed periods. From the FEVD result above, it showed that the dominant influence was the world oil price (OIL) and Bank Indonesia interest rate (BIR) against the JII. OIL was the most dominant influential variable reaching 38.99871 or by 39 percent by the end of the observation period. It showed, in the long run, that the oil price still has a large influence on the movement of the JII. The huge effect of OIL is caused by the dominance of foreign investors in Indonesia with investments in the mining industry. BIR variable rate (BIR) took second place with a dominant influence at 33.34662 or 33 percent by the end of the observation period. This shows the Islamic capital market even in the long term is not free from interest rate influence that is a normative transactions instrument prohibited under Sharia.
The huge ERI influence is caused by the export and import activities done by companies classified in the JII; and dominance of foreign investors in the Indonesia capital market further strengthens the influence of the exchange rate variable on stock price movements. As for the other variables, the Dow Jones index, Fed’s rate and domestic inflation (DOW, FED and CPII) have a relatively small effect on the JII. At the beginning, these variables increased to the eighth period, but on the ninth period the influence of these variables declined, and the influence of each variable is 0.039708, 0.084288 and 3.657258, respectively. See Figure 4.1 below:

Meanwhile, the results of the FEVD FTSE Hijrah Shariah Index (FHSI) prove that FHSI is really influenced by its own variables. This indicates that there are many other variables that are not included in model that causes significant changes on FHSI movements. The most dominant macroeconomic variable in Malaysia’s sharia capital market that influences the FHSI is the global interest rate called Fed rate (FED). This effect continuously rose from the beginning until the last study period (period 150), i.e. reaching the point of influence 33.76132 or in the other words, 34%. In a long-term, the FED’s high influence made the FHSI more responsive to the fluctuation of global interest rates. One of the triggers that causes this situation is the high dominance of foreign investors in Malaysia’s sharia capital market.

The other macroeconomic variables are the world oil price (OIL), the Malaysian Ringgit (MYR), the Malaysia domestic inflation (CPIM), and the Dow Jones index (DOW). Those variables have influences that kept increasing from the beginning of study period until each of them reached 6.094735 (6%), 6.929383 (7%), 9.120171 (9%) and 2.491735 (2.5%), respectively in the end. As for the influence of Malaysian Ringgit exchange rates (ERM), it kept falling down from the first period until its influence was 0.378664 (0.4%) at the end of study period.
V. CONCLUSION

According to the analysis and explanations in the previous chapter, there are several conclusions that:

a. The VECM analysis shows in terms the three global macroeconomic variables (world oil price (OIL), Fed rate (FED) and Dow Jones Index (DOW), OIL and FED are the most significant influential variables to cause movements on JII and FHSI. However, there are resulting effects on FED to JII and FHSI. FED has a negative significant influence on the movements of JII, yet a positive significant influence to FHSI. This phenomenon can occur due to different responses of the two countries’ monetary policy to US economic policy.

b. As for the influence of domestic macroeconomic variables (money exchange rates, interest rates, and inflation), both Indonesia and Malaysia actually experience the same effects to the sharia capital market in their respective country. Furthermore, those macroeconomic variables are also significantly influenced by each country’s capital market.

c. From all of the variables studied in a short-term, there are only OL, ERI, CPII, and JII which have effects on the movements of the Jakarta Islamic Index (JII). While in a long-term, global macroeconomic variables such as the DOW do not significantly influence the movements.

d. For Malaysia’s sharia capital market, there are no significant variables that have a short term influence, but the DOW significantly influences movement on the FHSI.
Based on the study results above, there are several recommendations:

a. Since there is only one variable, the Fed rate variable, which has a different influence on the Islamic capital market in Indonesia and Malaysia, this indicates different responses are taken by these two countries on economic policy adopted by other countries. Therefore, it is recommended that policymakers be cautious about responding the changes of other countries’ policies. Furthermore, capital outflow is very vulnerable to events in Indonesia due to policy changes in other countries. Therefore, the money exchange rates are in need of strict supervision because a large variation in exchange rates will affect the trade balance and foreign exchange reserves.

b. Domestic investors in sharia capital market should be increased. One of the responsive causes in terms of policy changes in other countries that occurs in both Indonesia’s and Malaysia’s sharia capital market is the high percentage of foreign investors compared to domestic investors. There is more than 60% of foreign investors in Indonesia’s capital market. Psychologically, these investors tend to move their funds easily to other countries when it is considered more profitable.

c. Regarding the variables that influence sharia capital market, further research about technical and fundamental variables that affect sharia capital market is needed, in order to get more comprehensive results about the influence factors of sharia capital market movements.
REFERENCES

Al-Qur’an Karim and translation, Departemen Agama RI cetakan PT. Syaamil Cipta Media


Arsana, I Gede Putu, Modul VAR (Vector Autoregressive). Laboratorium Komputasi Ilmu Ekonomi FE UI


Ascarya, 2009, Aplikasi Vector Autoregression dan Vector Error Correction Model Menggunakan Eviews 4.1. tidak diterbitkan

Bapepam, 2004, Studi Tentang Investasi Syariah Di Pasar Modal Indonesia


Fatwa DSN-MUI No.40/DSN-MUI/X/2003 tentang pasar modal dan pedoman penerapan prinsip syariah di bidang pasar modal


Zubaidah, Siti, 2004, Analisis Pengaruh Tingkat Inflasi, Perubahan Nilai Tukar Terhadap Beta Saham Syariah Pada Perusahaan Yang Terdaftar Di Jakarta Islamic Index (JII)
APPENDIX 1.1
Impulse Responses Function (IRF) Syariah Capital Market in Indonesia

Response of LN(JII to Cholesky
One S.D. BIR Innovation

Response of LN(JII to Cholesky
One S.D. FED Innovation

Response of LN(JII to Cholesky
One S.D. LNERI Innovation

Response of LN(JII to Cholesky
One S.D. UNDOV Innovation

Response of LN(JII to Cholesky
One S.D. LCPII Innovation

Response of LN(JII to Cholesky
One S.D. UNOIL Innovation
APPENDIX 1.2
Impulse Responses Function (IRF) Syariah Capital Market in Malaysia

Response to Cholesky One S.D. Innovations

Response of LNHSI to LNERM

Response of LNHSI to LNOIL

Response of LNHSI to LCPIM

Response of LNHSI to LNDOW

Response of LNHSI to FED

Response of LNHSI to MYR
This paper analyzes the competition level of the banking industry, prior to and after the introduction of the Indonesian Banking Architecture (API). Using panel data, the result shows that competition in banking decreased after the introduction of API, with a large tendency to monopoly or collusive oligopoly. For a bank with niche market such as a Regional Bank and joint venture bank, the introduction of API did not affect it much, while the competition level for a foreign bank was the lowest one. Non-price variables would be the main determinant of banking competition in the future including number of branches, wages and credit volume.

Keywords: banking competition, market structure, Indonesian Banking Architecture (API).

JEL Classification: C23, D40, E44, E58, G21, L11.
I. INTRODUCTION

Increased competition in the Indonesian banking actually began with Indonesian banking transparency initiated by the issuance of a policy package on June 1, 1983 (Pakjun) with the aim to modernize banking. This was then proceeded with a policy package October (Pakto) on October 27, 1988, which provided convenience in permitting the establishment of new banks, including the opening of a branch office. At that time, with funds of Rp 10 billion alone, an investor was able to establish a new bank (Deni and Djoni, 2004), and this led to a significant increase in the number of banks.

An increasing number of banks in the banking sector have the potential to encourage businesses to be more competitive and improve the efficiency and health of banking2. But for Indonesian banks, mostly private banks were owned by big businessmen before the Asian crisis; consequently, when such businesses required substantial funding, they tended to mobilize public funds through their banks for business interests (of the group/groups). This meant that the original intent of Pakto 88 to channel public funds to the community, shifted to the distribution to the group so there was a potential Lending Limit violation (LLL), (Deni and Djoni, 2004). This condition weakened the banking industry infrastructure, and consequently amidst the international financial market turmoil which began with the exchange rate crisis in Asian countries, Indonesian banks were not able to survive. These conditions resulted in the deepening crisis of confidence in the rupiah and national banks, especially after the revocation of business licenses of 16 banks in November 1997.

