

Nexus between Inflation and Unemployment: Evidence from Indonesia*

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Abstract

This study intended to examine the relationship between inflation and unemployment rate in Indonesia during 1987 to 2018 period. The study applied a quantitative method using Vector Error Correction Model (VECM) in order to comprehensively understand the causality between inflation and unemployment rates. The data were collected from various main sources including the World Bank, Central Bank of Indonesia, and Central Bureau of Statistics (BPS). The findings showed that inflation has a one-way relationship toward unemployment in Indonesia and it occurs at the third lag. Impulse Response Function (IRF), shows that the inflation rate are fluctuating in response to the shock of unemployment. The unemployment rate responses to shocks from inflation initially increased until it is eventually diminished. It shows that the shocks caused by the impact of inflation were only in the short term. Further, inflation in the three previous lags will have consequences for the unemployment rate in the year. Lastly, both in the long run and short run, unemployment did not affect inflation rates. These findings suggest that high inflation in Indonesia is determined the rising price of basic commodities and fuel. In addition, most companies in Indonesia applying capital intensive so that employment growth in Indonesia is small.

Keywords: Unemployment, Inflation, Phillips Curve, Trade off, Indonesia.

JEL Classification Code: E24; E31; P44.

1. Introduction

Inflation and unemployment are the most critical problem in many countries. Those variables have consequences to various economic activities such as saving, investment,

export, poverty, economic growth and so forth (Yolanda, 2017; Behera & Mishra, 2017). The high rates of inflation for instance, will decline the level of social welfare. In contrast, low level of inflation potentially brings to the lower economic growth rates, inclining poverty, decreasing job opportunity and gradually leads to recession. Behera and Mishra (2017) remarked that inflation positively affects gross domestic product. Whereas, the effect of unemployment rates can be depicted by several social economic conditions such as declining economic growth, rising of crime, and so forth (Huang & Huang, 2015; Minisi & Pantina, 2017).

Inflation is a condition which shown by continuous increase in prices for goods and services. This condition definitely affects the decreasing of purchasing power of society. Basically, certain level inflation also plays important roles in country. However, in fact, when it is not managed properly, it has consequences in economy. Dealing with the problems, government policies in a country intended to achieve the low rates of unemployment, stability in prices, and higher economic growth. In this case, government could implement both fiscal and monetary policy. However, since tradeoff between inflation and unemployment theoretically exist, it is difficult to ensure both goals can be achieved

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together. Therefore, policy makers should consider between overcoming inflation or unemployment first. In the other words, when government wants to enlarge job opportunities, it has consequences to prices stability. Conversely, when policy makers keep prices remained stable, they should not consider having wider job opportunities.

The tradeoff between inflation and unemployment is depicted by Phillips curve. The Phillips curve describes the negative slope of the curve that shows the relationship between two variables which are inversely proportional. It was initiated by Phillips (1958) who found that the rate of change in nominal wage has a negative correlation to the level of unemployment in the United Kingdom. Furthermore, Samuelson and Solow (1960) remarked a negative correlation between inflation and unemployment.

Inevitable studies on the relationship of inflation and unemployment have been performed in various countries (Goldstein, 1972; Bomberger & Makinen, 1976; Al-Zeaud, 2014; Florea, 2014; Alisa, 2015; Idenyi et al., 2017; Kasseh, 2018). Al-Zeaud (2014) conducted research in the State of Jordan and the finding showed that there is no evidence of causality between unemployment and inflation during the period of the study. Furthermore, Alisa (2015) remarked that the relationship between variables namely inflation and unemployment inversely exist in the short term whilst Touny (2013) showed that in the long run, inflation rate and the unemployment gap over the above mentioned period in Egypt. In contrast, another study by Goldstein (1972) provided the Phillips curve exist in Canada, the United Kingdom, and the United States as well as for a number of other countries. In India context also shows that there is a causal relationship between inflation and unemployment (Singh & Verma, 2016).

