# Negative expected inflation-evidence from Indonesia

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#### ABSTRACT

This study is about the Phillips curve in Indonesia from 1990 to 2019 using a VAR model to find out whether there is a stable tradeoff a strictly negative relationship between inflation and unemployment in the shortrun, and whether the coefficient of expected inflation is positive. This study found that there is negative expected inflation, meaning that the relationship between inflation and unemployment is not strictly downward sloping in the short run. Negative expected inflation will face difficulties to Bank of Indonesia (BI) in managing interest rate stemmed from economic shocks. Monetary contraction will decrease output and increase both unemployment and inflation, but monetary expansion does not result in meaningful output growth. Monetary expansion should be maintained at a longer period to increase output and purchasing power so that the expected inflation will become dynamically positive as modified Phillips curve suggested.

Keywords: negative expected inflation, Phillips curve

JEL Classification: E31, E52, O42

#### ABSTRAK

Studi ini adalah tentang kurva Phillips di Indonesia periode 1990–2019 menggunakan model VAR untuk mengetahui apakah terdapat tradeoff yang stabil yaitu adanya hubungan negatif antara inflasi dan pengangguran dalam jangka pendek, dan apakah ekpektasi inflasi bernilai positif. Ditemukan bahwa terdapat koefisien ekspektasi inflasi negatif sehingga tradeoff antara inflasi dan pengangguran bersifat tidak stabil dalam jangka pendek. Dengan ekspektasi inflasi yang negatif, Bank Indonesia (BI) akan menghadapi kesulitan dalam mengelola suku bunga acuan ketika terjadi guncangan ekonomi. Kontraksi moneter akan menurunkan output dan meningkatkan pengangguran dan inflasi, tetapi ekspansi moneter tidak menghasilkan pertumbuhan output yang signifikan. Oleh karena itu, ekspansi moneter perlu dijaga pada periode yang lebih panjang untuk meningkatkan output dan daya beli sedemikian rupa sehingga ekspektasi inflasi menjadi positif sesuai dengan kurva Phillips termodifikasi melalui proses dinamis.

Kata kunci: ekspektasi inflasi negatif, kurva Phillips

Klasifikasi JEL: E31, E52, O42

# **INTRODUCTION**

For economists, the Phillips curve is not only about the tradeoff between inflation and unemployment but also about how monetary and fiscal policies affect the rate of inflation and unemployment. On the monetary view, monetary policy could push inflation and unemployment in opposite directions. When the central bank wants to pursue a lower unemployment rate by decreasing the interest rate, the economy will experience a higher inflation rate, and when it wants to decrease inflation rate by increasing interest rate, the economy will experience a higher unemployment rate. The inflation and unemployment tradeoff is, at its heart, a statement about the effect of monetary policy (Mankiw, 2000).

Furthermore, a tradeoff between inflation and unemployment does not mean that a scatterplot

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of inflation and unemployment produces a stable downward-sloping Phillips curve where there is a strict negative relationship between inflation and unemployment. The tradeoff between inflation and unemployment does not also mean that any particular regression fits the data well or produces any particular set of coefficients (Blanchard et al., 2015).



Source: Year (2020) **Figure 1.** Scatter Plot of Inflation and Unemployment in 1990 to 2019

This paper discusses about the Phillips curve and to find out whether there is a relationship between the inflation rate and unemployment rate in Indonesia. Inflation rate and unemployment rate data in Indonesia in the period of 1990 to 2019 (Figure 1), scatter plot does not show a downward sloping between inflation and unemployment. In that period, it cannot be concluded that the increase in inflation will be followed by a decrease in unemployment. Figure 1 shows that inflation and unemployment in Indonesia were in accordance with Blanchard (2016), Blanchard et al. (2015) and Mankiw (2000) which stated that a tradeoff between inflation and unemployment do not mean that a scatterplot of inflation and unemployment produces a stable downwardsloping Phillips curve. This paper also studies whether expected inflation  $\theta \pi_t^e = \theta \pi_{t-1}$  in Indonesia economy satisfies that  $0 \le \theta \le 1$  as macroeconomic literateurs revealed (Romer, 2012).

