Peer-reviewed and Open access journal **BEH - Business and Economic Horizons**
ISSN: 1804-5006 | www.academicpublishingplatforms.com Volume 14 | Issue 3 | 2018 | pp.674-688
The primary version of the journal is the on-line version DOI: http://dx.doi.org/10.15208/beh.2018.47

Inflationary effects of fiscal and monetary policies in Indonesia

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Abstract: This paper analyzes the effects of fiscal and monetary policies on inflation rate in Indonesia. This research uses the error correction model for estimating the empirical model of inflation rate for annual data 1970-2017. The results present the significant effects of fiscal and monetary variables on the inflation rate. These findings reveal the inflationary effects of fiscal and monetary policies in the country. This research also finds the impact of output and exchange rate on inflation rate. Therefore, this paper supports the theory of demand-pull inflation as well as the proposition of imported inflation. The other uniqueness of this research is the inclusion of shock variables in the empirical model. This study asserts the significant role of inflation shock and unanticipated exchange rate on the domestic price level. It implies that domestic inflation is closely related to the international financial sector.

JEL Classifications: C53, E62, E63

Keywords: Inflation, fiscal, monetary, shock, exchange rate
Citation: Sriyana, J. (2018). Inflationary effects of fiscal and monetary policies in Indonesia. *Business and Economic Horizons, 14*(3), 674-688. http://dx.doi.org/10.15208/beh.2018.47

1. Introduction

Since its independence in 1945, Indonesia has experienced some phases of price instability. The hyperinflation occurred in 1950-1960s causing a serious political and economic crisis. This phenomenon was suspected as a consequence of not only the emerge of political instability but also as an impact of the failure of fiscal and monetary policy (Hossain, 2005). Then, following political and economic reform in the 1970s, it brought the inflation rate down to a single digit and made the economy more stable.
In the early of five years periodical development plan in 1970, Indonesia was remarkable as a successful country in stabilizing the economy. Not only stabilized the price level, but Indonesia also recorded positive economic growth in this period. The central government has successfully controlled the price change for about five decades except in the financial crises in 1998 which caused inflation rate about 60 percent this year. Starting in the 2000s, the average of inflation rate is less than 10 percent per annum for one decade. However, this inflation rate is more than target which is around 7-8 percent per annum.

The emergence of the global financial crisis in 2008 has affected Indonesia's economic stabilization until the early of the 2010s. As a result, the inflation rate was about 10 percent average for one decade which caused some challenges of monetary and fiscal policies. To response the phenomena, the government devised some various fiscal stimulus to reduce inflation rate. Theoretically, the expansive fiscal policy has positive effects on inflation and other macroeconomic variables (Auerbach, Gale, & Harris, 2010). Therefore, fiscal consolidation program regarding inflation targeting should minimize the impact of its possible contradictory. For example, government spending potentially

increases price expectations of economic agents in high inflation. In this situation, fiscal policy effectiveness which depends on the government's policy and credibility is a key factor in price stabilization.

Following the global crisis, Indonesia has applied a package of the fiscal stimulus policies that gradually recovered the economy. However, the inflation rate in the period of 2008-2010 was still higher than the target. Therefore, it remains some challenges the fiscal policy effectiveness on reducing inflation. Some previous research has emphasized that the fiscal policy credibility is one of the most important of macroeconomic policies (Raji, Juzhar, & Jantan, 2014; Nguyen, 2015). According to economic stabilization policy, the government's budget plan which contains some fiscal policy instruments such as tax revenue, government spending, and budget deficit should accommodate the dynamic of the economic situation.

Attention to prices stability is not only a fiscal policy concern itself. Moreover, the phenomena of high inflation in a country strongly relates to monetary sector dynamics. Theoretically, monetary variables changes such as money supply as well as other monetary variables cause inflation rate. Monetary policy plays an important role in the macroeconomic stabilization, especially in controlling price level. As was stated in some papers, increase in money supply as one of most important monetary sector indicator will raise prices level (Kandil, 2005; Nguyen, 2015; Raji et al., 2014). Other monetary variables such as interest rate and the exchange rate may also affect the inflation rate in the long run perspective.

Some papers mention that key factors regarding this price control in Indonesia are the practice of prudential and harmonization of fiscal and monetary policies (Hossain, 2005; Thanh, 2015; Tirtosuharto & Adiwilaga, 2013). Such varied Indonesia's experiences in price stabilization for a long period may be useful for other countries especially relating to fiscal and monetary policy strategies. Not all these policies have successfully reduced inflation rate for a long period. Some stages of enhancement of fiscal and monetary indicators associated with the inflation rate.

