BADAN PENDIDIKAN DAN PELATIHAN KEUANGAN KEMENTERIAN KEUANGAN REPUBLIK INDONESIA

# **JURNAL BPPK**



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INFO ARTIKEL	ABSTRAK
SEJARAH ARTIKEL	The paper examines the interaction of fiscal and monetary policy and the effectiveness of
Diterima Pertama	Inflation Targeting Framework (ITF) using Vector Autoregression (VAR) method in Indonesia
15 September 2015	from 2000 to 2013. The study uses model that is estimated from the Nordhaus approach and the secondary data obtained from Federal Reserve St. Lois (FRED) and CEIC. The study shows the
Dinyatakan Dapat Dimuat	absence of fiscal dominance in Indonesia and the ITF is moderately effective in achieving targeted
23 Desember 2015	inflation rate. Tightening monetary policy by Bank Indonesia is able to affect almost 30 per cent
	the change in inflation variability after two year. Expansionary fiscal policy is only able to reduce
KATA KUNCI:	the unemployment in a very short term, which will potentially lead to inflation. The results
Fiscal Theory of Price Level,	suggest that in a short term the coordination of fiscal and monetary policy is needed and effective
Vector Autoregression	to achieve lower unemployment and minimize the gap between the targeted and actual inflation.
	studi ini menenti interaksi antara kebijakan fiskal dan kebijakan moneter di indonesia sejak tahun 2000 s.d 2013, serta keefektifan <i>Inflation Targeting Framework</i> (ITF) dengan menggunakan metode <i>Vector Autoregression</i> (VAR). Studi ini menggunakan model yang disusun oleh Nordhaus (1994) dan menggunakan data sekunder dari Federal Reserve St. Lois (FRED) dan CEIC. Hasil studi menunjukkan tidak adanya dominasi kebijakan fiskal di Indonesia and ITF berjalan dengan efektif dalam mencapai target inflasi. Kebijakan moneter yang kontraktif dari Bank Indonesia mampu mempengaruhi hampir 30 persen dari perubahan variasi inflasi setelah dua tahun. Di lain sisi, kebijakan fiskal ekspansif hanya mampu mengurangi pengangguran pada jangka pendek, yang akhirnya berpotensi meningkatkan inflasi. Hasil ini menunjukkan bahwa dalam jangka pendek koordinasi antara otoritas fiskal dan otoritas moneter di Indonesia diperlukan sebab koordinasi ini cukup efektif untuk menurunkan tingkat pengangguran dan meminimalkan gap antara target inflasi dan inflasi aktual.

## **1. INTRODUCTION**

Developing countries have adopted the Inflation Targeting Framework (ITF) in their monetary policy over the last decade. This framework was also formally adopted by Indonesia in 2000 by the implementation of Law No. 23 Year 1999 replacing the previous monetary policy that used base money as the monetary policy target. The ITF is a monetary policy framework which aims to create price level stabilization. Using this framework, Bank Indonesia, the central bank of Indonesia, announced to the public in the commencement of fiscal year a government-set inflation target and used interest rate as monetary policy instrument to achieve this target. Masson (1997) suggests that the success of the ITF is in the absence of fiscal dominance on monetary policy which means that central bank independence is an important factor for the ITF success.

However, central bank independence is not enough to assess the effectiveness of monetary policy. Leith and Wren-Lewis (2000) argue that monetary and fiscal policy has an influence on the price level separately which called the Fiscal Theory of the Price Level (FTPL). FTPL describes the interaction of fiscal policy and monetary policy and the theory states that when fiscal policy makers do not meet the intertemporal budget constraints, the fiscal policy has more influence on the price level. Monetary policy can only control the price stabilization if the Ricardian Equivalence is met. The basic FTPL model explains the role of short-term fiscal policy as a stabilization which is consistent with an active monetary policy. However, whether fiscal policy is active or passive is irrelevant. Thus, the combination of stabilization and solvency becomes credible.

The interaction of fiscal and monetary policy has long been a debate among economists and policy makers. On the one hand, monetary policy aims to maintain price level stability, while on the other hand fiscal policy aims to achieve higher economic growth to obtain high employment. The main problem of the interaction of fiscal and monetary policy lies in the short term trade-off between the achievement of price stability and economic growth. Hence, it is necessary to understand the linkage between these two policies to know the effectiveness of both to achieve price stabilization.