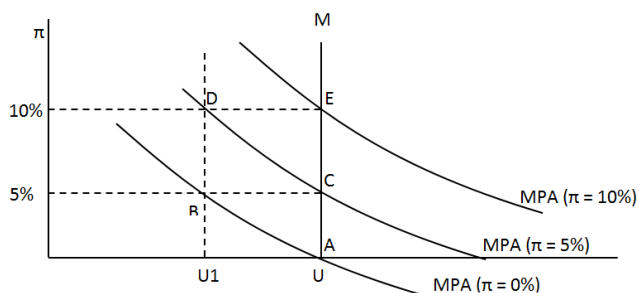
In the economic theory, higher inflation stimulates in reducing unemployment rates and vice versa. However, in Indonesia, the existed phenomenon of tradeoff between inflation and unemployment rates is different. When the level of unemployment is high, it tends to affect to the higher inflation. In fact, there are little attention on the relationship between inflation and unemployment rate in Indonesia. Therefore, this study aims to examine the relationship between inflation and unemployment rate in Indonesia comprehensively both in the short term and long term during the period of research.

2. Literature Review

2.1. Phillips Curve and the Rational Estimation

The movement of inflation and unemployment rise simultaneously shows the Phillips curve shift that occurred

in the United States during 1950 to 1982 (Nopirin, 2000; Dornbusch et al., 2011). It provided that there is no trade-off between inflation and unemployment. Shifting the Phillips curve in the United States allegedly caused by several factors such as shifts in the demographic composition of the population such as increase in the number of women and children into the labor force. The labor force women and children tend to show the existence of a higher unemployment rate than older men. Therefore, when inflation is at a certain level, unemployment is higher.



Source: Adapted from Dornbusch et al. (2011)

Figure 1: Phillips curve and Estimates

Figure 1 depicts about Phillips curve and its estimation. Phillips curve shows in the point of intersection with the horizontal axis. Neither fiscal nor monetary policy cannot lower unemployment below the natural rate of unemployment without having to bear the brunt of inflation. For example, when the government wants to implement an expansionary monetary policy to reduce the level of unemployment U1. This will lead to rise in price as well if not followed by an increase in wages, the real wages will fall. So the demand for labor will increase as seen from the shift from point A to B along the LTO (π = 0).

Labor eventually has information about the price increase that occurred for example 5 percent, so that workers will ask for higher wages. Therefore, the real Upha rise, and unemployment rises until equilibrium is reached at the level of U* is shown on the shift point B to C in KPP π = 5 percent. Therefore, the Phillips curve shifted due to price forecasts made by labor. The movement from B to C shows an increase in the inflation rate and the unemployment rate is called stagflation or stagflation. When labor has adjusted the estimated price, then to lower the unemployment rate at the level of government U1 should take monetary policy.

The process in the form of monetary policy, which resulted in increased prices and demand for labor on wages rise so that the demand for labor decreases. The situation shifted repeatedly and point C to point D when the forecast price rises of up to 10 percent Phillips curve shifts to the LTO (π = 10%) to the level of unemployment will back U*.

Therefore, in the long run Phillips curve is vertical, swordfish occurs trade-off between inflation and unemployment. If the government wants to keep the unemployment rate below the natural level, the consequence is the inflation bear constantly. It was called accelerationist hypothesis if it does not bear the constant inflation, unemployment will go back to the point U*.

2.2. Inflation

According to McConnell et al. (2012), inflation is the increase in the general price level. When inflation occurs, money owned by just going to get the goods and services that are less than before. In this case the public will lose purchasing power for goods and services. Previous studies mentioned that inflation plays an important role in economy (Sweidan, 2004; Garnier et al., 2015). It reflects to the stability of economy of a country and measures the ability of government to manage through fiscal and monetary policy. Mankiw (2006) divided inflation into two based is called Cost-Push Inflation and Demand-Pull Inflation.

Demand-pull Inflation. The inflation caused by the pull of demand. This inflation stems from their total demand (aggregate demand), while production has been in a state of full employment or nearing full employment.

Cost-Push Inflation. Cost-push inflation characterized by rising prices and lower levels of production. The increase in production costs would lead to stagflation, for instance inflation accompanied by stagnation. The increase in production costs, in turn, will raise prices and lower production. If this process continues then there will be Cost-Push Inflation.