The Government sought assistance from the International Monetary Fund (IMF) to resolve the crisis, but the policies imposed by the IMF in the form of tightening of liquidity worsened conditions for Indonesia3. Furthermore, the Government and the central bank tried to implement a comprehensive program of stabilization and reform to concurrently strengthen the national financial system and restore public confidence.

In 1999, the Act No. 23 of 1999 was issued emphasizing that Bank Indonesia (BI) have a more focused goal of achieving and maintaining stability of the rupiah, which was seen as a prerequisite of economic growth sustainable. Several years later, Bank Indonesia issued the Indonesian Banking Architecture (API) as the basic framework of the Indonesian banking system. API is comprehensive and expected to provide direction, shape, and structure of the banking industry for a period of five to ten years (BI, 2007, the Indonesian Banking Architecture).

After the emergence of the API, which was supported by the strengthening of the capital structure of banks, Indonesian banks were expected to be more stable and able to function as intermediary institutions. Stability would result in stronger national banks that would eventually

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2 According Cetorelli (2001), there is a long view that says competition will drive banks to better market situation
3 Contrast with United State who excercised opposite policies during the global crisis of 2008.
be able to compete with foreign banks in the international market. The competition, which encourages increased competitiveness, is the main foundation of the process of strengthening the national banking system. Therefore, changes in the level of competition among banks will also change the behavior and the conduct of the banking business.

Several studies have tried to examine competition in Indonesian banks, including Claessen and Laeven (2004) who estimated the level of competition in 50 countries including Indonesia using the Panzar-Rosse method over the period 1994-2001. From these studies it was noted that the Indonesian banking industry structure belonged to the category of *monopolistic competition*. Results of this study were also supported by Setyowati (2004) which arrived at the same conclusion.

Associated with the implementation of the Indonesian Banking Architecture (API), an interesting question arose, how the API can influence the level of stability and competition in Indonesian banking industry? This research question will be answered in this paper.

The next section of this paper reviews the basic theory and literature on banking stability, level of competition and the performance of the Indonesian banking industry. The third part of the paper reviews the data and methodology employed, while the fourth section presents the results and analysis. The conclusion and policy implications are given at the end and comprise the concluding section of this paper.

**II. THEORY**

Competition is often associated with some sort of competitive situation to obtain something. Furthermore, competition is also often associated with market power despite the fact that these two things are different. Market power refers to the behavior of individual firms in setting pricing strategies, while the competition has more to do with the interaction of the market or more it aggregated members (de Rozas, 2007).

There are several forms of market competition. The first is a perfect competitive market, characterized by a lot of sellers and buyers, where prices are determined by market forces. In these market conditions, the parties are free to enter or to exit from the market. Second characteristic is goods are homogeneous, and the third is no transaction cost, nor transportation costs. On the other side, non-competitive market is characterized by the opposite features of perfect competition, such as monopoly and monopsony, oligopoly, and monopolistic competition.

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4 Associated with the number three pillars of the API.
5 Indonesian banking Hstatistic value was 0.62 during the period 1994-2001 as studied by Claessen and Laeven (2004).
2.1. Competition and Stability in the Banking Industry

Alhadeff (1951) mentioned that the banking market has several characteristics, first, the presence of more than one credit provider, in this case a bank, in one region. Second, the relationship between bankers and borrowers (debtors) are built based on the experiences related to earlier time lending. Third, large volumes of credit borrowers will get more offers of credit while a small number of borrowers will face a very limited supply. Fourth, there are barriers for the entry of new players who show a tendency to maintain a monopoly or oligopoly conditions for a positive benefit in the long run. Fifth, actions and decision of bankers generally correlate with each other, often referred to as agreement, mutual assistance, reduction of unhealthy competition, coordination, and so on. This is the reason for the existence of collusion losses that occur when competing against each other which can be replaced with profit obtained after an agreement is reached.

Chandler (1938) argues that competition in the banking industry is not perfectly competitive but is coupled with monopolistic collusion to set non-price competition and price. Alhadeff (1951) supported the statement with Chandler stating that the bank may not be in a situation that it really competes because a situation of pure competition may threaten banks in going bankrupt which will jeopardize the macro economy as the collapse of a bank can be transmitted to other banks (contagion effect).

Competition between banks can occur due to seizure of productive resources, such as the deposit, savings, and loans that are a source of income. Non-price competition among banks may take the form of gifts and promotions to attract customers as much as possible. Competition also may take the form of new products and the types of services that are supported by the development of technology that can reduce the cost of production and distribution.

Some studies concluded that more concentrated banking markets have a low level of competition, which is a buffer in the face of vulnerability. This makes banks more stable. On the other hand, these conditions also provide incentives to excessive risk-taking.

There are two opposing views about the relationship between a high level of banking competition and banking health: first the traditional view which states that banking competition will increase the supply of credit to companies in need. This opinion is also supported by Claessens and Laeven (2003) who found that high competition in the financial sector could boost production efficiency, quality financial products, and the level of innovation. Increased competition is also expected to reduce the cost of intermediation services making them more efficient because of the time needed to obtain a loan becomes much shorter and eventually will increase bank revenues (in Patti and Dell’Ariccia, 2004). In contrast, higher interest rates will reduce investment in research and development, so that the innovation will be hampered and ultimately decrease productivity (Cetorelli, 2001). Lindgren, Garcia, and Saal (1996) stated that a competitive banking market will use its own power to reduce weak banks and to encourage the existence of healthy banks.
Contrary to the above, there is an expressed view that competition is actually bad for a new company and the future of the banking industry as borrowers face credit supply when more and more banking competition increases. This model is based on the idea that competition will increase moral hazard and adverse selection problems of the borrower. When the inter-bank competition increases, companies increasingly have a choice of banks or creditors. Dell ‘Ariccia (2000)\(^6\) supported the conclusion that the bank’s efforts to screen prospective borrowers will decline when the number of banks increase.

2.2. Measuring Competition and Panzar Rosse Model

Based on the literature, the measurement of competition can be grouped into two: first, a more structural approach that is conventional and generally adheres to the paradigm of Structure Conduct Performance (SCP), and second, non-structural approaches that take the opposite direction to study of the structural approach, in which the manner or behavior of companies or organizations affect market conditions. There are three models of non-structural approach to the Iwata model, Bresnahan model, and Panzar-Rosse (PR) model. In this study, the model used is the PR model.

The PR model was introduced by Panzar and Rosse (PR) in 1987, using an indicator of competition known as ‘H statistic’ which provides a quantitative assessment of competition in the market. The H statistic is derived from the sum of the income elasticity of the price of production factors, based on reduced-form bank revenue equations. This model is widely used in empirical research because it does not need to specify the geographic market given the behavior of each bank will give you an indication of market strength.

PR model can only be applied to companies with a single type of product. Therefore, the bank is treated as a loan product producer of services. In the production process, the bank requires three inputs namely labor, physical capital and financial account. The PR model is based on the assumption of a situation of perfect competition and that a company behaves to maximize profits.

The data required in the model is in company unit, and does not require a level of industry aggregate. Another advantage is the use of bank earnings as the dependent variable which are more easily observed and found to be comparable in price and quantity of products or the actual cost. Applications of the PR model were first used to measure competition in the printing industry and then used for many other fields, including banking.

The H statistic is based on a comparative static analysis of the revenue reduction equation. The methodology proposed by Panzar and Rosse (1987) refers to the general equilibrium model of the market, where firms use different pricing strategies in response to any changes in input

\(^6\) Paper published by Nicholson (2001): Competition among Banks: Good or Bad?
factor prices. The price change is highly dependent on the competitive behavior of participants in the market. In summary, the model developed by Panzar and Rosse refers to the equilibrium input price (marginal cost) with gross income (gross revenue).