This paper attempts to analyze the inflationary effects of fiscal and monetary variables on inflation rate in the case of Indonesia. The rest of the paper is as follows. The next section presents the literature review as well as the related previous studies. Then, we present a methodology which contains model specification and econometric estimation. The proceeding section provides the empirical findings and discussion. The last section presents the conclusion of this research.

2. Related literature

The issues of fiscal and monetary policy credibility regarding macroeconomic stabilization have attracted attention in recent years. Many papers have examined the role of fiscal and monetary policy on price stabilization as well as economic growth. However, the results of these studies are mixed and contradictory. Some papers confirm a strong relationship between money supply and the inflation rate for various countries (Bozkurt, 2014; Gali, 2010; Gupta & Uwilingiye, 2008; Hossain, 2005; Nikolaos & Constantinos, 2013; Raji et al., 2014). Meanwhile, few papers find the significant effects of fiscal variables, especially budget deficit and government spending on inflation (Bukhari & Yusof, 2014; Fakher, 2016; Khundrakpam, 2010). Moreover, other papers investigate the existence of imported inflation and the impact of openness variables on price changes (Berument & Doan, 2003; Duncan & Martínez-García, 2015; Hamilton, 2012).

Some previous studies highlight that price stabilization depends on in various factors. These factors include monetary variables, fiscal variables, and other macroeconomic variables as well as the international environment (Naz, Mohsin, & Zaman, 2012; Bhattacharya, 2014; Ghosh, 2014). Monetary variables consist of narrow, broad money, and interest rate. The main variables of fiscal policies are government spending, tax ratio, and budget deficit. Moreover, other macroeconomic variables that may affect inflation rate are real output, wage rate, and expectations. International economic indicators such as exchanges rate, international trade, and world price are also important factors in determining inflation in the country (Ghosh, 2014).

Hossain (2005) analyzed the inflationary process in Indonesia for the period of 1952-2002. Using the procedure of cointegration and error correction model, he found a cointegrating relationship between price and narrow money or broad money. Specifically, this research reveals a long-run causal relationship between money supply and inflation. The empirical results are stable for several sub-samples when the model uses the narrow money. Moreover, this paper also involves exchange rate within the long run dynamic relationship model. Hossain (2010) also examined the impact of money demand on inflation in Bangladesh using annual data of 1973-2008. Based on cointegration and the error correction approach, he also found the existence of a causal relationship between money and inflation.

The effects of budget deficit on inflation are deeply discussed in the public policy literature as well as in public economic field. Lin & Chu (2013) examined the relationship between budget deficit and inflation in 91 countries for the period of 1960-2006. The study uses autoregressive distributed-lag model, and it found a strong impact of deficits on inflation at various inflation levels. The paper also notes that the fiscal deficit affects inflation rate stronger in high-inflation phases than those in low-inflation periods. Moreover, this study reports the existence of dynamic adjustment of inflation rate for the limited period. Another research conducted by Nguyen (2015) also highlights that budget deficits and inflation has a strong relationship in selected Asian countries. The impact of fiscal policy which is represented by fiscal deficit is the key determinant of inflation in India (Mohanty & John, 2015). The paper also mentions the role of a shock variable in the inflation rate. A recent study presented by Fakher (2017) also emphasizes that budget deficit and exchange rate are main determinants of inflation in selected Asian countries

An analysis of determinants of inflation rate may involve monetary and fiscal variables as well as other macroeconomic variables in an econometric model. Raji, Juzhar, & Jantan (2014) analyzed the causality between price levels, money supply, and government budget deficit in Nigeria. Based on annual data for the period of 1970-2010, the study shows that there is a unidirectional causality running from real money supply to inflation as well as a budget deficit to the price level. For the long run relationship, it indicates bidirectional causality between money supply and price level. This result is similar to the phenomena in India where the fiscal and monetary variables simultaneously determine inflation rate (Mohanty & John, 2015). After the global financial crisis in 2008, the inflation rate in India has changed over time indicating significant effects of time variation. Moreover, Ajaz, Nain, & Kamaiah (2016) examined the dynamic relationship between inflation and openness from 1970 to 2014 in the Indian context. The empirical results show that there is asymmetry in the relationship between openness and inflation both in short-run as well as in long-run period. However, overall a positive relation holds between inflation and openness.