This paper will contribute to the understanding of how fiscal policy and monetary policy interact and measure the effectiveness of inflation targeting framework particularly in Indonesia. This issue is important especially in growing needs for good policy mix to achieve stabilization in economics. VAR analysis will be used in order to examine the interaction of fiscal and monetary policy in Indonesia for the period 200001 to 201304. This time period is chosen because it is the period whereas ITF implemented as the central bank objective. The hypothesis is that the ITF policy by the monetary authority is able to give a strong influence Indonesia's fiscal authority. Therefore, the fiscal dominance that Indonesia showed prior to the ITF based on a research by Firman (2003) will be much weaker or gone after more than a decade of ITF's implementation.

This paper examines the interaction of fiscal policy and monetary policy in Indonesia during the period 2000-2013, using Vector Autoregression (VAR) analysis to assess the effectiveness of the policy mix. There will be four variables that applied in the VAR system. Unemployment or output gap and inflation are two variables which represented macroeconomics goals of the both policies while fiscal policy and monetary policy instrument will be represented by the government expenditure and interest rate. Unit root test will be used to test the stationary of the data. Granger Causality test will be used to sequence the ordering of the variable in the VAR model.

The results indicate that the ITF implemented by Indonesia is moderately effective. Tightening monetary policy by Bank Indonesia is able to affect almost 30 per cent of the change in inflation variability after two year. Expansionary fiscal policy is only able to reduce the unemployment in a very short term, which will potentially lead to inflation. The evidence shows that the hypothesis is confirmed. There is no fiscal dominance in Indonesia, as policy rate moves independently apart the changes in fiscal policy. Furthermore, the results show that coordination between fiscal and monetary authority in Indonesia is needed and effective to achieve lower unemployment and targeted inflation in a short term.

The paper proceeds as follows: section two describes the literature review, section three explains the VAR model of fiscal and monetary policy interaction, section four discusses the results and the final section presents the conclusion.

## 2. LITERATURE REVIEW

Since the global financial crisis, the need for a better understanding of how fiscal and monetary policies interact is important. Interaction between fiscal policy and monetary policy in developing countries has been examined in several papers. However, empirical research on this area has provided mixed results because fiscal and monetary policies interact in many ways, both nationally and internationally.

Research on fiscal and monetary policy interactions can be divided into three aspects. The first focuses on the effect of interaction using a gametheoretical approach, for example, Tabellini (1986). The second analyzed the interactions using sophisticated macroeconomic models and has attempted to derive optimal monetary and fiscal policy strategies, for example, Woodford (2003). Finally, the last aspect of literature is more data-driven by using econometric techniques, Vector Auto Regression (VAR), by investigating the impact of policy interactions on the transmission mechanism, such as Zoli (2005) and Andlib et al (2012). This paper will focus on the last aspect by employing VAR approach in examining the data of the policy instruments and objectives.

Previous research such as Zoli (2005) argues that there was fiscal dominance in Brazil and Argentina while Agha and Khan (2006) found inflation to be a fiscal phenomenon by showing that fiscal policy significantly influences the conduct of monetary policy in Pakistan. However, Andlib et al (2012), using VAR model for the period 1980 to 2011 in Pakistan, found different result that the two policies have been executed independently in Pakistan, but the coordination between them was weak. In the case of six South Asian countries, Hasan and Isgut (2009) found that fiscal policy responded to economic slowdown promptly during the period 1980 to 2008, while the response of monetary policy was mixed. These empirical studies are country-based and use a standard Vector Auto Regression (VAR) methodology. Therefore, to provide a consistent examination on Indonesia as one of the developing countries, this paper will also use VAR to examine the transmission of fiscal and monetary policy mix on the available data.

In line with the general equilibrium theory, everything depends on everything else. Therefore, the question that arises is how to examine the relationships between different time series in the data. In principle, this question can be answered in two different ways. First, by conducting a bottom up strategy where the assumption is the data generating processes of the different time series are independent of each other. This approach is called Granger Causality test follows Clive W.J. Granger (1969) and usually employed when causality tests are performed. The second way is a top down strategy which assumes that the generating processes are not independent and asks whether some specific time series are generated independently of the other time series considered. This approach is called the Vector Auto Regressive processes following the paper by Christopher A. Sims (1980). Both approaches are employed to investigate the causal relationships which potentially exist between different time series (Kirchgassner, 2007).