Following the model used Bikker and Haaf (2001), the optimization of the bank in the industry must satisfy the condition of zero profit so that revenues equal to costs. This condition is represented as follows:

\[
R_i (y^*_i, Z^R_i) = C_i (y^*_i, W_i, Z^C_i)
\]

(1)

where \( R_i \) and \( C_i \) respectively of income and bank charges; \( y^*_i \) bank is in a state of equilibrium output; \( W_i \) is a vector of input prices; \( Z^R_i \) is a vector of exogenous variables; and \( Z^C_i \) is a vector of exogenous variables that affect the cost. At the company level, MR=MC, so that:

\[
R'_i (y^*_i, Z^R_i) = C'_i (y^*_i, W_i, Z^C_i)
\]

(2)

To evaluate the \( H \) statistic, the elasticity of the total revenue to changes in input prices is reflected below:

\[
H = \sum_{k=1}^{K} \left( \frac{\partial R^*_i}{\partial W_{ki}} \cdot \frac{w_{ki}}{R^*_i} \right)
\]

(3)

Linearization equation (2) gives the value of elasticity directly, and can avoid heteroschedasticity (Shaffer, 1982):

\[
\ln(R'_i) = a_0 + a_1 \ln(y^*_i) + \sum_{j=1}^{J} d_j \ln(z^R_{ji})
\]

(4)

\[
\ln(C'_i) = c_0 + c_1 \ln(y^*_i) + \sum_{k=1}^{K} b_k \ln(w_{ki}) + \sum_{l=1}^{L} v_l \ln(z^C_{il})
\]

(5)

In competitive equilibrium conditions (zero profit), and by some rearrangements we have:

\[
a_0 + a_1 \ln(y^*_i) + \sum_{j=1}^{J} d_j \ln(z^R_{ji}) = c_0 + c_1 \ln(y^*_i) + \sum_{k=1}^{K} b_k \ln(w_{ki}) + \sum_{l=1}^{L} v_l \ln(z^C_{il})
\]

(6)

\[
\ln(y^*_i) = \frac{1}{(a_1 - c_1)} \left( c_0 - a_0 + \sum_{k=1}^{K} b_k \ln(w_{ki}) + \sum_{l=1}^{L} v_l \ln(z^C_{il}) - \sum_{j=1}^{J} d_j \ln(z^R_{ji}) \right)
\]

(7)

The reduced form revenue equation bank \( i \), depends on the output and price of equilibrium as shown by:

\[
\ln(R^*_i) = \ln(p^*, y^*_i) \tag{8}
\]

where the price level can be obtained from the inverse demand equation, which is in natural logarithm form:

\[
\ln(p) = \mu + \lambda \ln(Y) \tag{9}
\]

where \( Y = \sum_{i=1}^{i} y_i \) (aggregate output in an industry). With a little algebra, the reduced form can be written back into:

\[
\ln(R^*_i) = \alpha + \sum_{k=1}^{K} \beta_k \ln(w_{ki}) + \sum_{q=1}^{Q} \delta_q \ln(z_{qi}) \tag{10}
\]

where \( Z_i \) is a vector of bank-specific variables \( Q \). In equation (3), the statistical value of \( H \) can be calculated by:

\[
H = \sum_{k=1}^{K} \beta_k \tag{11}
\]

\( H \)-statistic values range between to 1, which indicates the level of market competition. When the value of \(-\infty < H < 0\), this is the form of a market monopoly or oligopoly, perfect collusion. In the structure of this kind of competition, rising input prices will translate into higher marginal cost, the equilibrium output is reduced, and revenue declined. If \( 0 < H < 1 \), then a monopolistic competition market structure is formed. If a competitive market, the value of \( H \) will range from one (\( H = 1 \)). Under these conditions, an increase in input prices will proportionally affect revenue changes, without distorting the optimal amount of output from the company. Technically, the test can be done with the value of \( H \) Wald test, as well as to examine whether there are differences in the value of \( H \) in the first period or a period of consolidation with the post-issuance API period.

Given the PR model is a static approach, there is necessary condition that must be satisfied as the sample observations should represent the long-run equilibrium. Testing the stability of the long-term is usually done by measuring the E statistic which is the sum of the elasticity of Return on Equity (ROE) or Return on Assets (ROA) of the price of production factors, based on the reduced form income equation. The statistical value \( E = 0 \) indicates the situation in a long-run equilibrium, which means the return of bank assets are not related to the input prices of factors of production.
The equation to test the long-run equilibrium condition can be written as follows:

\[
\ln(ROE_i^{\text{atauROA}}_i) = \alpha + \sum_{k=1}^{K} \beta_k \ln(w_{kt}) + \sum_{q=1}^{Q} \delta_q \ln(z_{qt}) \tag{12}
\]

and the necessary condition that indicates that the market in a long-run equilibrium is:

\[
E = \sum_{k=1}^{K} \beta_k = 0 \tag{13}
\]

Fulfillment of a long-run equilibrium assumption is one of the most intractable problems in this method. However, some researchers emphasize that the banks had reached steady state\(^8\).

III. METHODOLOGY

3.1. Empirical Model

Estimated empirical model is a modification of the model of de Rozas (2007) in two ways, first, the variable logarithm of market share in loans and savings that target consumers is eliminated because the same group of banks makes it difficult to determine market share in a bank group. Second, a variable on the number of branches added is believed to consider specific variables of the Indonesian banking industry which could affect revenues, costs and demand\(^9\). U.S. research shows that banking consolidation in the country have a significant impact on improving the quality of banking services to customers, one of which is through the branch network (Berger, Demiurgic-Kunt, and Haubrich, 2004). Statistics show that the number of bank branches in Indonesia continues to increase despite the decline of total banks due to the large number of bank mergers and acquisitions among banks.

\[
\ln(NITA_{iy}) = \alpha_i + \beta_{y} \ln(PL_{it}) + \beta_{2t} \ln(PLF_{it}) + \beta_{3t} \ln(PCE_{it}) + \delta_t \ln(EQTA_{it}) + \delta_{2t} \ln(LOATA_{it}) + \delta_{3t} \ln(LFTA) + \delta_{4t} \ln(CAB_{it}) + \mu_{it} \tag{14}
\]

NITA is the income of the bank, which is the ratio between the amount of interest income and non-interest income to total assets. This variable includes both revenue earnings of each bank

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8 Ibid.
9 Shaffer (1982) recommends using the number of branches as it can affect the cost and demand.
and the interest, which is then divided by total assets and used as the dependent variable in calculating H-statistic.

PL is wages; PLF is the price of loanable funds, and reflects price per one unit of labor in this study that is represented by the ratio of personnel expenses to number of employees. Personnel expenses used in this study are the sum of the total salary and benefits or bonuses plus the cost of education and training of employees. PCE is the price of capital expenditure, and represents the price of each unit of money in the bank that was approached by the ratio of interest expenses to the loanable funds comprised of deposits, tradable securities, and subordinated instruments. Due to data limitations, the price per one unit of the fund was replaced with research interest expenses compared to Third Party Funds (TPF). The third variable (PL, PLF, and PCE) represent the input factor prices.

Other explanatory variables are nonfactor variables which reflect the risk of production, business depth, and size of the bank, as well as ability to affect revenues, costs and demand. EQTA is equity to total assets; LOATA is a loan to total assets, and represents the price per unit of capital is used. In this study the price per unit of capital is approximated by the ratio of capital expenditure on fixed assets. Capital expenditure in this study is obtained from the sum of the cost of maintenance and repairs, the cost of depreciation of fixed assets, rental fees, and the cost of goods and services. LFTA is the ratio of loanable funds to total assets, proxied with the ratio of deposits to total assets. This variable indicates the importance of deposits in the balance sheet. The latter is CAB, representing the total number of branches.