### LITERATURE REVIEW

Before the crisis, from 1990 to 1997, there was a Phillips curve in Indonesia, which was marked by a low unemployment rate and high inflation rate. In that period there was a tradeoff between inflation and unemployment. After 1998 until the economic crisis in 2008, the relationship between inflation rate and unemployment rate had no longer showed downward sloping, but after the crisis, from 2009 to 2019, Phillips curve then appeared again and showed the inflation and unemployment tradeoff.

In an economic situation that is experiencing economic growth due to monetary expansion policy, prices will increase through P = (1 + m)W where P is the price level, m is mark-up and W is nominal wage. An increase in mark-up will increase the price level and at the same time will push nominal idem up through the relationship that  $W = P^e F(u, z)$  where P<sup>e</sup> is the expected price, u is unemployment rate and z is the catchall variable (Blanchard, 2017).

Thus, there is a positive correlation between inflation and economic growth where the economic growth will affect inflation rate upwards and that the higher inflation rate was affected by the higher the economic growth (Barnicon & Mesters, 2019; Romer, 2012; Blanchard & Gali, 2010; King et al., 1995). In the relationship between inflation and unemployment, including in Indonesia, monetary policy determined by Bank of Indonesia (BI) will affect employment through changes in employment, then through changes in expected price Pe, monetary policy will have an impact on changes in nominal wages W, and ultimately will affect price level P or inflation. Changes in inflation as a result of monetary policy can be interpreted as a result of the role of expected inflation  $\pi^{e}$  on every change in monetary policy through micro-founded formulation or known as expectations-augmented Phillip curve (Romer, 2012):

$$\pi_t = \pi_t^s + \lambda (\ln Y_t - \ln \bar{Y}_t) + \varepsilon_t^s, \quad \lambda > 0$$
(1)

where  $\overline{Y}_{t}$  is the level of output at period are (associated with wages and employment) that would prevail if prices are fully flexible, or natural rate of output or potential output or fullemployment output or flexible price output,  $\pi_t^e$  is expected inflation or core inflation or underlying inflation. The  $\lambda(\ln Y_t - \ln \bar{Y}_t)$  term implies that at any time there is an upward sloping relationship between inflation and output. The  $\varepsilon^s$  term captures supply shocks (Romer, 2012). Nevertheless, expected inflation  $\pi_t^e = \pi_{t-1}$  then  $\pi^e$  does not need to be interpreted as expected inflation but as actual inflation in the previous period (Romer, 2012). With this assumption, the hybrid Phillips curve is formulated (Romer, 2012):

$$\pi_t = \theta \pi_t^* + (1 - \theta) \pi_{t-1} + \lambda (\ln Y_t - \ln \overline{Y}_t) + \varepsilon_t^s, \quad 0 \le \theta \le 1$$
(2)

As long as  $\theta$  is strictly less than 1, there is some inertia in wage and price inflation. That is, there is some link between past and future inflation beyond effects operating through expectations. If  $\theta = 1$  then there is an upward sloping between changes in the inflation rate against the gap between actual output and normal output. Furthermore, based on Okun's law that  $u_t - u_{t-1} = -\beta(Y_t - \bar{Y}_t)$  where u is unemployment rate, we find inflation and umployment tradeoff when  $\theta = 1$  (Romer, 2012):

$$\pi_t - \pi_{t-1} = \gamma - \alpha u_t + \varepsilon_t^s \tag{3}$$

The expected inflation phenomena in the relationship between inflation rate and unemployment rate as a result of monetary policy is what will be explored in this paper.