Vector Autoregressive Systems (VAR) is an alternative to the traditional simultaneous equations system approach. Starting from the autoregressive

Variables	Constant		<b>Constant and Trend</b>		None	
	t-Statistic	Prob.*	t-Statistic	Prob.*	t-Statistic	Prob.*
IR	-2.41294	0.1432	-3.54103	0.0454	-1.10082	0.2425
LCPI (INF)	-1.99979	0.2862	-1.33321	0.8690	8.827781	1.0000
LGOV	-0.99578	0.7488	-2.30042	0.4266	5.513531	1.0000
LGDPGAP	-1.35134	0.5993	-1.26014	0.8873	-1.36292	0.1585

Table 1 Stationarity Test Summary

representation of weakly stationary processes, all included variables are assumed to be jointly endogenous. Thus, in a VAR of order p (VAR(p)), each component of the vector X depends linearly on its own lagged values up to p periods as well as on the lagged values of all other variables up to order p. Therefore, the starting point of this research is the reduced form of the econometric model that will be described furthermore in the next section.

## 3. MODEL AND DATA

The study uses the approach developed by Nordhaus (1994) to empirically examine fiscal and monetary policy interaction in Indonesia for the period 2000 - 2014. This approach employs the unrestricted VAR model as the analysis tool. Four variables are examine in this study; two macroeconomic variables, unemployment rate which is represented by the output gap (GAP) and inflation (CPI) and, two policy variables are interest rate (IR) and government spending (GOV) which describe the monetary and fiscal policy instruments. In the case of Indonesia the authority for fiscal policy is the Ministry of Finance and for monetary policy the Central Bank.

The theoretical framework for the VAR model is derived from the objectives of monetary and fiscal authorities which is inflation and the output gap (Nordhaus, 1994). The Central Bank and Ministry of Finance have different utility preferences. The Central Bank is more concerned with price stabilization and has no preference for government spending. On the other hand, the Ministry of Finance is more concerned with the low unemployment rate and achieving higher economic growth even at the cost of high inflation. Neither of the two authorities has specific preferred level of interest rate. In this study, monetary policy instrument is represented by interest rate and fiscal To employ the Nordhaus (1994) approach in VAR analysis, the first step is to examine the utility functions of the two authorities, given below:

$$U^{M} = U^{M}(GAP, INF)$$
(1)  

$$U^{F} = U^{F}(GAP, INF, GOV)$$
(2)

 $U^{M}$  and  $U^{F}$  are the utility functions for the Central Bank and the Ministry of Finance, respectively. Unemployment and inflation are indicated by output gap (GAP) and CPI. Output gap measures the gap of the actual and the potential utilization of resources in the economy.

$$U = GAP(IR, GOV) \tag{3}$$

Equation (3) uses output gap to indicate the unemployment rate which is the function of the interest rate and government spending (Nordhaus, 1994). Inflation is assumed to be a function of output gap and the expected rate of inflation is:

$$INF = INF(GAP) + INF^{e}$$
(4)

Expected inflation  $(INF^e)$  depends on a historical component  $(INF^B)$  and actual inflation rate (INF) in the economy, given by equation (5):

$$INF^{e} = \theta INF + (1 - \theta)INF^{B}$$
(5)

By combining equation (4) and (5), we get:

$$INF = \frac{INF(GAP)}{(1-\theta)} + INF^B ; 0 \le \theta < 1$$
(6)

Variables	Constant		<b>Constant &amp; Trend</b>		None	
	t-Statistic	Prob.*	t-Statistic	Prob.*	t-Statistic	Prob.*
DIR	-4.50374	0.0007	-4.58497	0.0031	-4.46908	0.0000
DLCPI	-6.64268	0.0000	-7.07152	0.0000	-2.04226	0.0404
DLGOV	-8.49072	0.0000	-8.48542	0.0000	-1.81135	0.0670
DLGDPGAP	-7.29329	0.0000	-8.83376	0.0000	-7.35513	0.0000

Table 2 Stationarity Test Summary for First Difference

instrument is represented by government spending.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	302.3855	NA	2.73e-11	-12.97328	-12.81427	-12.91372
1	367.0235	115.2243	3.30e-12	-15.08798	-14.29292*	-14.79015
2	390.7918	38.23589	2.40e-12	-15.42573	-13.99462	-14.88963
3	412.4857	31.12603*	1.95e-12*	-15.67329	-13.60613	-14.89892*
4	430.2443	22.39131	1.97e-12	-15.74975	-13.04654	-14.73711
5	439.6115	10.18176	3.03e-12	-15.46137	-12.12211	-14.21046
6	450.2822	9.742823	4.83e-12	-15.22966	-11.25436	-13.74049
7	475.1104	18.35124	4.76e-12	-15.61350	-11.00214	-13.88605
8	506.1061	17.51932	4.45e-12	-16.26548*	-11.01808	-14.29977

