Journal
Of Economic
Development
Review of Developing Countries Economy
Page: 71 – 133

ANALYSIS OF FACTORS INFLUENCING INFLATION IN INDONESIA

Endri

ABFI Institute PERBANAS Jakarta

E-mail: endri67@yahoo.com

Abstract

This research is aimed at analysing some factors that affect inflation rate in Indonesia during period 1997-2005. Using cointegration analysis and error correction model this research will investigate the relationship between independent variable and dependent variables in both short run and long run. In the long run, the monetary policy instrument (SBI rate), output gap and exchange rate have significant influence on inflation rate under floating exchange rate regime. In the short-run, the speed of adjustment of exchange rate is higher and significant for corrected to its long run equilibrium.

Keywords: *inflation, transmition effect, cointegration, error correction model*

Introduction

Inflation is an important indicator to analyzing an economy, especially regarding its impact on aggregate macroeconomic variables, e.g.: economic growth, external balance, competitiveness, interest rate and even income distribution. Inflation also has a role in influencing the mobilization of funds through formal financial institutions. Price level is the opportunity cost for society holding financial assets. The higher the price level changes, the higher the opportunity cost for holding financial assets. This means people will feel fortunate to hold assets in the form of real financial assets as the price level remains high. If foreign financial assets is included as one of the asset, the difference in the level of inflation in home and foreign country may cause the home currency (rupiah, IDR) value against foreign currencies to be overvalued, and in turn competitiveness of (Indonesia) commodities.

Before Asian financial crisis attacked the Indonesian economy in 1998, Bank Indonesia as an institution in charge of stable level of inflation has been early formulating and implementing monetary policy to encourage low inflation, as well as to maintain and to manage exchange rate stability. However, in fact, achieving the goal to maintain exchange rate stability dominate over monetary policy goals, in contrary the achievement in monetary growth and inflation often becomes neglected. Moreover, with the increasing flow of incoming capital in the early 1990s, base money as monetary target can't be controlled. Along with the increasing pressure on the rupiah, on August 1997, Bank Indonesia liberated its interventions and floated rupiah.

In accordabce to the Law. 23/1999, Bank Indonesia focus its policy on the achievement of stability of rupiah value, by placing inflation as the basis of its monetary policy. Inflation targeting (IT) implicitly has been applied in Indonesia since the Bank Indonesia transparently announced the inflation target to the public in early 2000. Application of IT in Indonesia is based on some consideration (Alamsyah, et al., 2001). Firstly, as the system has left the exchange rate as a nominal anchor, a new alternative credible anchor is required. Secondly, the implementation of inflation targeting is a consequence of the independence of Bank Indonesia in running monetary policy that is focused on controlling inflation.

Strated in July 2005, Bank of Indonesia has implemented a new monetary policy framework consistent with the new Inflation Targeting Framework, including four fundamental elements, namely the usage of BI Rate interest rate as the operational objectives, anticipative process of monetary policy formulating, more transparent communication strategy, and strengthening policy coordination with the government. The steps are intended to increase the effectiveness and governance of monetary policy in achieving price stability as final goal in order to support sustainable economic growth and people prosperity.

This study is aimed to analysis the factors influencing inflation in Indonesia, which consists of domestic and external variables. Domestic variables consist of SBI interest rate and the output gap. While the external variables are exchange rates and US Consumer Price Index (CPI) to represent world inflation.

Review of Previous Research

Some previous researchs on inflation rate in Indonesia using pre-crisis data generally find that exchange rate movement is a significant determinant on inflation. A study conducted by Ahmed and Kapur (1990) analyzed the inflation effects of monetary policy using Ordinary Less Square estimation method. They found that inflation in Indonesia is only a part of a monetary phenomenon. Variables such as impor and rice price effect domestic inflation. They concluded that low money growth will reduce inflation on the other hand transmission of international inflation has a great effect in immidiate time.

The usage of cointegration techniques to describe the effect of strict exchange rate control policy on inflation has been applied by Siregar (1996). His hypothetis stated that the devaluation policy to stimulate export will bring consequences on inflation. He also shows that the changes in rupiah exchange rate effect inflation.

Research on the factors that affect inflation in Indonesia has also been done by McLeod (1997), who proposed the base maney targeting as the best option fot Bank Indonesia to control inflation. The reason is that monetary policy will be responded by inflation in medium term to long term through influence on supply of base money. Other conclusion is that the policy adopted by Bank Indonesia prior to the financial crisis in 1997 relating to the targeting of monetary base in the broad sense, such as M1 and M2 and bank credit is a wrong target, especially in the mid liberalisation of financial sector in the late 1980s, and tend to leave inflation problems.