## **RESEARCH METHOD**

This paper used data from the Indonesian economy over the period from 1990 to 2019, described the inflation rate and unemployment rate. This study used data from the Indonesian Central Bureau of Statistics (BPS) to evaluate the effect of shocks on both inflation and unemployment and to see the impact of changes in inflation on unemployment.

This study used a VAR (Vector Autoregressive) method in order to trace the Impulse Response Factor (IRF), which is the effect of inflation shocks on unemployment at a current period to the next several periods (King et al., 1995; King & Watson, 1994). By this model, the unemployment rate will help to estimate future inflation rate, and inflation rate will help to estimate the future unemployment rate.

Actual inflation  $\pi$  affected by expected inflation  $\pi_{t-1}$  and unemployment in the previous period  $u_{t-1}$ , similarly, actual unemployment  $u_t$ affected by unemployment in the previous period  $u_{t-1}$  and expected inflation  $\pi_{t-1}$ , then estimated VAR model is formulated.

$$\pi_t = \alpha_1 + \alpha_2 \pi_{t-1} + \alpha_3 u_{t-1} + \varepsilon_{1t}^s$$
(4)

$$u_t = \beta_1 + \beta_2 \pi_{t-1} + \beta_3 u_{t-1} + \varepsilon_{2t}^s$$
(5)

which in the matrix notation is written:

$$\begin{pmatrix} \pi_t \\ u_t \end{pmatrix} = \begin{pmatrix} \alpha_1 \\ \beta_1 \end{pmatrix} + \begin{pmatrix} \alpha_2 & \alpha_3 \\ \beta_2 & \beta_3 \end{pmatrix} \begin{pmatrix} \pi_{t-1} \\ u_{t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t}^s \\ \varepsilon_{2t}^s \end{pmatrix}$$

$$(6)$$

This VAR model is used to see the impulse response function, which is the impact of changes from one variable in the system to other variables dynamically in the model (King et al., 1995). In equation (6), monetary shocks  $\varepsilon_{1t}^{s}$  will immediately have an impact on u<sub>t</sub> but not on  $\pi_t$ . In the period t<sub>1</sub>, any changes as a result of  $\varepsilon_{1t}^{s}$  will have an impact on  $\pi_t$  through  $\pi_{t-1}$  and  $u_{t-1}$ . This impact will continue to the next period (Verbeek, 2000). In this case, monetary policy will first affect output and employment, then the output and employment will affect the price level or inflation (Romer, 2012; Gali, 2011).

## **RESULTS AND DISCUSSION**

In 1998, when Indonesia experienced an economic crisis, inflation rose sharply to 77.63% from 11.05% in 1997. At the same period, the high inflation rate was followed by an increase in unemployment rate from 4.69% in 1997 to 5.46% in 1998. This high inflation rate and high unemployment rate then occurred again in subsequent crises in 2001, 2005 and 2008 (Figure 2). Based on that economic situation particularly when Indonesia faced an economic crisis, we found the data that inflation rate



Figure 2. Inflation and Unemployment in Indonesia from 1990 to 2019

and unemployment rate did not show a stable downward sloping. In other words, there was no strictly negative relationship between inflation rate and uemployment rate in the shortrun.

In 1998, the period when the Indonesian economy experienced an extreme shock due to the effects of the crisis that began in Thailand, that crisis finally shook all socio-economic aspects in Indonesia. This crisis marked by the end of President Soeharto's regime to an era called the reform era in President Habibie's administration. The volatility of the Indonesian economy during the three decades of the Soeharto regime made that increasing of unemployment rate was accompanied by a tremendous increase in inflation (Goeltom, 2007).