Not only economic variables affect inflation, other factors such as time variant, expectation, uncertainty and adjustment behavior of economic agents also potentially determine inflation rate in a country (Phiri, 2013). Falahi & Hajamini (2017) found the asymmetric behavior of inflation of Iran's monthly inflation for the period 1990 to 2013. He found the existence adjustment process regarding inflation rate. The findings reveal the asymmetric behavior of an inflationary process in the country. Another paper also mentions the role of time variant and shocks variables on inflation (Deev & Hodula, 2016; Khundrakpam, 2010). Furthermore, Heidari & Bashiri (2010) found the significant impact of uncertainty on inflation rate in Iran. This study supports the proposition that inflation uncertainty depends on the actual inflation rate.

The recent papers mostly concern with fiscal, monetary, and other macroeconomic variables relating to inflation issues in selected regional economies. A few papers consider the international factors as determinants of inflation rate in some countries. However, only limited papers focus on the role of noneconomic indicators such as uncertainty and shocks variables. The fiscal and monetary policy in some countries shows the less effective indicating existence of inflationary effects. Therefore, identification of some various factors that affect inflation rate may provide new insight for government to control price level. More specific, this paper aims to contribute to the current literature avoiding inflationary effects of fiscal and monetary policies by considering economic and noneconomic variables. Moreover, this study attempts to estimate the inflation rate as a function of fiscal and monetary variables as well as shock variables for Indonesian case. We apply dynamic econometric method by constructing an alternative error correction model to estimate an empirical model of the inflation rate in Indonesia.

3. Research methods

3.1. The model specification

We consider a dynamic economic model which involve inflation rate as a function of endogenous and exogenous variables. As widely used in economic analysis, the dynamic model concerns with co-integration and error correction model to capture the short and long-run behavior of economic variables. Some papers use autoregressive approach to develop error correction model. However, these studies do not include shock variables that probably emerge in the economy. Furthermore, we use a single period welfare loss function at period t (WLF_t) which involves shock variables to construct the estimable dynamic model as also used in previous research (Domowitz & Elbadawi, 1987; Gupta & Uwilingiye, 2008; Insukindro & Sahadewo, 2010; Yağcıbaşı & Yıldırım, 2017).

The proposed model begins with some reasons of using single period welfare loss function and then followed by the construction of estimable error correction model. According to the underlying assumption of the dynamic model specification, we illustrate the economy is in long-run equilibrium and short-run disequilibrium conditions. In the case of consumer behavior, the actual price of some commodities is different from the expected price for the certain year. Some factors and variables including shock variables may determine this phenomenon. Shock variables that probably come from both endogenous and exogenous sources potentially affect inflation rate. Shock variables represent unanticipated dependent and independent variables which we assume as endogenous shocks. Meanwhile, exogenous shocks are unanticipated variable from outside of the model. Further, we consider the following loss function is regrading to inflation rate as expressed in equation (1).

$$WLF_t = b_1(\pi_t^p - \pi_t^e)^2 + b_2[\Delta(\pi_t^p - \pi_t^e)]^2 \quad (1)$$

$$WLF_t = b_1(\pi_t - S_t - \pi_t^e)^2 + b_2[\Delta(\pi_t - S_t - \pi_t^e)]^2 \quad (2)$$

$$\pi_t^e = \beta_0 + \beta_1 fv_t + \beta_2 mv_t + \beta_3 x_t + e_t \quad (3)$$

$$\Delta\pi_t = \eta_0 + \eta_1 \Delta fv_t + \eta_2 \Delta mv_t + \eta_3 \Delta x_t + \eta_4 fv_{t-1} + \eta_5 mv_{t-1} + \eta_6 x_{t-1} + \eta_7 \Delta S_t + \theta_i \sum_{i-1}^{k} S_{t-1} + \eta_8 ECT + v_t \quad (4)$$

Where: $(b_1 + b_2) = 1$; $\pi_t^p = \pi_t - S_t$; π_t^p is short-run expected/planned inflation; π_t^e is long-run expected/desired inflation; and S_t is optimum shock variable.

Substituting $\pi_t^p = \pi_t - S_t$ into WLF_t, then gives equation (2). The welfare loss function consists of two components which include disequilibrium adjustment loss. This welfare loss function also involves shock variable (S_t).

Suppose that the theoretical inflation rate model is $\pi_t = f(fv_t, mv_t, x_t)$, where (fv_t) is a set of fiscal variables meanwhile mv_t represents some monetary variables, and x_t is another economic variable. We can write a desired/expected inflation model is as equation (3). Then, substituting equation (3) into equation (2) and minimizing concerning π_t and involving the optimum lag of shock variables yields equation (4).