Furthermore, research on the inflation rate in Indonesia with the model that covers monetary sector, labor sector and foreign sector has been done by Ramakrishnan and Vavakidis (2002). Using quarterly data 1980-2000, applying cointegration technique couldn't produce significant inflation determinants. The research concluded that the exchange rate and foreign inflation are major contributors of inflation in Indonesia with a large prediction power, while money base growth, although statistically significant, but has only a small effect on inflation.

Meanwhile, Judah Court et al. (2003) include indicator variables and a control variable vector that contains the information for inflation using cointegration technique and ECM. The research concluded that the exchange rate is the best indicators of inflation and provide in an immediate effect; quantity of money, such as currency money, base money, M1, and M2 still have high actual information to inflation, but the aggregat actual information monetary weakened as exchange rate included as control variables. Other finding sugested that interest rates variabels, especially PUAB (Inter-Bank Money Market) interest rate has better inflation information than quantity of money variables; and the output gap has very significant information with faster impact than monetary aggregat.

Research Method

Data and Its Source

This study uses monthly data from August 1997 to September 2005. Inflation data used is CPI changes (CPI_IND_R). Domestic variables included in the model consist of SBI interest rate variable (SBI_R) which is used as the only monetary policy variable. Real sector Variabel included was output gap (OG_R) to accommodate the interaction of supply and demand of goods and services. Output gap is obtained by reducing potential output by actual one. Potential output itself obtained using Hodrick-Prescott Filter method. GDP at constant price of 2002 (GDP_R) is also included to measure productivity. While external variables are exchange rate (ER_R) and change in U.S. CPI, which is a representative of foreign inflation. All variables are in percentage, where the variable CPI for Indonesia and the USA use 2002 as base year and GDP is calculated as annual change (yoy), except for the output gap is the percentage of output gap to the GDP.

Sources of the data are Bank Indonesia, Statistics Indonesia, CEIC database and the International Financial Statistics.

Data Analysis Techniques

In general, time-series economic data are often not stationer on the series level. If this happens, stationary condition can be achieved by make first differentiation of data or more differentiation[1]. When the data has been stationer at the series level, the data can be called as integrated of order zero or I (0). When the data stasioner at the first-difference the data is integrated of order one or I (1). Analysis technique with linier ordinary regression (OLS) can be used only when all the data is stasioner, both dependent and independent variables. However, when a data is not stasioner, the usage OLS techniques is imposed, a false regression can appear (spurious regression)[2].

Unit Root Test

Before applying regression analysis using time-series data, stasionerity test need to be performed to all variables to see whether these variables are stationer or not. The test was conducted with a unit root test, which

[1] See for example Pyndick and Rubinfield (1991) and Enders (1995).
[2] *Spurious regression* is indicated by high determination coeficien (R^2) and significant statistic value, but DW-statistic is too low and the result doesn't show any economic relation. See for example Enders (1995) and Greene (2000).

aims to determine whether the data contain unit root or not. If the variables contain unit root, it can be stated that the data is not stationer.

Determination of the integration order can be done by unit root test to find out how many times the differentiation should be made so that series are stationer. There are several methods of testing the unit root, two of which are currently widely used are the (Augmented) Dickey-Fuller and Phillips-Perron unit root test. Illustration unit root test using the Dickey-Fuller test is to follow the process of the first order autoregression AR (1), as follows[3]:

$$y_t = a_0 + a_1 y_{t-1} + \varepsilon_t \text{ .... } (1)$$

where a_0 and a_1 are parameters and ε_t is assumed white noise; y_t is a series that is stasioner if $-1 < a_1 < 1$. If $a_1 = 1$, then y_t is the series that is a non-stasioner (a random walk with drift). If the absolute value is greater than one, then the series y_t becomes explosive. To enable a stasioneritas series hypothetys, absolute values a_1 must be smaller than one. With subtract y_{t-1} on both sides of the equation above, it gains:

$$\Delta y_t = a_0 + \gamma y_{t-1} + \varepsilon_t \text{ .... } (2)$$

where $\gamma = a_1 - 1$. The equality above is a representation of first-order autrogressive (AR) process. Test for unit root using the Dickey-Fuller test is a test of the hypothetical $H_0 : \gamma = a_1 - 1 = 0$ and $H_1 : \gamma < 0$. Formulation of Dickey-Fuller model is as follows (Enders, 1995):

$$Y_t - Y_{t-1} = \Delta Y_t = \gamma Y_{t-1} + \varepsilon_t,$$

where $\gamma = a_1 - 1$ .... (3)

Value obtained from Dickey-Fuller test then is compared to the McKinnon critical table value at significance level of 1%, of 5% and of 10%. When t-statistic greater than t-table then H0 is rejected and that means data is stasioner. When H0 is received, the data is not stasioner.