Due to the economic crisis, there was an extremely depreciation of Indonesian rupiah (IDR) toward the United State dollar (USD), from 7,400 (January 1998) to 16,800 (June 1998). Depreciation of IDR at this time was due to a systemic capital outflow because of the fading of trust to Indonesian government. The subsequent impact of the depreciation of Indonesian rupiah was the overall rise in prices level reflected by a very high inflation rate. To reduce the high fluctuation of USD/IDR exchange rate, Bank Indonesia increased interest rate from 20% in January 1998 to became 70.44% in August 1998. The worsening of economic situation made Indonesia's economic growth experience a negative growth by 13.13% in 1998. Through BI's monetary contraction policy, Indonesia economy was able to reduce inflation in 1999, and economic growth returned to a positive level by 0.79% but the unemployment rate still continued to rise.

Inflation and unemployment data in Indonesia from 1990 to 2019 are stationary at a level. This study found that a VAR model is stable at lag-1 so that the VAR model obtained is first-order VAR (Table 1).

Based on the relationship  $\pi_t^e = \theta \pi_{t-1}$ where  $\theta$  is the influence of the previous period inflation on expected inflation  $\pi^e$ , then for the period from 1990 to 2019,  $\theta = -0.05$ . The influence of inflation rate at t-1 was negatively correlated to expected inflation  $\pi_t^e$ . Because  $\theta < 0$ , then the increase of inflation rate at t-1 resulting in a decrease in expected inflation given unemployment rate, where deflation at period t-1 resulting in an increase in expected inflation given unemployment rate. Meanwhile, the relationship

Sample (adjusted): 1991 2019 Included observations: 29 after adjustments Standard errors in ( ) & t-statistics in [ ]			
	Inflation π	Unemploymen <b>u</b>	
$\pi_{t-1}$	-0.0475	0.0142	
	(0.1954)	(0.0141)	
	[-0.2429]	[ 1.0048]	
<i>u</i>	-0.7508	0.8592	
	(1.1187)	(0.0808)	
	[-0.6711]	[ 10.6333]	
C	14.8051	0.8725	
C	(8.0299)	(0.5799)	
	[ 1.8438]	[ 1.5043]	
R-squared	0.0187	0.8134	
Adj. R-squared	-0.05680	0.7991	
Sum sq. resids	5065.469	26.4262	
S.E. equation	13.9580	1.0082	
F-statistic	0.2478	56.6693	
Log likelihood	-116.0114	-39.8016	
Akaike AIC	8.2077	2.9518	
Schwarz SC	8.3491	3.09328	
Mean dependent	9.4628	6.5969	
S.D. dependent	13.5779	2.2489	
Determinant resid covariance (dof adj.)		190.8049	
Determinant resid covariance		153.3699	
Log likelihood		-155.2748	
Akaike information criterion		11.1224	
Schwarz criterion		11.4053	

Table 1. VAR Estimates for Relationship between Inflation and	Unemployement
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**VAR Estimates** 

between actual inflation and unemployment rate at t-1 is downward sloping in accordance with the Phillips curve. An increase in the unemployment rate in t-1 by 1 basis point will reduce actual inflation by 0.75 basis points.

Based on the IRF (Figure 3), the impulse response of expected inflation  $\pi^{e}$  to actual inflation is still high in period t<sub>1</sub>, but since t<sub>2</sub> the impulse response function of  $\pi^e$  to  $\pi$  was negative toward equilibrium at  $t_{10}$  (panel a). Even though the impulse response of the unemployment to inflation was positive from  $t_1$  to  $t_{10}$  (panel c), the impulse response of the unemployment to inflation was much smaller than the impulse response of the unemployment at u<sub>t1</sub> to actual unemployment (panel d). The most dominant of unemployment impulse response stemmed from unemployment itself. Meanwhile, the impulse response of the inflation to unemployment (panel b) was negative from  $t_1$  towards equilibrium at  $t_{10}$ .