2.3. Unemployment

Unemployment is a population that included labor force but not working and looking for work according to a certain time reference (Feriyanto, 2014). Meanwhile, according to Mankiw (2006) the unemployment rate shows the percentage of the workforce that does not work or the number of unemployed as compared to the total labor force. According to McConnell et al. (2012) unemployment is divided into several types, namely frictional unemployment, structural unemployment and cyclical unemployment.

3. Methodology

This study is a quantitative research using time series data consisting of a variable rate of inflation and the unemployment rate as the first and second variable. This study aims to determine the relationship between inflation

level and the unemployment rate in the short term and long term in Indonesia from 1986 to 2018. The variable used to measure inflation rate is the CPI (Consumer Price Index) or measure the level of the prices this year compared to last year prices. There are three categories of inflation. When inflation rate is less than 10 percent, it is categorized as mild inflation, while between 10 to 30 percent, it is a moderate inflation. When inflation rate is between 30 percent and 100 percent, it is a high inflation and above 100 percent is hyperinflation. The second variable is the unemployment rate which is the ratio between the number of unemployed to the total labor force. The unemployment rate can be used as an indicator of the ability to absorb labor with available job opportunity.

The data is collected from the annual report released by the World Bank, the Central Bank of Indonesia, and the Central Bureau of Statistics. This study applied VECM (Vector Error Correction Model) to understand the relationship in the short and long term. VECM is a method derived from VAR (Vector Autoregression). VECM is used for the inflation and the unemployment rate data at a different stationary level but cointegrated. We also used causality method to look at the effect of inflation to unemployment and vice versa.

With Granger causality test there will be four possible outcomes to be obtained, namely:

If $\sum_{j=1}^n \alpha \neq 0$ and $\sum_{j=1}^n \delta = 0$, there is a causality of the direction of inflation (INF) to Unemployment (UNP).

If $\sum_{j=1}^n \alpha = 0$ and $\sum_{j=1}^n \delta \neq 0$, there is a causality of the direction of Unemployment (UNP) to inflation (INF).

If $\sum_{j=1}^n \alpha = 0$ and $\sum_{j=1}^n \delta = 0$, each variable is independent between one another.

If $\sum_{j=1}^n \alpha \neq 0$ and $\sum_{j=1}^n \delta \neq 0$, there is a two-way causality between inflation (INF) and Unemployment (UNP).

4. Results and Discussion

4.1. Stationary Test Method ADF (Augmented Dickey-Fuller)

Stationary test aims to determine whether the data has a unit root or not. Stationary testing in this study is used Augmented Dickey-Fuller test (ADF) with a confidence level

of 5 percent. If the data has a unit source, the value tends to fluctuate around the average value so that it is difficult to estimate the model.

The test results of each source unit variables are provided in Table 1. The results of the calculation method of ADF at the current level, inflation rate and unemployment both variables are equally not stationary. Inflation has been stationary as seen from the probability values in Table 1 equal to 0.0000 which is less than the critical value of 5 percent. While the unemployment variable is not stationary as seen from the probability values in Table 1 equals to 0.4500, which is greater than the critical value of 5 percent.

The calculation method Difference ADF at the first level showed the variables are already stationary. Inflation has been stationary as seen from the probability values in Table 1 equal to 0.0000 which is less than the critical value of 5 percent, while the unemployment variable has also been stationary as seen from the probability values in Table 2 at 0.0000 which is smaller than the critical value of 5 percent.

Table 1: Unit Root Test Results Based on the ADF

level			First Different	
Variables	T-statistics	Possibility	T-statistics	Possibility
INF	-5.723693	0.0000	-6.877774	0.0000
5%	-2.960411		-2.967767	
UNP	-1.642579	0.4500	-5.770495	0.0000
5%	-2.960411		-2.921007	

4.2. Optimal Lag Test

There are several parameters that can be used to determine the length of optimal lag, such as AIC (Akaike Information Criterion), SIC (Schwarz Information Criterion), LR (likelihood ratio), FPE (Final Prediction Error) and HQ (Hannan-Quinn Information Criterion). In the calculation results in Table 2, it can be seen the number of optimal lag of this estimate is 3. In the above output asterisk (*) most are in the lag 3 with the lowest AIC value amounted to 11.36 percent.