Development of the Dickey Fuller test is Augmented Dickey-Fuller test (Maddala, 1992, and Enders, 1995), which is an extension of the Dickey-Fuller test with the higher-order autoregressive for the dependent

[3] See for example Pindyck and Rubinfeld (1991), Enders (1995) and Greene (2000).

variable. In this test, the information of lag long is required ti enable the autoregressive process so that it can accommodate the white noise residual. This allows the usage of the Dickey-Fuller test in the higher order. Suppose there is *p*-th order of the AR process is as follows:

$$\begin{aligned} y_t = {} & a_0 + a_1 y_{t-1} + a_2 y_{t-2} \\ & + a_3 y_{t-3} + \ldots\ldots + a_{p-2} y_{t-p+2} \\ & + a_{p-1} y_{t-p+1} + a_p y_{t-p} + \varepsilon_t \ldots\ldots\ldots\ldots (4) \end{aligned}$$

If series are correlated with higher order lag, white noise disturbance assumptions are contravened. The Augmented Dickey-Fuller (ADF) approach control the higher order correlation by adding lagged difference terms of the dependent variable *y* on the right side of the equation, so that:

$$\begin{aligned} \Delta y_t = {} & a_0 + \gamma y_{t-1} + \beta_1 \Delta y_{t-1} \\ & + \beta_2 \Delta y_{t-2} + \ldots\ldots + \beta_{p-1} \Delta y_{t-p+1} \\ & + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5) \end{aligned}$$

with $H_0 : \gamma = 0$ and $H_1 : \gamma < 0$, where ADF statistic value is compared with the MacKinnon critical value. If the value of t-statistics is less than the critical value, then we reject $H_0 : \gamma = 0$, which means that the series does not contain unit root or in other words is stasioner series.

Other unit root test approach is to use the Phillips-Perron unit root test, which is the development procedure of Dickey-Fuller that allows the assumption of the distribution of error presence. In Dickey-Fuller test it is assumed that errors are homogeneous and independent. While the Phillips-Perron unit root test accommodate the existence of errors that are dependent and heterogeneously distributed (heteroskedasity).

In the ADF test, we must determine the lag that is used so that errors in the use of lag will affect test results. Meanwhile, in the Phillips-Perron Unit Root Test, errors can be avoided because of the size of the lag has been determined based on the data range. In addition, the results of ADF test can provide bias results since it can not reject unit root. This is because the changes of data due to the the change of shock, such as the oil boom, financial deregulation, and intervention in monetary policy by central banks, where the shock can cause changes in the data permanently. In this case, the Phillips-Perron unit root test has a more appropriate level of test.

The Phillips-Perron unit root test approach proposes a nonparametric method to control the higher order serial correlation in a series. Test regression Phillips-Perron (PP) is a process AR (1) as follows:

$\Delta y_t = b_0 + \delta y_{t-1} + \varepsilon_t$ .... (6)

Berbeda dengan uji ADF yang mengoreksi korelasi serial orde yang lebih tinggi dengan menambahkan *lagged difference terms* pada sisi kanan persamaan, uji PP membuat suatu koreksi terhadap t-statistik koefisien γ dari regresi AR(1) untuk menghitung korelasi serial dalam ε. Koreksinya bersifat nonparametrik karena menggunakan suatu estimasi dalam spektrum ε pada frekuensi nol yang *robust* terhadap *heteroskedasticity* dan *autocorrelation* dari bentuk yang tidak diketahui. EViews menggunakan estimasi yang konsisten dengan *Newey-West heteroscedastricity autocorrelation* sebagai berikut:

Unlike the ADF test that makes correction of higher order serial correlation by adding lagged difference terms on the right side of the equation, PP test makes a correction to the t-statistics of γ coefficient from the regression AR (1) to calculate the correlation series in ε. The corrections are nonparametric since it uses estimation in the spectrum of ε at the robust zero frequency against heteroskedasticity and autocorrelation of unknown form. EViews estimates that use is consistent with Newey-West heteroscedastricity autocorrelation as follows:

$$\hat{\omega}^2 = \gamma_0 + 2\sum_{v=1}^{q}\left(1 - \frac{v}{q+1}\right)\gamma_j$$

where

$$\gamma_j = \left(\sum_{t=j+1}^{T} \hat{\varepsilon}_t \hat{\varepsilon}_{t-j}\right) / T$$

and *q* is *truncation lag. t-statistic* of PPP is counted as follows:

$$t_{pp} = \frac{\gamma_0^{1/2} t_b}{\hat{\omega}} - \frac{(\hat{\omega}^2 - \gamma_0) T s_b}{2\hat{\omega} s}$$

where t_b, s_b are *t-statistic* and *standard error* of β and s is *standard error* of regression test. Model used by Phillips-Perron in testing *unit root* is as follows (Enders, 1995):

$$Y_t - Y_{t-1} = \Delta Y_t = \gamma Y_{t-1} + \varepsilon_t \quad \text{............ (6)}$$