In the relationship between inflation and unemployment (Table 1), this study found that  $\pi_t = 14.8 - 0.05\pi_{t-1} - 0.75u_t$ , the tradeoff between inflation and unemployment is corrected by expected inflation by  $-0.05\pi_{t-1}$ . Since  $\theta < 0$ , the tradeoff between inflation and unemployment is greater than what is stated by the modified Phillips curve where  $0 \le \theta \le 1$ . It means that when the unemployment rate increases by 1 basis point, the inflation rate decreases not only by 0.75 basis points but also  $0.75 + 0.05\pi_{t-1}$  basis points.

In the initial period of shocks t<sub>1</sub>, 96.34% of the variance of the unemployment rate stemmed from the unemployment rate itself and only 3.66% of the variance explained by the inflation rate (Table 2). Until period t<sub>10</sub> of shocks, 87.95% of variance of unemployment rate stemmed from unemployment rate and only 12.05% was explained by the inflation rate. Furthermore, in the initial period of shocks t<sub>1</sub>, 100% of the



Figure 3. Impulse Response Function (IRF) for Relationship between Inflation and Unemployement

Table 2. Forecast Error Decomposition Variance (FEDV) for Relationship betw	een Inflation and
Unemployement	

Variance Decomposition of Inflation $\pi$ <i>Period</i>	s.e	Inflation $\pi$	Unemployment U	
1 2 3 4 5 6 7 8 9 10	13.9580 14.0010 14.0159 14.0269 14.0348 14.0405 14.0445 14.0474 14.0495	100.0000 99.7184 99.5338 99.4014 99.3066 99.2386 99.1899 99.1550 99.1299	$\begin{array}{c} 0.0000\\ 0.2816\\ 0.4662\\ 0.5986\\ 0.6934\\ 0.7614\\ 0.8101\\ 0.8449\\ 0.8701\\ 0.8800\end{array}$	
Variance Decomposition of Unemployment <i>u</i> <i>Period</i>	s.e	Inflation <b>π</b>	Unemployment Unemployment	
1 2 3 4 5 6 7 8 9 10	1.0082 1.3679 1.5748 1.7079 1.7975 1.8591 1.9021 1.9323 1.9538 1.9690	3.64319 9.02932 10.4573 11.1188 11.4831 11.7039 11.8454 11.9395 12.0035 12.0477	96.3568 90.9707 89.5427 88.8812 88.5169 88.2961 88.1546 88.0605 87.9965 87.9523	
Cholesky Ordering: $\pi$ u				

### Response to Cholesky One S.D. Innovations $\pm$ 2 S.E.

variance of inflation rate stemmed from inflation rate itself,  $\pi_{t-1}$ . Until period  $t_{10}$  of shocks, 99.11% of the variance of inflation rate stemmed from inflation rate  $\pi_{t-1}$  and only 0.89% was explained by the unemployment rate.

In monetary policy, monetary shocks such as a monetary expansion where BI decrease interest rate by 1 basis point, it would increase credit depth by 1.14 basis points (Sipahutar et al., 2017; Sipahutar, 2016). It means that monetary expansion will initially affect the economic real sectors by shifting aggregate demand curve to the right which increased output and employment. Monetary expansion policy would decrease unemployment rate. Increasing the aggregate demand would then further increase expected price of P<sup>e</sup> and then increase inflation rate. However, in this case, increasing of inflation rate in Indonesia was not only negatively affected by the unemployment rate but also was also corrected by expected inflation by  $-0.05\pi_{t-1}$ 

The correction of expected inflation toward actual inflation is clearly shown by the impulse response of unemployment to inflation (Figure 3). The unemployment rate response to inflation rate only increased at  $t_2$  then decreased dramatically until  $t_{10}$  (panel c). In this case, changes in the inflation rate are responded by a very little amount of unemployment rate. Likewise, the impulse response of inflation rate to unemployment rate is negative (panel b). Negative impulse responses occur from the beginning of the shock until it reaches equilibrium at  $t_{10}$ . In this case, changes in unemployment rate did not directly increase inflation rates (Goodfriend & King, 2005).