Where: $\Delta\pi_t = \pi_t - \pi_{t-1}$; $\beta_0 = \eta_0 / \eta_8$; $\beta_1 = (\eta_4 + \eta_8)/\eta_8$; $\beta_3 = (\eta_6 + \eta_8)/\eta_8$; $ECT_t = (fv_{t-1} + mv_{t-1} + x_{t-1})$; η_7 is short run effect of shock variable; θ_i is long run effect of shock variables. The coefficients of desired/expected empirical model, β_0, β_1, β_2 and β_3 explain the effect of fiscal and monetary variables on inflation in the long run. Shock variable may be assumed as unanticipated values of certain variable.

We can estimate such values as the residual values from empirical autoregressive model (AR) of the variable. Moreover, equation (4) is an alternative error correction model that captures the effect of independent and shock variables on inflation rate in the short and long run. Since this model is a linear in parameters, we can estimate the empirical model using the ordinary least square procedure.

3.2. Cointegration test and data stationary

This research concerns with dynamic analysis which involves the long-run and short-run behaviour of inflation rate based on error correction mechanism. The consequence of such analysis, the empirical estimation involves the variables in the first difference form. Some previous research applied co-integration technique regarding the long-run relationship of a set of economic variables (Bozkurt, 2014; Fakher, 2016; Feridun & Adebiyi, 2005; Hossain, 2005; Khundrakpam, 2010). The co-integration analysis implies some prerequisite tests regarding stationary properties of the data before running the empirical estimation. Most of the macroeconomic variables contain data that are not stationary in their level. Therefore, we should transform into first difference to achieve their stationary form (Enders, 2010). The stationary data has a zero mean and variance and it unchanges over time.

The co-integration analysis includes two steps, stationary testing of the variables and estimation process of the cointegration equation. This research applies Augmented Dickey-Fuller (ADF) method for data stationary testing and Johansen's multivariate procedure for cointegration analysis (Dicky & Fuller, 1981; Johansen, 1991). Johansen cointegration method applies vector autoregression (VAR) model to test the co-integration relationship in a set of time series variables. Cointegrating equation presents a long run relationship which is indicated by the significance of maximum eigenvalues $(\lambda_{\max})$ and trace test. We accept the hypothesis of at least one cointegrating vectors using likelihood ratio trace test. We reject or accept the hypothesis based on the probability value of MacKinnon, Haug, & Michelis (1999). Cointegrating relationship occurs due to rejecting at least none co-integrating statement.

3.3. Data and variables

This research estimates some empirical equations of inflation rate (π_t) which involve fiscal, monetary, and other economic variables. Fiscal variables include tax ratio, government spending, and budget deficit. The monetary variables are narrow money and quasi-money. Other economic variables as also part of the analysis are a real gross domestic product and exchange rate. The data are annual time series for the period of 1970-2017. All the monetary data are from several annual statistical reports of the Bank Indonesia. Meanwhile, the data of fiscal variables such as inflation, fiscal variables, and other economic variables are from annual reports of Indonesia Fiscal Policy Agency.

4. Empirical results and discussion

Before presenting the empirical model of inflation, this section shows the behavior of some variables of the research. Figure 1 presents the data of inflation rate and budget deficit, meanwhile Figure 2 depicts the data of monetary variables. Inflation rate increased sharply at the beginning 1970s. After that year, inflation rate gradually slows down for about thirty years. Unfortunately, the deep financial crisis in 1997 cause inflation rate jumped to about 60 percent in 1998. Even though Indonesian economy recovery was faster than expected, the inflation rate is still about 10 percent average for almost one decade.

FIGURE 1. INFLATION RATE AND BUDGET DEFICIT IN INDONESIA, 1970-2017 (%)

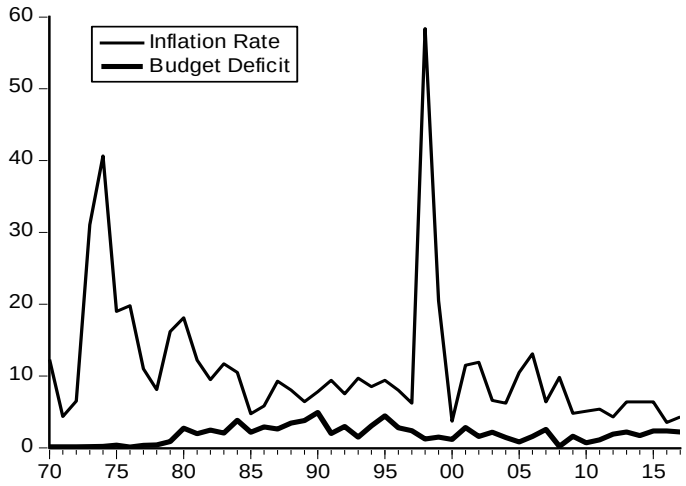
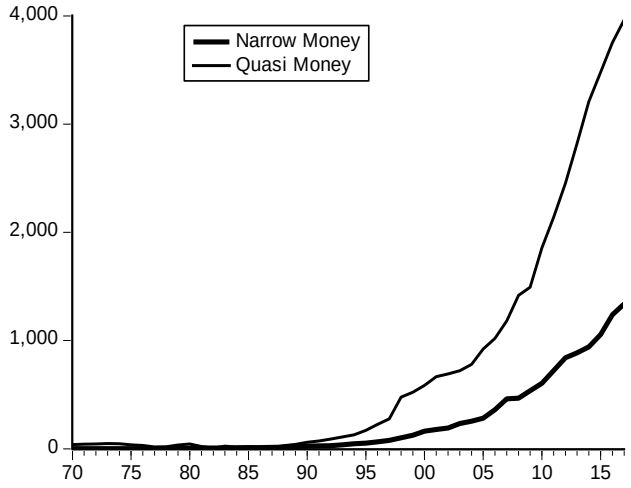