Given that the level of competition sought by any group of banks is examined during the two periods, i.e., during the consolidation phase (2001-2003), and the phase after the API was published (2004-2006), then equation (17) was added with a dummy variable (Dd). The dummy variables are specific to each type of bank (state-owned banks, foreign exchange banks, non-foreign exchange banks, regional bank, joint venture banks, and foreign banks):

\[
\ln(NITA_{it}) = \alpha_{it} + \sum_{d} \alpha_{itd} \cdot Dd + \beta_{it} \ln(PL_{it}) + \sum_{d} \chi_{itd} \cdot Dd \cdot \ln(PL_{it}) + \delta_{it} \ln(PLF_{it}) \\
+ \sum_{d} \xi_{itd} \cdot Dd \cdot \ln(PLF_{it}) + \phi_{it} \ln(PCE_{it}) + \sum_{d} \psi_{itd} \cdot Dd \cdot \ln(PCE_{it}) + \gamma_{it} \ln(EQTA) \\
+ \sum_{d} \eta_{itd} \cdot Dd \cdot \ln(EQTA_{it}) + \tau_{it} \ln(LOATA_{it}) + \sum_{d} \kappa_{itd} \cdot Dd \cdot \ln(LOATA_{it}) + \lambda_{it} \ln(LFTA_{it}) \\
+ \sum_{d} \omega_{itd} \cdot Dd \cdot \ln(LFTA_{it}) + \pi_{it} \ln(CAB_{it}) + \sum_{d} \theta_{itd} \cdot Dd \cdot \ln(CAB_{it}) + \mu_{it} \tag{15}
\]

If the level of competition is in the form of monopolistic competition, then according to Yildirim and Philippatos (2004), there will be an increase in revenue at the time there is an
increase in the prices of factors of production, even when this increase is not as high as the increase in the prices of factors of production. If the results of data processing show that the market is in a situation of perfect competition, the relationship between revenue and the prices of input factors will positive. This correlation is formed are based on perfect competition in which the banks are in a situation of zero profit, and where free entry and free exit will drive change in proportion to income without disturbing the optimal output level in each company in the event of an increase in the prices of factors of production. If the market form is a monopoly, a negative correlation is expected between the income and the prices of factors of production. In this situation, an increase in the prices of labor and other raw materials will increase the marginal cost, causing equilibrium output decline to ultimately reduce bank earnings. Given that banks behave as companies to maximize profit and have to deal with the market price-inelastic, then there would be a decrease in revenue.

A positive correlation between the amount of outstanding loans and bank earnings are expected to occur because of the interest-bearing loans of bank revenue. Meanwhile, for the other variables in addition to the variable factor of production, there is no expectation of any kind of signs of correlation, as in other studies using the PR model10.

The requirement that commercial banks can be tested with the dependent variable ROE or ROA in long-run equilibrium conditions represents the profitability of banks, with the following equation:

\[
\ln(ROE_{it}) = \alpha_{it} + \sum_{2}^{d} \alpha_{d}Dd + \beta_{it}\ln(PL_{it}) + \sum_{2}^{d} \chi_{d}Dd.\ln(PL_{it}) + \delta_{it}\ln(PLF_{it}) \\
+ \sum_{2}^{d} \varepsilon_{d}Dd.\ln(PLF_{it}) + \phi_{it}\ln(PCE_{it}) + \sum_{2}^{d} \varphi_{d}Dd.\ln(PCE_{it}) + \gamma_{it}\ln(EQTA) \\
+ \sum_{2}^{d} \eta_{d}Dd.\ln(EQTA_{it}) + \tau_{it}\ln(LOATA_{it}) + \sum_{2}^{d} \kappa_{d}Dd.\ln(LOATA_{it}) + \lambda_{it}\ln(LFTA_{it}) \\
+ \sum_{2}^{d} \mu_{d}Dd.\ln(LFTA_{it}) + \pi_{it}\ln(CAB_{it}) + \sum_{2}^{d} \rho_{d}Dd.\ln(CAB_{it}) + \mu_{it}
\]  

\[ (16) \]

3.2. Estimation Technique

Panel data regression was utilized to estimate the data in this study. There were many changes in the role of banking in Indonesia, among others, are changes in policy, bank closing, and merger and acquisition after the economic crisis. Therefore, we are dealing with unbalanced panel estimation. The use of panel estimation is to anticipate the possible correlation between

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10 Bikker (2001) mentioned that the majority of researchers do not have a certain expectation of the sign of the correlation for the independent variables in addition to the factors of production. Most researchers still expect equity would negatively be correlated because they can drive revenue from interest although some other researchers actually expect a positive correlation between equity capital and income because demand will increase with credit risk and investment.
banks, for example when they share common market target.

The method chosen or considered to be the most appropriate for this study is random effect method. This method was chosen with consideration of the number of samples more than the amount of time (Nachrowi and Usman, 2006). In addition, the choice is supported with the Haussman test (see Appendix). The fixed effect method cannot be used since provide a near singular matrix, due to many dummy variables, resulting matrix close to zero.

Autocorrelation and heteroscedasticity examination was not carried out specifically since the amount of panel data in this study reach thousands. This minimizes the possible bias as when individual or company level data is aggregated. In addition to our effort to overcome multicollinearity and heteroschedasticity problem by using natural logarithm (de Rizas, 2007) and ratios, we also examine multicollinearity issue using coefficient covariance matrix. We examine the collinearity issue given that high collinearity can produce parameters that are not in accordance with the substance and potentially lead to miss interpretations, (Nachrowi and Usman, 2006).

**IV. RESULT AND ANALYSIS**

**Bank Stability**

Broadly speaking, the estimation will provide us two types of statistics, namely E-Statistic for the long-run equilibrium or indicator of stability, and H-Statistic that describes the level of competition for each bank group. Calculation of the level of competition with the PR method requires that the banking system must be in a long-run equilibrium. By applying the Wald test for the value of E-statistic, we know that during the consolidation period, overall banks were not in their long-run equilibrium.

When we estimate the E-statistic for each group of banks using random effect models, we found that three of the six groups of commercial banks; state-owned banks, foreign banks, and non-foreign exchange banks, were not in their long-run equilibrium state during the consolidation period. The other three commercial banks, namely Regional Bank (BPD), joint venture banks, and foreign banks, were in long-run equilibrium situation during the consolidation period.

However, we still continue to measure the competition level using PR model for these three groups of bank that were not stable during consolidation period. Shaffer (2004) argued that if the result showed disequilibrium, it does not necessary reflect the PR model results to be invalid. Instead, rejection of equilibrium indicators showed that the banking industry was growing dynamically during the observation. Shaffer (2008) also emphasized that research with this

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11 Quoted from Schaeck Klaus, Martin Cihak, and Simon Wolfe (2009), Competition, Concentration, and Bank Soundness: New Evidence from the Micro-Level
condition can still be continued as long as the H-statistics can reject a monopoly situation ($H_0$.)

If the H-statistic generates monopoly, then the long-term instability ($E \neq 0$) would indicate that the market was in short-run equilibrium.

For the period of 2004-2006, the estimation result shows that the commercial banks were in their long-run equilibrium. The entire estimation results of E-statistic for each commercial banks group shows that the six banks were already in long-run equilibrium. This includes the state-owned banks, foreign exchange, and non-foreign exchange banks, which previously not in equilibrium during consolidation phases.

The shift from non-equilibrium to equilibrium for the entire group of banks shows that three years implementation of API had led stability for banks. Comparison between the two periods shows that more banks were stabilizing after the API luncheon (see Table 1).

Indication of more stable commercial banks after the API luncheon was also supported by several indicators. Deposits collections for all groups of commercial banks tended to rise, with the exception of the foreign bank deposits that slumped at the end of 2006. General bank lending continued to rise, as well as the Loan to Deposit Ratio (LDR). In contrast, the percentage of bad loans at all commercial banks declined from 2001 to 2006, possibly due to the recovery and stabilization of the economy after the crisis.