As the ADF test, PP test compares the value of PP t-statistics with the MacKinnon critical values with hypothetes $H_0 : \gamma = 0$ and $H_1 : \gamma < 0$, in which $\gamma = a_1 - 1$. t-statistics value resulted from Phillips-Perron unit root test is further compared with the MacKinnon critical value at significance level of 1%, of 5% and of 10%.

Data stasionerity test procedure is as follows:

1. The first step in testing the unit root test is to test at level series. If the unit root test results reject the hypothetical zero that unit root is exist, the series is stasioner at level or in other words integrated in series I (0).

2. If all variables are stationer, the estimation of the model used is with the OLS regression.

3. If in the test series against the hypothetical level of unit root for all series is received, then at the entire level the series are nonstationer.

4. The next step is to test the unit root of the first difference of series.

5. If the results reject the unit root hypothetical, it means that on the first difference level, the series has been already stationer, in other words all the series are integrated in order I (1), so that estimation can be done using the cointegration method.

6. If the unit root test on the series level indicates that the series is not all stasioner, then the whole series are derived to first-difference.

7. If the unit root test results on the first-difference reject hypothetis of unit root presence for the entire series, it means that the entire series on the first difference level are integrated in order I (0), so that the estimation with OLS regression method is applied on its first- difference level.

8. If the unit root test resulted receives the hypothetis of the unit root existence, then the next step is to make a differentiation of the series until it is stationer, or until the series are integrated in order I (d).

Cointegration

Cointegration method is used essentially to know the long-term equilibrium among the observed variables. Sometimes two variables that each is not stationer or follow the random walk pattern have a linear combination between the two which is stationer. In this case it can be said that these two variables are mutually integrated or cointegrated. Formal definition of cointegration is presented by Engle and Granger, which the formal analysis starts with the consideration of a set of long term economic variables as follows (Enders, 1995):

$$\beta_1 x_{1t} + \beta_2 x_{2t} + ... + \beta_n x_{nt} = 0 \text{ .... } (7)$$

If β is a vector of $(\beta_1, \beta_2, ..., \beta_n)$ and x is a vector of $(x_{1t}, x_{1t}, ..., x_{1t})'$, the system is in the long term equilibrium if $\beta x_t = 0$. Deviation from the long-term equilibrium is called the equilibrium error, e_t, so that:

$$e_t = \beta x_t \text{ .... } (8)$$

Components of vector $x_t = (x_{1t}, x_{2t}, ..., x_{nt})'$ is said to be cointegrated in order d, b that is notated as $x_t \sim CI(d, b)$, if[4]:

1. All components of x_t are integrated in order d.
2. There is a vector $\beta = (\beta_1, \beta_2, ..., \beta_n)$ that has a combination linier $\beta x_t = \beta_1 x_{1t} + \beta_2 x_{2t} + ... + \beta_n x_{nt}$ integrated in order (d, b), in which $b > 0$, so that vector β is said as *cointegrating vector*.

There are several important notes to be considered in cointegration definition:

1. Cointegration regarding linier combination of non-stationer variables.

[4] Enders (1995), p.358. See also Mills (1993) p.172.

2. All variables must be integrated on the same order. If there are two variables integrated in different order, then it's possible for the two variables to be cointegrated.

3. However, there is still possibility of the presence of a mixture of different series order when three or more series are noted. In this case, a set of series with a higher order could have been cointegrated in a lower order.

4. If x_t has n component, there is possibility of linierly independent $n-1$ cointegration vectors.

However, if the unit root test results indicate that not all variables are non-stationer, then cointegration technique can not be apllied because it requires all variables must be integrated on the same order.