FIGURE 2. NARROW MONEY (M1) AND QUASI MONEY IN INDONESIA, 1970-2017 (trillion IDR)



Since the inflation rate has a strong association with the monetary sector, especially money supply, increasing in narrow money and quasi-money may affect inflation rate in the country. Figure 2 shows the sharp increase of these variables for a long period, specifically in the era after the financial crisis in 1998. The expansive monetary policy may contribute to the raising of these monetary variables. The amount of quasi-money is higher than narrow money indicating the significant role of financial and banking institution in financial intermediation (Table 1). The financial sector development including Islamic banking in Indonesia since the 1990s have contributed on economic and business activities. It created more aggregate demand which theoretically also contributes to the inflation rate.

TABLE 1. DESCRIPTIVE STATISTIC OF VARIABLES

VARIABLES	DESCRIPTIVE STATISTIC INDICATORS				
	MEAN	MEDIAN	MAXIMUM	MINIMUM	STANDARD DEVIATION
Inflation rate (%)	11.18	8.30	58.40	3.53	9.80
Tax ratio (% of GDP)	4.44	1.36	13.83	0.08	5.02
Government spending (% of GDP)	14.69	11.38	22.89	7.16	5.85
Budget deficit (% of GDP)	1.83	1.93	4.91	0.11	1.20
Narrow money (Trillion IDR)	238.66	41.33	1338.14	0.27	362.06
Quasi money (Trillion IDR)	746.98	118.63	3964.00	6.95	1,111.40
Gross Domestic Product (Trillion IDR)	1,274.00	184.00	4,947.00	9.80	1,614.26
Exchange rate (US $/IDR)	4,964.85	2,155.00	16,800.00	415.00	4,764.81

Source: 1. The data of inflation, narrow money, quasi money, gross domestic product are from Indonesian Financial Statistics reported by Bank Indonesia. 2. The data of tax ratio, government spending, and budget deficit are form annual reports of Indonesia Fiscal Policy Agency (http://www.fiskal.kemenkeu.go.id/).

Note: 1. Gross domestic product is based on 2010 constant price. 2. Quasi Money consists of (1) Time deposits; (2) Savings deposits; and (3) Demand deposits (All deposits are denominated in Indonesian Rupiah).

TABLE 2. RESULTS OF UNIT ROOT TEST

VARIABLES	AUGMENTED DICKEY-FULLER (ADF) TEST		PHILLIPS-PERRON (PP) TEST	
	LEVEL	FIRST DIFFERENCE	LEVEL	FIRST DIFFERENCE
Inflation rate	-1.48	[-7.91]***	-2.14	[-21.3]***
Tax ratio	-2.35	[-3.58]**	-1.96	[-5.73]***
Government spending	-2.06	[-5.81]***	-1.78	[-5.80]***
Budget deficit	-3.43	[-2.37]**	-1.23	[-18.3]***
Narrow money	-0.45	[-8.72]***	14.5	[-4.38]***
Quasi money	-1.21	[-6.92]***	7.95	[-3.84]***
Gross Domestic Product	-0.46	[-4.56]***	-0.25	[-4.51]***
Exchange rate	-0.59	[-6.69]***	-1.22	[-10.3]***

Note: Values in the [ ] are t-statistic. *** and ** indicate significant at 1% and 5% level.

Regarding co-integration analysis, we first conduct the stationary testing for all variables. The results of unit root test on individual data series with intercept and time trend component imply we accept the hypothesis that the data contains unit root in the level. Otherwise, we reject this hypothesis in first difference at least at 5 % level for all variables

(Table 2). These indicate that all the data series are stationary in first difference. Co-integration test is valid if data series are stationary at the same degree (Engle & Granger, 1987). Therefore, we run co-integration to estimate the long run relationship between those variables. This study uses Johansen procedure as a most recognized method in such analysis (Johansen, 1991).