### Table 1.

<table>
<thead>
<tr>
<th>Bank Group</th>
<th>Consolidation period</th>
<th>Post-API</th>
</tr>
</thead>
<tbody>
<tr>
<td>All General Banks</td>
<td>Fail to pass the test of long run equilibrium</td>
<td>Passed the test of long run equilibrium</td>
</tr>
<tr>
<td>State-owned Banks</td>
<td>Fail to pass the test of long run equilibrium</td>
<td>Passed the test of long run equilibrium</td>
</tr>
<tr>
<td>Foreign Exchange Bank</td>
<td>Fail to pass the test of long run equilibrium</td>
<td>Passed the test of long run equilibrium</td>
</tr>
<tr>
<td>Non-foreign Exchange bank</td>
<td>Fail to pass the test of long run equilibrium</td>
<td>Passed the test of long run equilibrium</td>
</tr>
<tr>
<td>Regional Bank (BPD)</td>
<td>Passed the test of long run equilibrium</td>
<td>Passed the test of long run equilibrium</td>
</tr>
<tr>
<td>(Regional Banks)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joint Venture Bank</td>
<td>Passed the test of long run equilibrium</td>
<td>Passed the test of long run equilibrium</td>
</tr>
<tr>
<td>Foreign Banks</td>
<td>Passed the test of long run equilibrium</td>
<td>Passed the test of long run equilibrium</td>
</tr>
</tbody>
</table>

**Description:** This is $E$ statistical test which is a necessary condition before seeking statistical value $H$.

### Competition level of Commercial Banks

Calculation results for H-statistic value and the Wald test for each bank group is provided in Table 2. Overall, the commercial banks were in a monopolistic competition conditions during the consolidation period. Looking across bank group, four of the commercial banks were in monopoly or collusive oligopoly structure, while the other two groups (state-owned banks and foreign banks) were in monopolistic competition.
Three years after the API was launched, competition in the Indonesian commercial banks has evolved. A whole group of commercial banks were in a situation of monopoly or collusive oligopoly, where previously they were in monopolistic competition. This condition showed that the level of competition in commercial banks tended to be lower and higher monopoly intensities in some banks.

From 2001 to 2006, most of the banks were in a situation of monopoly or collusive oligopoly. In summary, banks were generally in a situation of monopoly or collusive oligopoly as supported by Manurung and Rahardja (2004) who stated that the financial industry is rarely in perfectly competitive market. This is particularly true for domestic market due to the difficulty for the new banks to achieve economies of scale, complexity management issues, and the severity of non-price competition.

Collusion in banking can be in a form of agreement, mutual assistance, and coordination between banks to set price and or non-price competition, (Alhadeff, 1951). Furthermore, the monopoly or oligopoly is more often favored by bankers because it produces more stable profits compared to the situation of a highly competitive market (Caves and Porter, 1978).

The findings of this study correct Setyowati (2004) and also the findings of Claessen and Laeven (2003) who concluded that Indonesian banks in general are in a situation of monopolistic competition. Along with the previous E-statistic result, we found that the competition in every group of commercial banks in Indonesia was getting lower with increasing stability.

This finding is also supported by the results of H-statistics for all groups of commercial banks data, using only one dummy variable representing prior and after the implementation of API. The estimation results of six groups combined data shows a decrease in the level of competition, shifted from monopolistic competition towards monopoly or collusive oligopoly. Decrease in the level of competition as a result of increased stability in the financial sector is also supported by Allen and Gale (2004); Stability is beneficial for banks since it provides bigger opportunities to be a price leader.

The first reason for the decline of competition level was because of the large number of bank mergers and acquisitions, or consolidation among banks, especially in the following years after API luncheon (post crisis 1997/98). This policy was adopted because it was more elegant than direct liquidation, and would not likely triggering panic especially for banks with poor performance. Empirically, the process of mergers and acquisitions that reduce the number of banks was already pushing the market towards monopoly or oligopoly and away from perfect competition (Alhadeff, 1951; Bikker and Haaf, 2001).

---

The second factor that reduced the level of competition is the banking regulation, such as the Single Presence Policy\textsuperscript{13} (SPP), which encouraged reduction in the number of banks. Similarly, the establishment of new banks policy with minimum Rp 3 trillion of capital, also helped stop the emergence of new banks. At first, the presence of this regulation was to prevent fraud and mismanagement. However, in reality, these series of regulatory measures had also restricted the flexibilities of financial institutions (Manurung and Rahardja, 2004).

Changes in the level of banking competition due to the emergence of a government policy or banking surveillance authority was also found in de Rozas (2007) research Spain banking and also in Bikker and Groeneveld (1998) on European banks after deregulation following the establishment of the European Union. Therefore, competition was likely hampered in a financial industry loaded with regulations.

Another interesting finding of the random effect estimation was the presence of two out of six groups of banks that have a monopoly or collusive oligopoly structure, both prior and

\textsuperscript{13} The SPP policy forced banks with common ultimate shareholders to merge into one bank. However, the definition of the common ultimate shareholders was apparently taken from legal lending limit, which was actually intended for spreading risk; this made the two definitions were not match.
after API luncheon. Two groups of banks are banks that have a niche market, the Regional Bank (BPD) group and joint venture banks. These findings indicate that the API does not affect the competitive level of these two groups of bank. Likewise, the foreign banks appeared to have the lowest competition level relative to other groups. Chances are this is related to the foreign bank presence in only certain cities due to the geographical limitation for this bank.

On the micro level, the effect of competition changes on the asset side tends to be different from the liability side. On the liabilities side, the increase in competition may encourage an increase in deposit rate because banks tend to garner new customers through the lure of a higher interest rate relative to its competitors. In contrast, on the asset side, competition increase would drive banks to lower interest rates as banks try to offer lower interest rates to the debtor.

Panel data estimation results showed that not all elasticity parameters of independent variable are statistically significant. These insignificant variables could be interpreted to represent the evolution of the market structure and market specialization process. Some variables which are likely to be decisive in the future of competition level are the number of branches, the price of labor, and the volume of lending.

The number of branches could affect the level of competition and bank profits. Branches could increase profits at the point where bank branches are able to spearhead marketing, both in terms of financial resources (adding depositors) and the use of funds (increase the debtor) leading to an increase in transactions. In contrast, the branch office that is not able to attract more customers will add costs. It is evident for example on BRI with its Teras program, the BTPN with MUR, Danamon with DSP, Bukopin with Swa Mitra, and even Mandiri with its Micro Unit.

The price and the quantity of labor could also be determinant of competition in the future given the direct relationship between the price of labor and the costs. Decline in the price of labor will also decrease the cost, considering the banking industry as a labor intensive industry, particularly for banks that engaged in retail or micro, small and medium-sized enterprises (SMEs).

The volume of lending could also be a determinant of competition (in terms of assets to the bank) since bank lending will create revenue through interest margin, which is much larger than the inter-bank money or securities market. More bank lending will invite greater income,

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14 De Guavara, Maudos, and Perez (2002) which researched levels of competition with a model that was almost the same as the PR model but it was based on a function of cost and price of three factors of production in its processing to produce a findings that contained a lot slope for the independent variables which were not significant.

15 Branches are not limited to the physical form of the building but also the non-physical (or often called branchless banking) such as internet banking or e-banking which is growing along with information and communication technology and more innovative gadgets. In addition, the bank is also working with the post office or agency, finance companies, rural banks and Credit Unions to expand its network, such as Danamon with DSP, etc. Bukopin with Swa Partners.
and vice versa. It is worth to note that the Loan to Deposit Ratio (LDR) during the banking consolidation period was lower than after the API luncheon. This represents potential increase of credit allocation.

V. CONCLUSION

The first conclusion of this paper is that the overall performance of the commercial banks improved after three years the API luncheon. All groups of commercial banks were also more stable after the API. Although more stable, competition level of banking industry in Indonesia at the national level tended to decrease. Commercial banks in general were in monopolistic competition during the period of consolidation and then shifted to monopoly or collusive oligopoly after API.