Table 3 VAR Lag Order Information Criteria

Endogenous variables: DLGAP DLCPI DLGOV IR

Sample: 2000Q1 2013Q4

Included observations: 46

If the assumption is  $\theta = 1$ , then inflation will not depend on historical price behavior and unemployment rate is always at the natural rate of unemployment, that is:

$$Inflation = Inflation(Unemployment^{N})$$
(7)

Combining the terms from equation (1) to (5), the utility function for both authorities is:

$$U^{M} = U^{M} \{ GAP(IR, GOV), \frac{INF(GAP)}{(1-\theta)} + INF^{B} \}$$
$$U^{F} = U^{F} \{ GAP(IR, GOV), \frac{INF(GAP)}{(1-\theta)} + INF^{B} \}$$

This utility function shows that monetary and fiscal policies are subject to unemployment, inflation and government spending. A VAR analysis is used to examine the interaction between these two policies. The unrestricted VAR model will have the structure as below:

$$\begin{split} GAP_t &= \Sigma \{ a_{11\eta} GAP_{t-\eta} + a_{12\eta} INF_{t-\eta} + a_{13\eta} GOV_{t-\eta} + a_{14\eta} IR_{t-\eta} \} + \varepsilon_{1t} \\ INF_t &= \Sigma \{ a_{21\eta} GAP_{t-\eta} + a_{22\eta} INF_{t-\eta} + a_{23\eta} GOV_{t-\eta} + a_{24\eta} IR_{t-\eta} \} + \varepsilon_{1t} \\ Gov_t &= \Sigma \{ a_{31\eta} GAP_{t-\eta} + a_{32\eta} INF_{t-\eta} + a_{33\eta} GOV_{t-\eta} + a_{34\eta} IR_{t-\eta} \} + \varepsilon_{1t} \\ IR_t &= \Sigma \{ a_{41\eta} GAP_{t-\eta} + a_{42\eta} INF_{t-\eta} + a_{43\eta} GOV_{t-\eta} + a_{44\eta} IR_{t-\eta} \} + \varepsilon_{1t} \end{split}$$

## 3.1. Data

This study uses secondary data with quarterly time series observations from 2000Q1 to 2013Q4. This period is chosen because it is after the Asian Financial Crisis and the implementation of Law No 23 year 1999 about the independence of the Central bank. Variables used are the interest rate (IR) as the monetary policy instrument, government spending (GOV) as the fiscal policy instrument, the consumer price index as a proxy for inflation (CPI) and output gap (GAP). The data are already seasonally adjusted and obtained from Federal Reserve St. Lois (FRED) and CEIC. The selection of the optimum lag is based on the information criteria. Impulse response and variance decomposition were used to examine the response to the policy shocks to the different variables.

Before conducting the VAR analysis, the four variables are in logarithm value to standardize the distribution. Then, Output Gap (LGAP), inflation (CPI),

government spending (LGOV) and interest rate (IR), were tested for their stationary properties using unit root (Augmented Dicky Fuller) test. Table 1 contains the results of the unit root test, it show that the data used is not stationary so that it should be modified to the first difference.

Table 2 contains the results of the unit root test on the first difference. From table 2 the degree of integration of the test results on the first level of differentiation is seen that the variables used in general has been stationary at  $\alpha = 1\%$ . So it can be explained that all the variables in this study have been stationary at the same degree.

## 3.2. Lag length selection

Optimal lag length determination is important to get the right VAR model to be estimated. In this study the amount of lag in the VAR model is determined on the information criteria recommended by the Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn (HQ). Hatemi and Hacker (2009) suggest that combining the LR test with the SC and HQ will give better success rate of choosing the optimal lag order compared to cases when only SC or HQ are used. However, table 3 shows SC and HQ choose a different optimal lag therefore LR will decide the optimal lag. The test results show that the most appropriate lag is lag 3 model.

## 4. RESULTS

The ordering of the variables in the VAR was based on Granger causality tests given in Table 3 (appendix). The variable least influenced by other variables was ordered first while the variable most influenced by other variables was placed at the last. Table 3 shows that the order of the VAR should be Output Gap, Inflation, Government Expenditure and Interest Rate.



Figure 2 Response to Inflation Shock

Furthermore, the analysis of the system will be driven from the impulse response function since the cumulative impulse response function describes the effects of a permanent shock on the system.