Table 3 summarizes the result of the co-integration test. We reject the null hypotheses of no co-integrating relationship at 1 percent level. It implies the existence of a long-run relationship in a set of the series variables including inflation rate, tax ratio, government spending, budget deficit, narrow money, quasi-money, gross domestic product, and exchange rate. The presence of the cointegrating relationship indicates an error correction representation. The change in the dependent variable is a function of the residual in the cointegration model. The error correction term captures this mechanism as well as changes in independent variables. Next step, we may estimate inflation rate using error correction model. The model has some explanatory variables and error correction term which is from the residual of co-integration equation. This model explains the short-run effect of explanatory variables on the inflation rate.

TABLE 3. RESULTS OF CO-INTEGRATION TEST

HYPOTHESIZED NO. OF CE(S)	EIGENVALUE	MAX-EIGEN STATISTIC	0.05 CRITICAL VALUE	PROB.**
None *	**0.718**	**58.234**	**48.877**	**0.004**
At most 1	0.532	34.966	42.772	0.279
At most 2	0.511	32.948	36.630	0.126
At most 3	0.418	24.961	30.439	0.200
At most 4	0.264	14.140	24.159	0.587
At most 5	0.135	6.685	17.797	0.840
At most 6	0.082	3.968	11.224	0.633
At most 7	0.0007	0.035	4.129	0.876

Note: Max-eigenvalue test indicates one cointegrating equation at the 0.01 level. * denotes rejection of the hypothesis at the 0.01 level. **MacKinnon-Haug-Michelis (1999) p-values.

This research applies general-to-specific methodological framework regarding the alternative model of the inflation rate. The model is part of error correction mechanism (ECM) as we present in equation (4). The advantage of this model to general ECM is the inclusion of multi-period shock variables. We estimate the empirical model of inflation rate which involves explanatory variables such as tax ratio, government spending, budget deficit, narrow money, quasi-money, gross domestic product, exchange rate, and shock variables. The data of fiscal and monetary variables are secondary data provided in the annual report of government institutions. We must pay attention to data shock variables which are unobservable directly. To find this data, we estimate the autoregressive model (AR) of the variables. For example, regarding shock variable of inflation, we estimate the AR model of the inflation rate. Considering the optimum lag of AR model using Akaike information criterion, we find the empirical model of the inflation rate. We assume that shock variable of inflation is the residual of the AR model. After estimating such models, we find AR(1) for the inflation rate, meanwhile for others variables are optimum in AR(2).

Next step, we examine the effect of explanatory variables on inflation rate by estimating equation (4) on the data. This research estimates the equation using the ordinary least

square technique. We run the estimation into two models, model (A) and model (B). The first model presents the empirical model of inflation as a function of fiscal and monetary variables. Meanwhile, the second model has more explanatory variables such as gross domestic product and exchange rate. Table 4 presents the estimation results based on model (A) which presents three empirical models. The first model is general ECM in which only quasi-money is significant. We add shock variable of inflation from residual of AR estimation in the second model. The results show that not only quasi-money is significant but also all lagged variables are. Finally, in the third model, we include shock variables from inflation, budget deficit, and narrow money. The results seem more sophisticated indicating fiscal variables, monetary variable, and shock variables affect inflation rate. We infer that the alternative model may explain the effects of fiscal, monetary, and shock variables on inflation rate in short and long-term periods. We can also mention that the complete model which involves more shock variables is better than other models.

TABLE 4. RESULTS OF ECM ESTIMATION (MODEL A)