Cointegration and Error Correction Model

As described above, conceptually cointegration is applied to find the long-term equilibrium of the variables observed. A special feature of the cointegrated variables is that its time path is influenced by the deviation from the long-term equilibrium. If a system has long-term equilibrium, the movement of its variables in the short term must be respond of the long-term disequilibrium. This means that the movements in short term should be influenced by the deviation from its long-term relationship. In the error correction model (ECM), short-term movements of these variables in the system are influenced by the deviation of equilibrium. Basically ECM consists of of an error-correction (EC) term, which ensures long-term relationship fulfilled. EC is obtained from residual of cointegration equation estimation.

As an illustration, take an example two variables y_t and z_t that are assumed to be integrated in order 1 and will be seen its relationship in a long-term. And if both y_t and z_t are $I(1)$, estimation of its long-term equilibrium relation is as following equation: $y_t = \beta_0 + \beta_1 z_t + e_t$

To find out the short-term equilibrium, that is, to know the variations of its equilibrium in long-term, an error correction model (ECM) is required.

Suppose ECM is as follows:

$$\Delta y_t = \alpha_1 + \alpha_y \hat{e}_{t-1} + \sum_{i=1} \alpha_{11}(i)\Delta y_{t-i} + \sum_{i=1} \alpha_{12}(i)\Delta z_{t-i} + \varepsilon_{yt}$$

$$\Delta z_t = \alpha_2 + \alpha_z \hat{e}_{t-1} + \sum_{i=1} \alpha_{21}(i)\Delta y_{t-i} + \sum_{i=1} \alpha_{22}(i)\Delta z_{t-i} + \varepsilon_{zt}$$

where $\hat{e}_{t-1}$ is the error-correction term which is the residual tolerance value of long-term relation estimation. While α_y and α_z is the speed of adjustment coefficient, and ε_{yt} and ε_{zt} is white-noise disturbances. Estimation of error correction equation above can be applied by ordinary least square (OLS) regression.

Research Model

In order to oversee the relationship between inflation and variables influencing it both domestic and international factors cointegration equation can be written as follows:

$$X_t = \alpha + \beta Y_t + \varphi Z_t + e_t \quad \ldots\ldots\ldots\ldots\ldots\ (1)$$

and in forming an error correction model with cointegration relationship among variables, and by adding the error correction term into model (1), it becomes:

$$\Delta X_t = \alpha(L)\,\Delta X_{t-1} + \beta(L)\,\Delta Y_{t-1} + \varphi(L)\,\Delta Z_{t-1} + EC_{t-1} + \varepsilon_t \ \ldots.\ (2)$$

where X is the percentage change in consumer prices and Y is the domestic variables, and Z is international variables that possibly influence inflation. EC is the error correction term when appear a cointegration relationship among variables included in the model.

The Discussion of Estimation Results

The test to oversee unit root for all variables included in the model indicates that all variables have unit root in level. The value of test is shown by the greater Phillips-Perron statistics than the critical value of the Mac Kinnon with 95 percent confidence level with insertion of trend and constant (Table 1). Thus it can be concluded that all variables are not stationer.

Table 1: Phillips-Perron *Unit root* Estimation Result at level

Variables	**Constant and *Trend***	**Constant**	**Without Constant and *Trend***
CPI_IND_R	-2.510508	-2.033814	-1.569099
SBI_R	-2.819570	-1.907822	-1.206758
OG_R_GDP	-3.249258*	-2.918508**	-2.733775***
GDP_R	-2.578255	-1.900540	-1.835674*
ER_R	-2.601587	-2.173876	-2.183679**
CPI_USA_R	-2.148739	-1.874509	-0.044527

Source: estimation result

Notes: *** significant with 99 percent confidence level
** significant with 95 percent confidence level
* significant with 90 percent confidence level

Table 2: Phillips-Perron *Unit root* Estimation Result at first-difference

Variables	**Constant and *Trend***	**Constant**	**Without Constant and *Trend***
D(CPI_IND_R)	-3.261341*	-3.266880**	-3.284218***
D(SBI_R)	-7.977201***	-7.992187***	-8.018719***
D(OG_R_GDP)	-7.038287***	-5.952018***	-5.968540***
D(GDP_R)	-4.208903***	-4.198963***	-4.214929***
D(ER_R)	-8.537725***	-8.582083***	-8.629736***
D(CPI_USA_R)	-7.977201***	-7.992187***	-8.018719***

Source: estimation result

Notes: D indicates first-difference
*** significant with 99 percent confidence level
** significant with 95 percent confidence level
* significant with 90 percent confidence level