Across the banking group, the market structure of commercial and foreign exchange bank were previously monopolistic competition during consolidation period, and then shifted to monopoly or collusive oligopoly after the API. On the other hand, those bank with originally in monopoly or collusive oligopoly also experienced a decline in competition level (or increasing monopoly intensities).

We suspect the decline of banking competition level is caused by reduction of number of banks, and also by the emergence of banking deregulation. In addition, the decline of competition level was also affected by the increase of banking stability. Therefore, this study provides evidence that commercial banks became more stable, with lower levels of competition after the API luncheon.

The second conclusion, the API does not affect the structure of competition in the Regional Bank (BPD) group that has a niche market (i.e. local governments, their employees and associated companies), nor the joint venture banks with a fixed market of foreign multinational companies. The monopolistic competition or collusive oligopoly on these two types of banks stayed the same prior and post the implementation of API.

The third conclusion is that foreign banks have a lower level of competition relative to other bank groups. This is related to the regional restriction imposed by the government to operate only in certain region.

To investigate in more detail about the structure of banking industry in Indonesia, future study can release the static assumption as presumed on current paper. Another option is to use more precise proxy for the variables. The grouping of the bank based on their asset size may also be interesting rather than use the current classification from Bank Indonesia.
This paper has emphasized the future decisive role of number of branch, price of labor, and the credit volume (across region) on the level of bank competition. Future research may want to focus on these variables to predict and to manage the competition of banking to the desired level.

The above findings bring implications for the monetary authorities to pay more attention on the level of competition among banks, considering that the larger tendency toward monopoly, the greater inefficiency will occur. With respect to the ability to compete globally, it is also important for the bank to achieve certain scale, be strong and stable, which could be attained by merger and acquisition process, without sacrifice the decline in competition level.
REFERENCES


# APPENDIX

## Wald Test for Statistic - E (E=0)

<table>
<thead>
<tr>
<th>State Owned Bank (Bank Persero)</th>
<th>Post API Implementation (2004-2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wald Test:</strong></td>
<td><strong>Wald Test:</strong></td>
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<td>Pool: THESIS7</td>
<td>Pool: THESIS7</td>
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<td><strong>Test Statistic</strong></td>
<td><strong>Test Statistic</strong></td>
</tr>
<tr>
<td><strong>Value</strong></td>
<td><strong>Value</strong></td>
</tr>
<tr>
<td>df</td>
<td>df</td>
</tr>
<tr>
<td>Probability</td>
<td>Probability</td>
</tr>
<tr>
<td>F-statistic 20,71381 (1, 9685)</td>
<td>F-statistic 0,03975 (1, 9685)</td>
</tr>
<tr>
<td>Chi-square 20,71381 1 0</td>
<td>Chi-square 0,03975 1 0</td>
</tr>
<tr>
<td><strong>Null Hypothesis Summary:</strong></td>
<td><strong>Null Hypothesis Summary:</strong></td>
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<td>Normalized Restriction (= 0)</td>
</tr>
<tr>
<td>Value</td>
<td>Value</td>
</tr>
<tr>
<td>Std. Err.</td>
<td>Std. Err.</td>
</tr>
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<td>C(14) + C(26) + C(38) 0,682298</td>
<td>C(15) + C(27) + C(39) 0,032767</td>
</tr>
<tr>
<td>Restrictions are linear in coefficients.</td>
<td>Restrictions are linear in coefficients.</td>
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</tbody>
</table>

## Foreign Exchange Bank (Bank Devisa)

<table>
<thead>
<tr>
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<td><strong>Wald Test:</strong></td>
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<td><strong>Test Statistic</strong></td>
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<tr>
<td><strong>Value</strong></td>
<td><strong>Value</strong></td>
</tr>
<tr>
<td>df</td>
<td>df</td>
</tr>
<tr>
<td>Probability</td>
<td>Probability</td>
</tr>
<tr>
<td>F-statistic 5,731132 (1, 9685)</td>
<td>F-statistic 2,773027 (1, 9685)</td>
</tr>
<tr>
<td>Chi-square 5,731132 1 0,0167</td>
<td>Chi-square 2,773027 1 0,0167</td>
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<tr>
<td><strong>Null Hypothesis Summary:</strong></td>
<td><strong>Null Hypothesis Summary:</strong></td>
</tr>
<tr>
<td>Normalized Restriction (= 0)</td>
<td>Normalized Restriction (= 0)</td>
</tr>
<tr>
<td>Value</td>
<td>Value</td>
</tr>
<tr>
<td>Std. Err.</td>
<td>Std. Err.</td>
</tr>
<tr>
<td>C(16) + C(28) + C(40) 0,362901</td>
<td>C(17) + C(29) + C(41) 0,252621</td>
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<td>Restrictions are linear in coefficients.</td>
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</tbody>
</table>
### Non-Foreign Exchange Bank (Bank Non-Devissa)

<table>
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</tr>
</thead>
<tbody>
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<td>F-statistic</td>
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<td>(1, 9685)</td>
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<td>Chi-square</td>
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<th>Normalized Restriction (= 0)</th>
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Restrictions are linear in coefficients.

### Regional Bank (BPD)

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<td>F-statistic</td>
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<td>0.1771</td>
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<table>
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<th>Normalized Restriction (= 0)</th>
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<td>C(20) + C(32) + C(44)</td>
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Restrictions are linear in coefficients.
### Mix Bank (Bank Campuran)

<table>
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<tbody>
<tr>
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<td>Wald Test:</td>
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<td>Pool: THESIS7</td>
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<td><strong>Test Statistic</strong></td>
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<tr>
<td><strong>Value</strong></td>
<td><strong>Value</strong></td>
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<tr>
<td><strong>df</strong></td>
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<td>0,2963</td>
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<td>0,2963</td>
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### Foreign Bank (Bank Asing)

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### Wald Test for restriction $H=0$ and $H=1$


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#### Normalized Restriction Summary

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Restrictions are linear in coefficients.

#### State Owned Bank (Bank Persero) Post API Implementation (2004-2006)

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<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
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<td>0,6588</td>
<td>F-statistic</td>
<td>186,8024</td>
<td>(1, 9686)</td>
<td>0</td>
</tr>
<tr>
<td>Chi-square</td>
<td>0,195048</td>
<td>1</td>
<td>0,6587</td>
<td>Chi-square</td>
<td>186,8024</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Normalized Restriction Summary

<table>
<thead>
<tr>
<th>Normalized Restriction $= 0$</th>
<th>Value</th>
<th>Std. Err.</th>
<th>Normalized Restriction $= 0$</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C(15) + C(27) + C(39)$</td>
<td>-0,033392</td>
<td>0,075609</td>
<td>$-1 + C(15) + C(27) + C(39)$</td>
<td>-1,03339</td>
<td>0,075609</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>3.061351</td>
<td>(1, 9686)</td>
<td>0,0802</td>
<td>F-statistic</td>
<td>158,2152</td>
<td>(1, 9686)</td>
<td>0</td>
</tr>
<tr>
<td>Chi-square</td>
<td>3.061351</td>
<td>1</td>
<td>0,0802</td>
<td>Chi-square</td>
<td>158,2152</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:

<table>
<thead>
<tr>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(16) + C(28) + C(40)</td>
<td>0,122115</td>
<td>0,069793</td>
<td>-1 + C(16) + C(28) + C(40)</td>
<td>-0,87789</td>
<td>0,069793</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

### Foreign Exchange Bank (Bank Devisa) Post API Implementation (2004-2006)

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>2.300753</td>
<td>(1, 9686)</td>
<td>0,1293</td>
<td>F-statistic</td>
<td>2.300753</td>
<td>(1, 9686)</td>
<td>0,1293</td>
</tr>
<tr>
<td>Chi-square</td>
<td>2.300753</td>
<td>1</td>
<td>0,1293</td>
<td>Chi-square</td>
<td>2.300753</td>
<td>1</td>
<td>0,1293</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:

<table>
<thead>
<tr>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(17) + C(29) + C(41)</td>
<td>0,105956</td>
<td>0,069854</td>
<td>-1 + C(17) + C(29) + C(41)</td>
<td>-0,89404</td>
<td>0,069854</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>2.301804</td>
<td>(1, 9686)</td>
<td>0.1293</td>
<td>F-statistic</td>
<td>165,2097</td>
<td>(1, 9686)</td>
<td>0.0000</td>
</tr>
<tr>
<td>Chi-square</td>
<td>2.301804</td>
<td>1</td>
<td>0.1292</td>
<td>Chi-square</td>
<td>165,2097</td>
<td>1</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:
- Normalized Restriction (\(= 0\))
  - Value: 0.105575
  - Std. Err.: 0.069587

Restrictions are linear in coefficients.