As in Figure 1, since 2005 the unemployment rate in Indonesia had a declining trend. In 2005 the unemployment rate was 11.24%, and it continued to decrease to 5.28% in 2019. In the same period,

the inflation rate also had a declining trend. In 2015 the inflation rate was 3.35% and then continued to decline to 2.72% in 2019. Since 2015 until 2019, the inflation rate was in a stable condition where there was a strictly negative relationship between inflation and unemployment. The stable inflation rate in this period was followed by decreasing in unemployment rate. In this case, from 2015 until 2019, there was a decrease in the unemployment rate followed by a stable inflation rate at low level of around 3%.

In a condition where there is an increase in labor demand but not followed by an increase in economic growth (that was relatively stagnant at around 5% with a downward trend), the expected price  $P^e$  did not increase. It means that wagesetting and price-setting is relatively stagnant. This sticky wage and sticky price then made nothing to aggregate supply curve for increasing output. This was why inflation rate was relatively stable at low levels despite there was a decline in the unemployment rate. Negative expected inflation triggers the disappeared of the Phillips curve in that period, that there was no trade-off between inflation rate and unemployment rate (Blanchard, 2018; Blanchard & Gali, 2010).

Furthermore, the relationship between inflation and unemployment is not a Granger causality (Table 3). There is no causality from unemployment rate to inflation rate, and vice versa, there is no causality from inflation rate to unemployment rate. The absence of causality between inflation rate and unemployment rate occurred even though there is a downwardsloping relationship between inflation rate and unemployment rate, but because of negative coefficient of expected inflation, the response function of inflation rate to unemployment rate is also negative since the initial state of shocks until steady state.

Table 3. Granger Causality for Relationship between Inflation and Unemployement

Pairwise Granger Causality Tests Sample: 1990 2019: Lags: 1				
Null Hypothesis:	Obs	F-Statistic	Prob.	
$u$ does not Granger Cause $\pi$ $\pi$ does not Granger Cause $u$	29	0.4504 1.0095	0.5081 0.3243	

Table 1 shows  $\pi_t = \gamma - \pi_{t-1} - \alpha u_t + \varepsilon_t^s$ where  $\varepsilon_t^s$  leads to supply shocks, then monetary policy will only affect the unemployment rate during the 1990-2019 period but the effect on the inflation rate is very small. Therefore, based on a hybrid Phillips curve  $\pi_t = \theta \pi_t^* + (1 - \theta) \pi_{t-1} + \lambda (\ln Y_t - \ln \overline{Y}_t) + \varepsilon_t^s$ in equation (4), when  $\theta < 0$ , the actual output of Y does not increase significantly even though inflation rate is stable at low level, and even though the unemployment rate tends to decrease due to the higher employment demand. Stable inflation rate at low level stemmed from the negative coefficient of expected inflation. At this point, stable inflation rate can not increase aggregate demand. Indonesian output of economy tends to be stagnant at a growth rate around 5%.

In a situation that there is a negative expected inflation, there are two things that are highlighted in monetary policy. First, negative expected inflation will further affect the ability of the central bank to conduct monetary policy. Let  $\pi_t$ be the rate of inflation and  $\pi^*$  be the target rate of inflation, let  $i_t$  be the policy rate, the nominal interest rate controlled by the central bank, and i<sup>\*</sup> be the target nominal interest rate—the nominal interest rate associated with the neutral rate of interest,  $r_n$ , so  $i^* = r_n + \pi^*$ , and let  $u_t$  be the unemployment rate and  $u_n$  be the natural rate of unemployment than according to the Taylor rule, the central bank should use the equation pursuing inflation targeting framework policy.

$$\begin{split} i_t &= i^* + \alpha (\pi_t - \pi^*) - \beta (u_t - u_n), \quad \alpha > 0; \; \beta > 0 \\ (7) \end{split}$$