#### 4.1 Output Shock

Figure 1 shows the responses of the variables to the shock in the unemployment. Shock in the output gap converges back to its long run path after second quarter. The positive shock to output gap leads to fall in the inflation. Monetary policy reacts to the increase in the unemployment by decreasing the interest rate gradually in a counter-cyclical manner. Fiscal policy response, on the other hand, remains largely procyclical. Government expenditure increases, before converging back in about two years. This pro-cyclical behavior does not indicate an increase in tax revenue of the government of Indonesia during the upswing of the business cycle, rather it shows the general behavior of the government in developing countries to spend even more during decline of the business cycle (Ilzetzki & Vegh, 2008). The variance decomposition (appendix) confirmed this analysis. Variance decomposition shows that shock to output gap accounts for almost 9 per cent of the total variation in gross government expenditure. It accounts for about 8 per cent of the total changes in inflation while it only accounts for 1 per cent of the total changes in the policy rate.

#### Figure 3 Response to Fiscal Shock



#### 4.2 Inflation Shock

The negative impact of inflation shock on unemployment last several quarters, though the statistical significance is weak. The response of inflation to its own shock will converge back to its equilibrium in about five quarters. The response of fiscal policy is again pro-cyclical as it decrease by the second quarter and increase in the third quarter before converging back by the eight quarter. The increase in government expenditure due to inflation is caused by increasing price rather than increasing in tax revenue. Variance decomposition shows the shock to inflation explains about 11 per cent total variation in government spending. The variance decomposition analysis also shows that inflation accounts for highest percentage of the total variation in policy rate. It suggests the response of the Central Bank to implement tightening monetary policy to the rise in inflation.

#### 4.3 Fiscal Shock

Expansionary fiscal policy or a positive shock to government spending takes about two years to converge back to its long run equilibrium path. Figure 3 shows that expansionary fiscal policy may lead to decline in the level of unemployment in the second quarter. However, the positive impact remains only for a short term, as impulse response shows it only happens until the second quarter and by the third quarter the impact declining and back to its original equilibrium thereafter. This implies the short run



effectiveness of fiscal policy to Indonesia's economy that only last for less than a year.

Furthermore, The variance decomposition analysis shows that shock to gross fiscal deficit explains about 1 per cent and 3 percent of the total variation in output gap and policy rate, while explaining around 12 per cent of the total variation in inflation. This analysis shows that rising government expenditure may cause inflation in short term.



## Figure 4 Response to Interest Rate Shock

#### 4.4 Interest Rate Shock

Figure 4 shows that increase in policy rate or tightening monetary policy may lead to decline in output below its potential level, reflecting negative impact on aggregate demand. Increase in policy rate may also leads to some fiscal expansion in the short term, which could follow from rise in borrowing cost of the Government and the fall in the level of output, before it converges back after two years. The variance decomposition analysis shows that shock to policy rate accounts for about 28 per cent of the total variation in inflation by the tenth period, suggesting a significant impact of monetary policy on inflation. Policy rate accounts for 16 per cent of the total variation in output gap suggesting that monetary policy supports in achieving the potential output.

#### 5. CONCLUSION

In conclusion, the study shows that the fiscal and monetary policy is balancing to each other in Indonesia. The study suggests that expansionary fiscal policy is effective in raising the level of output to the potential level only in the short run. However, in longer term fiscal expansion leads to economic slowdown. This means that the effectiveness of raising the government consumption in one year may help to stimulate the economy but the government need more than that to achieve stabilization in the long term. The impulse response functions showed that monetary policy is highly sensitive to shocks in inflation and it responds in a counter-cyclical manner. On the other hand, fiscal policy indicates a pro-cyclical movement to inflation



and unemployment, which perhaps explains as to why monetary policy responds strongly than otherwise it would have.

Fiscal policy is an important determinant of economic developments and, as such, it affects monetary policy through several channels. Some fiscal measures such as increasing the government consumption have a direct effect on inflation. Other fiscal measures have indirect effects on inflation through their impact on aggregate demand. Furthermore, fiscal policy influences other economic variables that are important in monetary policy transmission, notably interest rates, interest rate spreads and exchange rates (Nasir, 2011). In the extreme case known as fiscal dominance, monetary policy might even become subordinate to fiscal policy. One policy implication of these findings is the need of continuity in policy coordination between Bank Indonesia as the monetary authority and the Ministry of Finance as the fiscal authority. This institutional coordination can avoid fiscal dominance and helps to ensure the economic stability of a country.

The limitation in this paper is the study only employed government expenditure as fiscal instrument. Future research could employ other policy variables such as fiscal deficit, tax revenue as fiscal instruments and use producer price index rather than consumer price index to analyze of price stabilization in the supply side. FISCAL AND MONETARY POLICY INTERACTION IN INDONESIA: A VAR ANALYSIS FROM 2000 TO 2013 Eko Sumando

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