## Non-Foreign Exchange Bank (Bank Non-Devisia) Post API Implementation (2004-2006)

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.481951</td>
<td>(1, 9686)</td>
<td>0.4876</td>
<td>F-statistic</td>
<td>186,9261</td>
<td>(1, 9686)</td>
<td>0.0000</td>
</tr>
<tr>
<td>Chi-square</td>
<td>0.481951</td>
<td>1</td>
<td>0.4875</td>
<td>Chi-square</td>
<td>186,9261</td>
<td>1</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:
- Normalized Restriction (\(= 0\))
  - Value: 0.048323
  - Std. Err.: 0.069607

Restrictions are linear in coefficients.
### Regional Bank (BPD) Consolidation Period (2001-2003)

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.488204</td>
<td>(1, 9686)</td>
<td>0.4847</td>
<td>F-statistic</td>
<td>185,8757</td>
<td>(1, 9686)</td>
<td>0</td>
</tr>
<tr>
<td>Chi-square</td>
<td>0.488204</td>
<td>1</td>
<td>0.4847</td>
<td>Chi-square</td>
<td>185,8757</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:

<table>
<thead>
<tr>
<th>Normalized Restriction (( = 0 ))</th>
<th>Value</th>
<th>Std. Err.</th>
<th>Normalized Restriction (( = 0 ))</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(20) + C(32) + C(44)</td>
<td>0.048751</td>
<td>0.069772</td>
<td>-1 + C(20) + C(32) + C(44)</td>
<td>-0.95125</td>
<td>0.069772</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

### Regional Bank (BPD) Post API Implementation (2004-2006)

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.225298</td>
<td>(1, 9686)</td>
<td>0.635</td>
<td>F-statistic</td>
<td>191,1256</td>
<td>(1, 9686)</td>
<td>0</td>
</tr>
<tr>
<td>Chi-square</td>
<td>0.225298</td>
<td>1</td>
<td>0.635</td>
<td>Chi-square</td>
<td>191,1256</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:

<table>
<thead>
<tr>
<th>Normalized Restriction (( = 0 ))</th>
<th>Value</th>
<th>Std. Err.</th>
<th>Normalized Restriction (( = 0 ))</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(21) + C(33) + C(45)</td>
<td>0.033194</td>
<td>0.069933</td>
<td>-1 + C(21) + C(33) + C(45)</td>
<td>-0.96681</td>
<td>0.069933</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.
### Mix Bank (Bank Campuran) Consolidation Period (2001-2003)

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.002794</td>
<td>(1, 9686)</td>
<td>0.9578</td>
<td>F-statistic</td>
<td>206,8383</td>
<td>(1, 9686)</td>
<td>0</td>
</tr>
<tr>
<td>Chi-square</td>
<td>0.002794</td>
<td>1</td>
<td>0.9578</td>
<td>Chi-square</td>
<td>206,8383</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:

<table>
<thead>
<tr>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(22) + C(34) + C(46)</td>
<td>-0.003689</td>
<td>0.069788</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

### Mix Bank (Bank Campuran) Post API Implementation (2004-2006)

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.005744</td>
<td>(1, 9686)</td>
<td>0.9396</td>
<td>F-statistic</td>
<td>92,67264</td>
<td>(3, 9686)</td>
<td>0</td>
</tr>
<tr>
<td>Chi-square</td>
<td>0.005744</td>
<td>1</td>
<td>0.9396</td>
<td>Chi-square</td>
<td>278,0179</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:

<table>
<thead>
<tr>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(23) + C(35) + C(47)</td>
<td>-0.005313</td>
<td>0.070108</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>1.446236</td>
<td>(1, 9686)</td>
<td>0.2292</td>
<td>F-statistic</td>
<td>7841.977</td>
<td>(12, 969)</td>
<td>0</td>
</tr>
<tr>
<td>Chi-square</td>
<td>1.446236</td>
<td>1</td>
<td>0.2291</td>
<td>Chi-square</td>
<td>94103.73</td>
<td>12</td>
<td>0</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:

<table>
<thead>
<tr>
<th>Normalized Restriction ( (= 0) )</th>
<th>Value</th>
<th>Std. Err.</th>
<th>Normalized Restriction ( (= 0) )</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C(24) + C(36) + C(48) )</td>
<td>-0.085573</td>
<td>0.071157</td>
<td>( -1 + C(24) + C(36) + C(48) )</td>
<td>-1.08557</td>
<td>0.071157</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

### Foreign Bank (Bank Asing) Post API Implementation (2004-2006)

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>3.745501</td>
<td>(1, 9686)</td>
<td>0.053</td>
<td>F-statistic</td>
<td>7841.977</td>
<td>(12, 969)</td>
<td>0</td>
</tr>
<tr>
<td>Chi-square</td>
<td>3.745501</td>
<td>1</td>
<td>0.0529</td>
<td>Chi-square</td>
<td>94103.73</td>
<td>12</td>
<td>0</td>
</tr>
</tbody>
</table>

Null Hypothesis Summary:

<table>
<thead>
<tr>
<th>Normalized Restriction ( (= 0) )</th>
<th>Value</th>
<th>Std. Err.</th>
<th>Normalized Restriction ( (= 0) )</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C(25) + C(37) + C(49) )</td>
<td>-0.137157</td>
<td>0.07087</td>
<td>( -1 + C(25) + C(37) + C(49) )</td>
<td>-1.13716</td>
<td>0.07087</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

### Non-Foreign Exchange Bank (Bank Non-Devisa)

**Wald Test:**

Pool: THESIS7

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>3.74501</td>
<td>(1, 9686)</td>
<td>0.053</td>
</tr>
<tr>
<td>Chi-square</td>
<td>3.74501</td>
<td>1</td>
<td>0.0529</td>
</tr>
</tbody>
</table>

**Null Hypothesis Summary:**

<table>
<thead>
<tr>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(18) - C(19) + C(30) - C(31) + C(42) - C(43)</td>
<td>0.057252</td>
<td>0.012055</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

### Regional Bank (BPD)

**Wald Test:**

Pool: THESIS7

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>1.15238</td>
<td>(1, 9686)</td>
<td>0.2831</td>
</tr>
<tr>
<td>Chi-square</td>
<td>1.15238</td>
<td>1</td>
<td>0.2831</td>
</tr>
</tbody>
</table>

**Null Hypothesis Summary:**

<table>
<thead>
<tr>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(20) - C(21) + C(32) - C(33) + C(44) - C(45)</td>
<td>0.015557</td>
<td>0.014492</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.
### Mix Bank (Bank Campuran)

**Wald Test:**

**Pool:** THESIS7

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.01139</td>
<td>(1, 9686)</td>
<td>0.915</td>
</tr>
<tr>
<td>Chi-square</td>
<td>0.01139</td>
<td>1</td>
<td>0.915</td>
</tr>
</tbody>
</table>

**Null Hypothesis Summary:**

<table>
<thead>
<tr>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(22) - C(23) + C(34) - C(35) + C(46) - C(47)</td>
<td>0.001625</td>
<td>0.015222</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.