INDEPENDENT VARIABLES	ENGLE-GRANGER ECM		ECM WITH SHOCKS FROM DEPENDENT VARIABLE		ECM WITH SHOCKS FROM DEPENDENT AND INDEPENDENT VARIABLES	
	COEFFICIENT	T-STATISTIC	COEFFICIENT	T-STATISTIC	COEFFICIENT	T-STATISTIC
Constant	1.760	[0.23]	4.880	[2.54]**	-6.257	[-1.90]*
ΔBudget deficit	-1.752	[-1.18]	-0.071	[-0.19]	-0.840	[-0.98]
ΔGovernment spending	-0.531	[-0.45]	-0.281	[-1.07]	-0.090	[-0.40]
ΔTax ratio	-0.053	[-0.03]	0.594	[1.49]	**1.480**	[3.59]***
ΔNarrow money	0.003	[0.04]	0.021	[1.40]	**2.038**	[3.83]***
ΔQuasi money	**0.057**	[2.14]**	**0.016**	[2.51]**	0.007	[1.21]
Budget deficit (-1)	-0.339	[-0.26]	**2.195**	[6.31]***	**1.985**	[4.57]***
Government spending (-1)	-0.085	[-0.11]	-1.079	[-5.47]***	-0.867	[-4.91]***
Tax ratio (-1)	-0.446	[-0.49]	**1.004**	[4.65]***	**0.684**	[3.41]***
Narrow money (-1)	0.012	[0.19]	**0.049**	[3.14]***	-0.101	[-2.43]**
Quasi money (-1)	-0.008	[-0.40]	-0.015	[-3.09]***	-0.037	[-5.20]***
Shock of inflation	-	-	**0.967**	[22.2]***	**0.986**	[26.8]***
Shock of inflation (-1)	-	-	**0.183**	[1.94]*	**0.266**	[3.209***
Shock of budget deficit	-	-	-	-	0.769	[0.87]
Shock of narrow money	-	-	-	-	-1.993	[-3.79]***
Error correction term	-0.960	[-5.88]***	-0.829	[-8.28]***	-0.866	[-10.1]***
Adjusted R-squared	0.427		0.973		0.981	
F-statistic	4.125		123.1		153.2	
Prob(F-statistic)	0.000		0.000		0.000	

Note: Values in the [ ] are t-statistic. ***, **, and * and indicate significant at 1%, 5% and 10% level. The bold font indicates a positive effect of the variables on the inflation rate.

Further, we estimate the inflation rate as a function of fiscal, monetary, and macroeconomic variables based on equation (4). Comparing to model (A), we add gross domestic product and exchange rate in the explanatory variables. Table 5 summarizes the estimation results of the model (B) which contains three empirical estimations. The first empirical model is without shock variables. Unlike in the previous model, after adding macroeconomic variables, four explanatory variables are significant; there are a budget deficit, gross domestic product, narrow money, and exchange rate. Based on these results, we can infer that fiscal, monetary, macroeconomic variables and exchange rate positively affect inflation. This research supports the proposition of inflationary effects of fiscal and

monetary policies as well as the theory of demand-pull inflation (Fuddin, 2014; Kandil, 2005; Nguyen, 2015; Raji et al., 2014). We also conclude that international money market as an indicator of economic openness contributes to the inflation rate in Indonesia (Berument & Doan, 2003; Ghosh, 2014).

TABLE 5. RESULTS OF ECM ESTIMATION (MODEL B)

VARIABLE	ENGLE-GRANGER ECM		ECM WITH SHOCKS FROM DEPENDENT VARIABLE		ECM WITH SHOCKS FROM DEPENDENT AND INDEPENDENT VARIABLES	
	COEFFICIENT	T-STATISTIC	COEFFICIENT	T-STATISTIC	COEFFICIENT	T-STATISTIC
Constant	3.600	[3.23]***	4.267	[6.65]***	4.891	[6.98]***
Δ Budget deficit	0.099	[0.57]	0.004	[0.03]	-0.020	[-0.24]
Δ Government spending	-0.154	[-1.13]	-0.040	[-0.53]	0.035	[0.53]
Δ Tax ratio	0.011	[0.04]	0.152	[1.12]	0.159	[1.21]
Δ Narrow money	0.001	[0.11]	0.003	[0.07]	-0.001	[-0.27]
Δ Quasi money	-0.005	[-1.45]	-0.003	[-0.30]	-0.003	[-1.47]
Δ Gross Domestict Product	0.001	[0.30]	-0.003	[-0.31]	0.001	[0.96]
Δ Exchange rate	**0.003**	[2.90]***	-0.001	[-1.47]	-0.001	[-1.17]
Budget deficit (-1)	**2.148**	[13.6]***	**2.901**	[23.2]***	**3.075**	[22.1]***
Government spending (-1)	-0.863	[-7.25]***	-1.119	[-15.4]***	-1.209	[-17.1]***
Tax ratio (-1)	-1.348	[-4.25]***	-1.710	[-9.65]***	-1.857	[-11.6]***
Narrow money (-1)	**0.021**	[2.60]***	**0.034**	[7.41]***	**0.041**	[5.01]***
Quasi money (-1)	-0.019	[-6.54]***	-0.027	[-14.6]***	-0.030	[-12.2]***
Gross Domestict Product (-1)	**0.017**	[8.13]***	**0.021**	[17.1]***	**0.023**	[16.7]***
Exchange rate (-1)	-0.0002	[-1.74]*	-0.0002	[-2.99]***	-0.0003	[-3.96]***
Shock of inflation	-	-	**1.017**	[79.7]***	**1.025**	[93.1]***
Shock of inflation (-1)	-	-	**0.387**	[8.30]***	**0.431**	[10.8]***
Shock of budget deficit (-1)	-	-	-	-	-0.113	[-0.725
Shock of narrow money (-1)	-	-	-	-	-0.003	[-0.499
Shock of exchange rate (-1)	-	-	-	-	**0.0002**	[2.83]***
Error correction term	-0.686	[-31.5]***	-0.982	[-25.2]***	-1.032	[-28.5]***
Adjusted R-squared	0.993		0.998		0.998	
F-statistic	425.6		1369.5		1776.1	
Prob(F-statistic)	0.000		0.000		0.000	