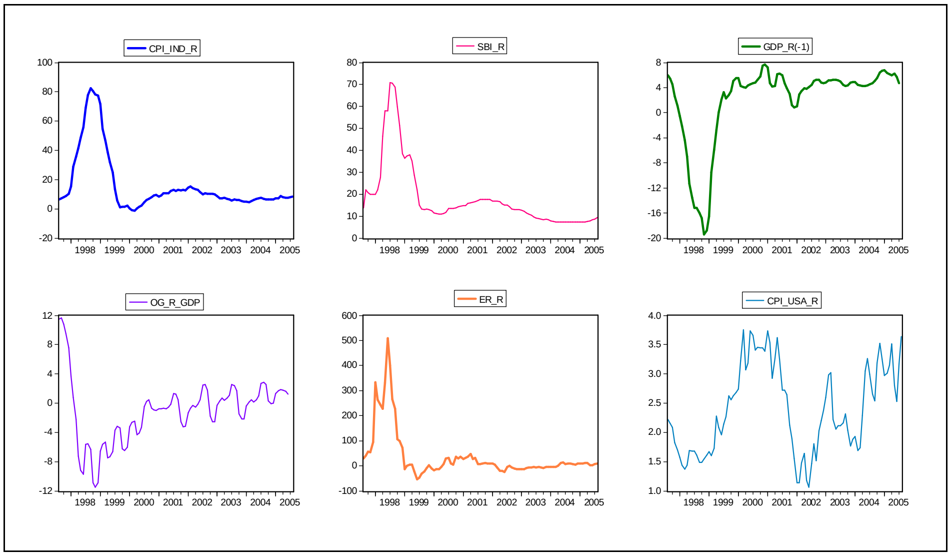

Figure 1: Plot of all variables included in the model

Next is the test to find the existence of cointegration among variables. The test indicates that using trace test, thee cointegrations are found at 5 percent and two cointegration equation at 1 percent, while the max-eigenvalue test indicates the presence of a cointegration equation both at 5 and 1 percent level. Cointegration test using lag interval (1 4), which both Akaike Information Criteria and Schwarz Criteria are the smallest. The existence of this cointegration is also supported by the plot between CPI_IND_R, SBI_R and ER_R which tend to be relatively in the same line (Figure 1).

Results of cointegration equation which is also inflation long-term inflation equation can be written as follows:

$$
\begin{aligned}
\text{CPI\_IND\_R} = {} & 0{,}598\ \text{SBI\_R} + 0{,}884\ \text{OG\_R\_GDP} \\
& \quad [3.36576] \qquad\qquad [4.76371] \\
& - 0{,}150\ \text{GDPR(-1)} + 0{,}107\ \text{ER\_R} \\
& \quad [\,-0.35404] \qquad\quad [3.08870] \\
& - 1{,}265\ \text{CPI\_USA\_R} + 5{,}545 \\
& \quad [\,-1.24001] \qquad\qquad\qquad (3)
\end{aligned}
$$

Note: Figures in parentheses show t-statistics value.

Based on the equation (3), in the long term, inflation is significantly influenced by monetary policy (in this case is the SBI interest rate), output gap and exchange rates. It should be noticed that SBI_R coefficients sign is positive, which means an increase in SBI interest rate will increase the rate of inflation. What should to be examined here is that Bank Indonesia will immediately raise SBI interest rates when inflation increases.

Output gap coefficients sign is positive which indicates that a 1% of GDP increase in the output gap will increase the inflation rate around 0.9%. Similarly if there is a 1% increase (depreciation) of rupiah exchange rate will increase the inflation rate around 0.11 percent. On the other hand, in the long term GDP variable coefficient and foreign inflation do not significantly affect inflation in Indonesia.

Equation (3) above also indicates that domestic variables, i.e. monetary (SBI rate) and real (output gap) variables have a very large role to influence inflation. The same case appears in the external variable, exchange rate, which affect inflation through increasing price of imported goods and services, from consumption goods, raw materials and capital goods.

The graphical evidence of equation (3) can be shown in Figure 2.