---

### Foreign Bank (Bank Asing)

**Wald Test:**

**Pool:** THESIS7

<table>
<thead>
<tr>
<th>Test Statistic</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>4.802108</td>
<td>(1, 9686)</td>
<td>0.0284</td>
</tr>
<tr>
<td>Chi-square</td>
<td>4.802108</td>
<td>1</td>
<td>0.0284</td>
</tr>
</tbody>
</table>

**Null Hypothesis Summary:**

<table>
<thead>
<tr>
<th>Normalized Restriction (= 0)</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C(24) - C(25) + C(36) - C(37) + C(48) - C(49)</td>
<td>0.051584</td>
<td>0.023539</td>
</tr>
</tbody>
</table>

Restrictions are linear in coefficients.
### Estimation Result across Types of Bank
#### State Owned Bank (Bank Persero)

<table>
<thead>
<tr>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.62</td>
<td>Constant</td>
<td>-1.98**</td>
</tr>
<tr>
<td>Price of labor</td>
<td>0.17**</td>
<td>Price of labor</td>
<td>-0.03</td>
</tr>
<tr>
<td>Price of capital</td>
<td>-0.17**</td>
<td>Price of capital</td>
<td>0.33**</td>
</tr>
<tr>
<td>Price of fund</td>
<td>0.87***</td>
<td>Price of fund</td>
<td>-0.33*</td>
</tr>
<tr>
<td>Equity</td>
<td>0.14**</td>
<td>Equity</td>
<td>-0.08</td>
</tr>
<tr>
<td>Loan</td>
<td>0.17</td>
<td>Equity</td>
<td>-0.16</td>
</tr>
<tr>
<td>Third Party Fund</td>
<td>0.93***</td>
<td>Third Party Fund</td>
<td>-0.51</td>
</tr>
<tr>
<td>Number of Branch</td>
<td>-0.08</td>
<td>Number of Branch</td>
<td>0.2***</td>
</tr>
</tbody>
</table>

***: Significant at 1%  **: Significant at 5%  *: Significant at 10%

### Foreign Exchange Bank (Bank Devisa)

<table>
<thead>
<tr>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.10</td>
<td>Constant</td>
<td>-1.55**</td>
</tr>
<tr>
<td>Price of labor</td>
<td>-0.01</td>
<td>Price of labor</td>
<td>-0.06</td>
</tr>
<tr>
<td>Price of capital</td>
<td>0.23***</td>
<td>Price of capital</td>
<td>0.27***</td>
</tr>
<tr>
<td>Price of fund</td>
<td>-0.10</td>
<td>Price of fund</td>
<td>-0.22</td>
</tr>
<tr>
<td>Equity</td>
<td>-0.13**</td>
<td>Equity</td>
<td>-0.15**</td>
</tr>
<tr>
<td>Loan</td>
<td>0.78***</td>
<td>Loan</td>
<td>0.56**</td>
</tr>
<tr>
<td>Third Party Fund</td>
<td>-1.14***</td>
<td>Third Party Fund</td>
<td>-1.18***</td>
</tr>
<tr>
<td>Number of Branch</td>
<td>-0.95</td>
<td>Number of Branch</td>
<td>0.06</td>
</tr>
</tbody>
</table>

***: Significant at 1%  **: Significant at 5%  *: Significant at 10%
### Non-Foreign Exchange Bank (Bank Non Devisa)

<table>
<thead>
<tr>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.79</td>
<td>Constant</td>
<td>-1.71***</td>
</tr>
<tr>
<td>Price of labor</td>
<td>-0.06</td>
<td>Price of labor</td>
<td>0.08</td>
</tr>
<tr>
<td>Price of capital</td>
<td>0.29***</td>
<td>Price of capital</td>
<td>0.29***</td>
</tr>
<tr>
<td>Price of fund</td>
<td>-0.12</td>
<td>Price of fund</td>
<td>-0.32</td>
</tr>
<tr>
<td>Equity</td>
<td>-0.12**</td>
<td>Equity</td>
<td>-0.17**</td>
</tr>
<tr>
<td>Loan</td>
<td>-0.13</td>
<td>Loan</td>
<td>-0.12</td>
</tr>
<tr>
<td>Third Party Fund</td>
<td>-1.39</td>
<td>Third Party Fund</td>
<td>-0.11</td>
</tr>
<tr>
<td>Number of Branch</td>
<td>0.14**</td>
<td>Number of Branch</td>
<td>0.17**</td>
</tr>
</tbody>
</table>

***: Significant at 1%    **: Significant at 5%    *: Significant at 10%

### Regional Bank (BPD)

<table>
<thead>
<tr>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.07</td>
<td>Constant</td>
<td>-1.00</td>
</tr>
<tr>
<td>Price of labor</td>
<td>-0.08</td>
<td>Price of labor</td>
<td>-0.01</td>
</tr>
<tr>
<td>Price of capital</td>
<td>0.29***</td>
<td>Price of capital</td>
<td>0.3***</td>
</tr>
<tr>
<td>Price of fund</td>
<td>-0.16</td>
<td>Price of fund</td>
<td>-0.29**</td>
</tr>
<tr>
<td>Equity</td>
<td>-0.1*</td>
<td>Equity</td>
<td>-0.14**</td>
</tr>
<tr>
<td>Loan</td>
<td>-0.05</td>
<td>Loan</td>
<td>0.02</td>
</tr>
<tr>
<td>Third Party Fund</td>
<td>0.02</td>
<td>Third Party Fund</td>
<td>-0.11</td>
</tr>
<tr>
<td>Number of Branch</td>
<td>-0.02</td>
<td>Number of Branch</td>
<td>0.03</td>
</tr>
</tbody>
</table>

***: Significant at 1%    **: Significant at 5%    *: Significant at 10%
### Mix Bank (Bank Campuran)

<table>
<thead>
<tr>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-2.77***</td>
<td>Constant</td>
<td>-3.16***</td>
</tr>
<tr>
<td>Price of labor</td>
<td>0.22***</td>
<td>Price of labor</td>
<td>0.19**</td>
</tr>
<tr>
<td>Price of capital</td>
<td>0.19**</td>
<td>Price of capital</td>
<td>0.29***</td>
</tr>
<tr>
<td>Price of fund</td>
<td>-0.41***</td>
<td>Price of fund</td>
<td>-0.49**</td>
</tr>
<tr>
<td>Equity</td>
<td>-0.07**</td>
<td>Equity</td>
<td>-0.05</td>
</tr>
<tr>
<td>Loan</td>
<td>-0.18</td>
<td>Loan</td>
<td>-0.31</td>
</tr>
<tr>
<td>Third Party Fund</td>
<td>-0.45</td>
<td>Third Party Fund</td>
<td>-0.57**</td>
</tr>
<tr>
<td>Number of Branch</td>
<td>-0.01</td>
<td>Number of Branch</td>
<td>0.09</td>
</tr>
</tbody>
</table>

***: Significant at 1%        **: Significant at 5%      *: Significant at 10%

### Foreign Bank (Bank Asing)

<table>
<thead>
<tr>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
<th>Independent Variable (in natural log)</th>
<th>Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-1.95***</td>
<td>Constant</td>
<td>-1.53***</td>
</tr>
<tr>
<td>Price of labor</td>
<td>0</td>
<td>Price of labor</td>
<td>-0.03</td>
</tr>
<tr>
<td>Price of capital</td>
<td>0.53***</td>
<td>Price of capital</td>
<td>0.32***</td>
</tr>
<tr>
<td>Price of fund</td>
<td>-0.61***</td>
<td>Price of fund</td>
<td>-0.43***</td>
</tr>
<tr>
<td>Equity</td>
<td>-0.07</td>
<td>Equity</td>
<td>-0.09</td>
</tr>
<tr>
<td>Loan</td>
<td>-0.09</td>
<td>Loan</td>
<td>-0.14</td>
</tr>
<tr>
<td>Third Party Fund</td>
<td>-0.27</td>
<td>Third Party Fund</td>
<td>-0.37</td>
</tr>
<tr>
<td>Number of Branch</td>
<td>-0.28***</td>
<td>Number of Branch</td>
<td>-0.03</td>
</tr>
</tbody>
</table>

***: Significant at 1%        **: Significant at 5%      *: Significant at 10%
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