Note: Values in the [ ] are t-statistic. ***, **, and * and indicate significant at 1%, 5% and 10% level. The bold font indicates a positive effect of the variables on the inflation rate.

The second estimation shows the significant effect of the shock of inflation on the inflation rate. It is consistent with the previous model which provides information that lag variable of inflation shock significantly affects inflation rate (Falahi & Hajamini, 2017). Furthermore, we add shock variables from an exogenous variable; there is shock from the budget deficit, narrow money, and exchange rate to the model. The only shock from exchange rate has a significant role in the inflation rate even though in low value. Overall, the third estimation which is the complete model also provides a new insight of empirical model of inflation in Indonesia. According to error correction mechanism, the error

correction term which indicates the deviation of the long run equilibrium is also significant. The lag variable of the budget deficit, narrow money, the gross domestic product is strongly significant indicating the long run effects of these variables on the inflation rate. This model shows the effects of fiscal and monetary variables as well as a macroeconomic variable on the price level. Therefore, this research supports the existence of long rung inflationary effects of fiscal and monetary policy (Nguyen, 2015). Again, this results also confirm the proposition of positive relationship between output and price level (Burstein, 2006). In other words, aggregate demand significantly contributes to the inflation rate in the long run.

Regarding the effects of fiscal and monetary variables, we emphasize the positive impact of explanatory variables on the inflation rate based on the third model (Table 5). Government spending and tax ration as fiscal policy instruments significantly reduce inflation rate with one year lag time. Meanwhile, the previous period of the budget deficit and narrow money increase the inflation rate. Moreover, narrow money as one of important monetary variable significantly affects the inflation rate. These results confirm the previous empirical estimation using error correction model supporting the inflationary effects of fiscal and monetary variables (Fakher, 2016; Hashem, 2017; Nguyen, 2015). A fiscal and monetary policy which aim to encourage the economic growth and to stabilize the economy, have a negative effect on the price level in Indonesia. Therefore, the central government might improve the credibility of some fiscal policies. Meanwhile, the central bank should apply the more prudent monetary policies.

5. Conclusion

This research provides some empirical model of inflation rate based on the dynamic econometric analysis. The alternative error correction model which we develop in this research can explain the determinants of inflation rate in Indonesia for the long period data. Fiscal and monetary variables strongly determine the inflation rate both in short and long-term. Gross domestic product as the main component of aggregate demand also significantly affect inflation rate in the long-run perspective. Exchange rate variable as an openness indicator also contributes to the inflation rate in the short and long-term period.

The uniqueness of this paper lies in the inclusion of shock variables in the model. We classify shock variables into two categories, shock variable form inflation and shock variable from explanatory variables. The results present the important role of inflation shock variable on inflation rate in both short and long-term effects. Only shock variable from exchange rate significantly affects inflation rate in the long-term period. The role of inflation shock variable indicates that government and central bank fail to anticipate part of price changes. The significant effect of both exchange rate and shock from exchange rate indicate existence simultaneously imported inflation for a long period.

These findings reveal the inflationary effects of fiscal and monetary policy in Indonesia. It implies the government should improve the affectivity of these policies. The gross domestic product also contributes to inflation risk in the long period. Therefore, more output increases the price level in the commodity market. This research supports the theory of the demand-pull inflation. Also, world financial market indicated by exchange rate movement has a significant impact on domestic inflation in Indonesia. Regarding economic stabilization policy, the central government should review the quality of government spending as well as maintain budget deficit at the low level. Moreover, the

central bank might review the inflation targeting policy and control the money supply, both narrow money and quasi-money.

Acknowledgment

The author would like to thank Centre for Economics Studies, Department of Economics, The Islamic University of Indonesia for providing the fund for this research under the scheme of Applied Research Grant No. 15/Dir.PPE/II/2017.

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