If  $\pi_t > \pi^*$ , central bank should increase  $i_t > i^*$  and would lead to increase unemployment. Increase in unemployment will then lead to a decrease in inflation rate. However, based on the results obtained where expected inflation  $\pi^e = \theta \pi_{t-1}$  and because  $\theta < 0$  then  $\pi^e < 0$ , then refer to  $\pi_t = \gamma - \theta \pi_{t-1} - \alpha u_t + \varepsilon_t^s$ , actual inflation  $\pi^e$ , then  $\pi_t$  will tend to be identical to the inflation target  $\pi^*$  or  $\pi_t \equiv \pi^*$ , so that the central bank should set the nominal interest rate  $i_t$  equal to its target value i\* or  $i_t = i^*$ . In an economic situation like this, the central bank will find the difficulties to reduce the unemployment rate through its monetary policy.

Second, negative expected inflation  $\pi^{e}$  is positively correlated with negative expected price P<sup>e</sup>. The negative expected price P<sup>e</sup> will tend to shift the aggregate supply curve to the left, and reduce the output given aggregate demand, which in turn increases the price level P. Expansive fiscal policy in Indonesia since 2015 by increasing government spending on infrastructure development has an impact on shifting the aggregate demand curve to the right, and continuing to increase the price level P and then decrease real income. Furthermore, when nominal income is not strong enough to accept an increase in the price level P, consumption will decrease. Purchasing power is not strong enough to accept the new price level P. The decrease in consumption then shifts the aggregate demand curve to the left. The result is that price level P are stable at high levels, so changes in the price level of  $\Delta P$  are relatively small. That is why inflation rate is stable at low level and economic output is relatively stagnant from 2014 to 2019 at a range of about 5%. Negative expected inflation seemed to be a correction factor to the multiplier effect stemmed from government spending. The negative expected inflation that occurred in Indonesia from 1990 to 2019 explained that even though there is a downward sloping between inflation rate and unemployment rate, this tradeoff does not mean that decreasing in unemployment rate will increasing inflation rate.

# CONCLUSION AND RECOMMENDATION

Macroeconomics literature revealed that the coefficient of inflation rate at t-1 or expected inflation rate is positive at range of  $0 \le \theta \le 1$ , but using a VAR model approach, this study found negative expected inflation. This negative expected inflation rate explained that a tradeoff between inflation rate and unemployment rate in Indonesia economy in the period of 1990–2019 produced an unstable downward-sloping Phillips curve. Referring to the negative expected inflation, BI as central bank of Indonesia will face difficulties in managing the interest rates when there is economic shock. Negative expected inflation can be explained by IRF. Analysis by IRF showed that the most dominant of unemployment impulse response stemmed from unemployment itself. IRF also showed that impulse response of expected inflation to actual inflation is still high in the initial period, but negative since  $t_2$  toward equilibrium. Meanwhile, the impulse response of the inflation to unemployment was negative from the initial state of shocks towards equilibrium. The impulse response of the unemployment to inflation was positive but much smaller than the impulse response of the unemployment at  $u_{t-1}$  to actual unemployment.

Referring to the negative expected inflation that found by VAR technique where  $\pi_t = 14.8 - 0.05\pi_{t-1} - 0.75u_t$  and from  $\pi_t = \pi_t^s + \lambda (\ln Y_t - \ln \overline{Y}_t) + \varepsilon_t^s$ , then when BI conducts monetary contraction policy by increasing interest rate due to the exchange rate shocks, output will decrease and unemployment will also increase. In this case, monetary contraction policy will increase both unemployment rate and inflation rate. Conversely, when BI conducts a monetary expansion policy, output would increase but does not experience a significant growth in the short run. Therefore, monetary expansion policy should be maintained at a longer period of time to give sufficient time to the economic real sectors in increasing output and increasing purchasing power, then the expected inflation will undergo a dynamic process to become  $\theta > 0$  as modified Phillips curve suggested and trade off between inflation and unemployment will then help BI to conduct monetary policy.

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