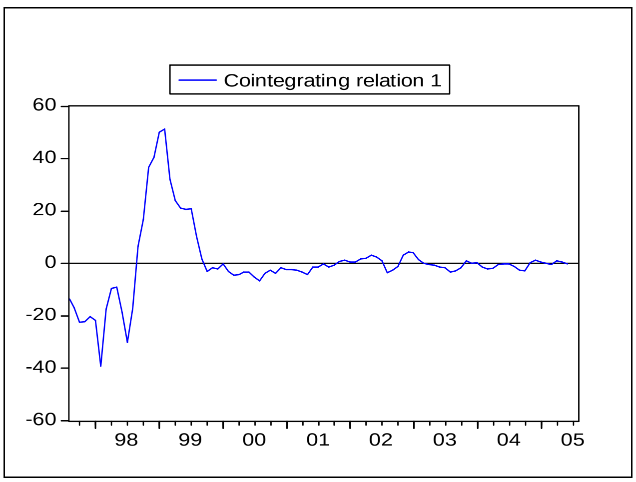

Figure 2: Inflation equation long-term relation

Table 3: *Speed of Adjustment* coeficients

Error Correction:	D(CPI_IND_R)	D(SBI_R)	D(OG_R_GDP)	D(GDP_R(-1))	D(ER_R)	D(CPI_USA_R)
CointEq1	-0.058133	-0.019502	0.037233	0.074689***	-4.456690***	-4.59E-05
	(0.03790)	(0.06272)	(0.02385)	(0.01579)	(0.88595)	(0.00870)

[-1.53376]	[-0.31094]	[1.56119]	[4.73059]	[-5.03041]	[-0.00528]

Notes: ( ) indicates standard error value, [ ] indicates statistic value

Analysis using cointegration method is a long-term analysis, while for the influence of short-term error correction model method is used. Error correction model estimation result is an error correction equation coefficient that indicates the speed of the variable to return to equilibrium from its deviation. There are only two significant error correction coefficients i.e. GDP and exchange rate (Table 3). As seen from the coefficient value, GDP is very small as 0.07 which means that it's too slow to return to its equilibrium. Meanwhile exchange rate coefficient is -4.46 which indicates that it's fast to return to its equilibrium.

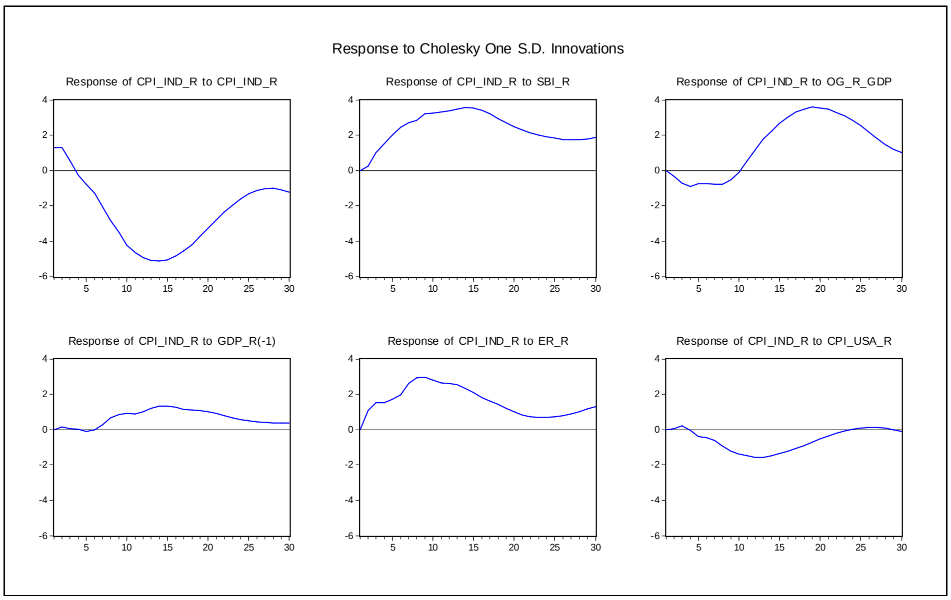

Figure 3: Inflation *impulse response* to other variables

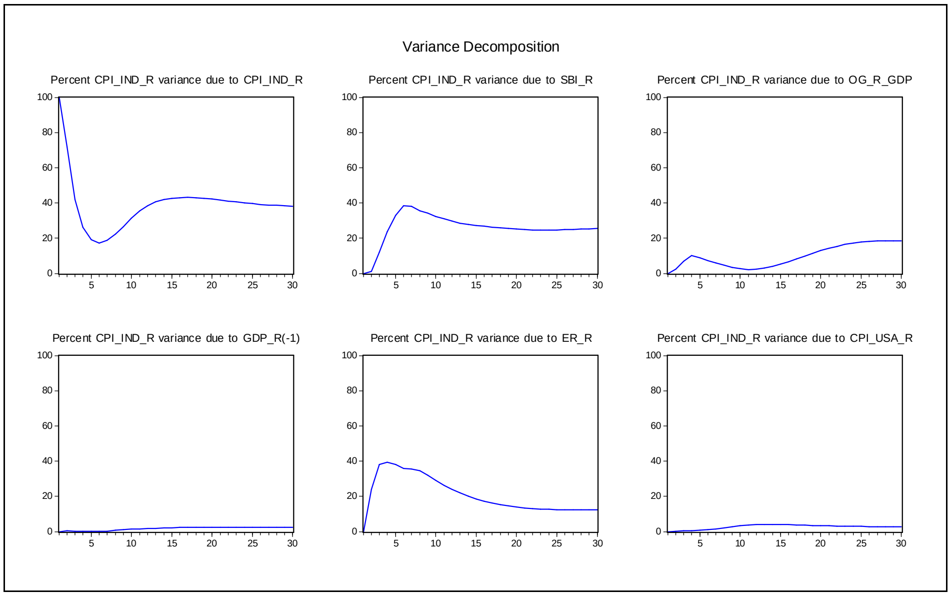

Figure 4: Inflation *variance decomposition* to other variables

In the short term, using error correction model, through the inflation impulse response to the other variables, it shows that the responses are different. The response of inflation to its shock will be responded by declining it to approximately one year period of time and then increasing it again (see Figure 3). While monetary policy shock that is the increase in SBI rate will be responded by increasing the rate of inflation until approximately 15 months. Similarity is found in the response of inflation to the shock of the output gap, GDP and exchange rates tend to increase the rate of inflation. Meanwhile the response of inflation to foreign inflation is negative.

By using the variance decomposition, it can be seen that in the short term in addition to itself, the rate of inflation in consecutive heavily influenced by SBI interest rate, exchange rate, output gap, inflation and foreign GDP (Figure 4). This indicates that monetary policy and exchange rate generally affect inflation.

Conclusion

This study is aimed to analysis of the factors that affect inflation both domestic variables such as the SBI rate, output gap, and productivity, and international variables such as exchange rates and foreign inflation. Using cointegration and error correction models, it shows some important findings i.e. that during the floating exchange rate period, in the long-term, monetary policy instrument (SBI interest rate), output gap and exchange rate have a significant effect on Indonesia inflation.

In the short term exchange rate adjustments is large enough and significant to return to the long-term equilibrium. By using the impulse response and variance decomposition it also shows that the SBI interest rate, exchange rate and output gap have a significant contribution in influencing inflation in Indonesia.

References

Agung, Judah, et al. (2003). "Identification of Variable Information In Inflation Targeting Framework." Bulletin of Monetary Economics and Banking, Bank Indonesia, in December.

Ahmed, S. and B.K. Lime. (1990). "How Indonesia's Monetary Policy Affects Key Variables." Working Bank Policy, Research, and External Affairs Working Paper, February.

Alamsyah, Halim, et al. (2001). "Toward Implementation of Inflation Targeting in Indonesia." Bulletin of Indonesian Economic Studies, December.

Awaluddin, Imam. (2004). "Real Exchange Rate of Rupiah Ekuilibrium Before and During a Crisis," Journal of Development Economics and Indonesia, the Ministry of Economic Sciences FEUI, Vol 4 No. 1, January.

Enders, Walter. (1995). Applied Econometrics Time Series. John Wiley & Sons, Inc., New York.

Greene, William H. (2000). Econometric Analysis. Fourth Edition, Prentice-Hall Inc., New Jersey.

Gujarati, Damodar N. (2003). Basic Econometrics. Third Edition, McGraw-Hill Book Co.., Singapore.

Maddala, G.S. and In-Moo Kim. (1998). Unit Roots, Cointegration, and Structural Change. Cambridge University Press, Cambridge.

McLeod, R. H. (1997). "Explaining Chronic Inflation in Indonesia." Journal of Development Studies, Vol. 33, No. 3, February.

Muelgini, Yoke, Imam Awaluddin and Nusyirwan. (2004). "Effect and Transmission Internsional Against Domestic Inflation in Indonesia," Papers Academic Annual Economic Seminar II, the cooperation between BI and FEUI, Jakarta.

Laksono, Yuliana Beta. (2005). "Identification of mechanisms of transmission line and Monetary Policy Effectiveness in Meeting the Inflation Level Support Regional Economic Growth", Disertasi Graduate Economic Sciences FEUI, not published.

Pindyck, Robert S. and Daniel L. Rubinfeld. (1991). Econometric Models and Economic Forecasts. Third Edition, McGraw-Hill Inc., Singapore.

Ramakrishnan, Uma and Athanasios Vamvakidis. (2002). "Forecasting Inflation in Indonesia". IMF Working Paper, WP/02/111.

Siregar, R.Y. (1996). "Real Exchange Rate and Inflation Targeting in India: Theory and Empirical Evidence." Pacific Basin Working Paper Series, Federal Reserve Bank of San Francisco, no. PB96-07.