Table 2: Optimal Lag Test

lag	LogL	LR	FPE	AIC	SC	HQ
0	-159.9228	NA	879.9989	12.45560	12.55238	12.48347
1	-154.8138	9.039051	809.6481	12.37029	12.66062	12.45389
2	-148.0138	10.98451	657.7691	12.15491	12.63879	12.29425
3	-133.7172	20.89504 *	303.1788 *	11.36286 *	12.04030 *	11.55794 *
4	-129.9550	4.919837	318.9559	11.38115	12.25214	11.63197
5	-126.0511	4.504523	339.0737	11.38854	12.45309	11.69509

Note: *Optimal lag

4.3 Johansen Cointegration Test

Cointegration test aims to determine whether there is any long-term equilibrium relationship between two variables. To test for cointegration among the variables that exist, the method used is the method of Johansen Test.

Table 3: Johansen Cointegration Test

Hypothesized No. of CE (s)	Eigenvalue	Trace Statistic	critical Value	Prob. **
none *	0.617478	30.21357	15.49471	0.0002
At most 1 *	0.146195	4.267419	3.841466	0.0388

Note: * Reject the hypothesis at the 0.05 level

In the calculation results in Table 3 by the method of Johansen Test result is that the variable inflation and unemployment have a long-term relationship as seen from Trace Statistic value that has a value greater than the critical value of 5 percent. Trace Statistic values obtained at 30.21357 > 15.49471 so that the hypothesis that there is no cointegration on inflation and unemployment declined.

4.4. Estimation Model VECM (Vector Error Correction Model)

Estimated VECM generate short-term relationships and long-term between Inflation and Unemployment. In this forecast, inflation is the dependent variable, while the independent variable is unemployment. VECM estimates results in analyzing the effects of short-term and long-term dependent and independent variables. Their relationship short-term and long-term shows that that the independent variables affect the dependent variable.

Table 4: Estimation of Short Term and Long Term VECM

Short-term		
Variable	Coefficient	T-Statistic
CointEq1	-0.768715	[-2.30126]
D (INF (-1))	-0.272907	[-1.00372]
D (INF (-2))	-0.171587	[-0.93295]
D (UNP (-1))	-1.299613	[-0.67434]
D (UNP (-2))	-5.749575	[-2.98715]
C	0.515694	[0.21471]
Long-term		
Variable	Coefficient	T-Statistic
UNP (-1)	-0.726916	[-0.74429]

$$D(INF) = -0.76871462004 * (INF (-1)) - 0.72691567748 * UNP (-1) - 5.24896588048 - 0.272906562545 * D(INF (-1)) - 0.171586559241 * D(INF (-2)) - 1.29961272225 * D(UNP (-1)) - 5.74957504288 * D(UNP (-2)) + 0.515694381799$$

$$D(UNP) = 0.0529150881999 * (INF (-1)) - 0.72691567748 * UNP (-1) - 5.24896588048 - 0.0321599961043 * D(INF (-1)) - 0.029892635641 * D(INF (-2)) - 0.0981925576395 * D(UNP (-1)) - 0.142015191057 * D(UNP (-2)) + 0.0885862122974$$

4.5. Test Result of Impulse Response Function (IRF) Analysis

Impulse Response Analysis can use impulse response function (IRF). Results of IRF can be seen in the picture. Based on Figure 3, it can be seen that the IRF analysis of variable levels of Inflation and Unemployment levels for the next 10 years are as follows:

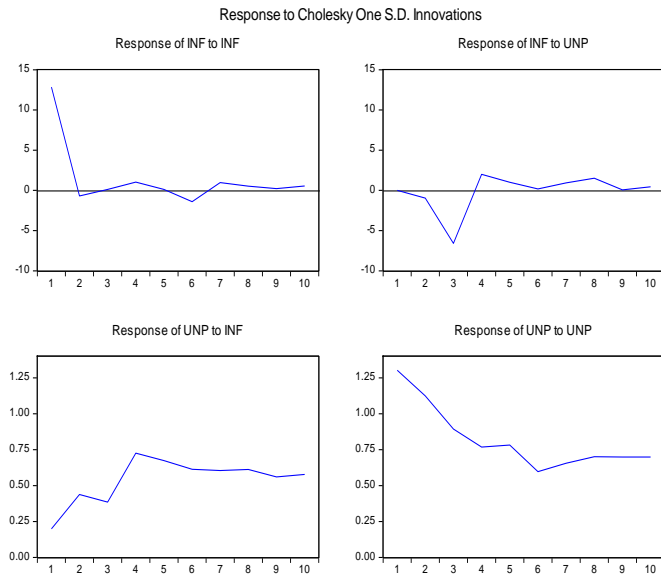


Figure 3: Results of Analysis of Impulse Response Function (IRF)

Inflation rate response to shocks of its own inflation rate in the first year is as high as 12.9, then in the second year it dropped dramatically to - 0.7. However, it fluctuated during the period and reach slightly higher 0 in the end of period.

Inflation rate response to shocks than the unemployment rate in the first year to the second year continued to decline remarkably to -6.6. However in the third year, it rocketed to the highest level in fourth year. Further, in the fifth to eighth response inflation rate to the unemployment rate has fluctuated.

The response rate of unemployment to shocks from the rank of inflation showed an upward trend. in the first year, it was under 0.25 but it rocketed in next four year and reach almost 0.75. However, in the fifth year until the end of period remained stable.

The response rate of unemployment on the unemployment rate experienced a downward trend. In the beginning of period, it was approximately 1.25 and continued to decline dramatically until the sixth year. However, in the seventh to eighth year it had increased slightly and reached almost 0.75 in the end of period.

4.6. Granger Causality Test

Granger Engel Model is a model which is used to analyze the pattern of causality or causation between variables or to indicate whether there is a two-way or one-way inter-specific variables.

Table 5: Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
DUNP does not Granger Cause DINF	28	19.2788	3.e-06
DINF does not Granger Cause DUNP		0.39305	0.7593

From the estimation results in Table 5, the null hypothesis for DUNP does not granger cause DINF, it can be seen that the probability $0.0000 < \alpha (0.05)$ on the lag 3 and the F statistics are amounted to 19.27 percent. From these results, H0 is rejected, inflation causes unemployment or inflation, in other words affect unemployment. For the second result, where the null hypothesis for DINF does not granger cause DUNP, it can be seen that the probability of $0.7593 > \alpha (0.05)$ on the lag 3 with the F-statistics by 4 percent.

From this result, then H0 is accepted, meaning that unemployment does not cause inflation, in other words no effect on inflation. Based on the results of causality test with pairwise granger causality tests can be concluded that there is a one-way causal relationship between the variables of inflation on unemployment variable in Indonesia, where rising inflation each year will affect the unemployment rate annually.

These findings reject what is gained from research Phillips (1958) which states that the rate of change of money wage rates in the United Kingdom can be explained by the level of unemployment and the rate of change of unemployment, It is obtained from the estimated VECM (Vector Error Correction Model) which shows that the unemployment rate did not significantly affect the rate of inflation in Indonesia in the short term and long term. In addition, from the results of granger causality test, relationship was found only in one direction (the inflation rate to the unemployment rate). So we can say that unemployment does not cause inflation.

According to Phillips (1958), the high inflation rate is due to increased aggregate demand so companies need to increase production by increasing capital one labor capital. Therefore, the unemployment rate decreased with increasing rate of inflation. The rising level of inflation in Indonesia is caused by the rise in prices of basic commodities and fuel, addition, most companies in Indonesia applying capital intensive not labor-intensive, so the employment growth is smaller than the labor force growth. Therefore, high inflation rate will be followed by a high level of unemployment as well.

Research conducted by Touny (2013) in Egypt showed that the Phillips curve is also not applicable, because a lot of foreign workers who enter the labor market. In Egypt, the unemployment rate remains high despite Egypt's high inflation rate. This indicates that in the period of observation Egypt were facing a stagflation. Data on the number of foreign workers obtained from the Ministry of Labor (2018) states that nearly 90 thousand foreign workers are working in Indonesia. Foreign workers who work in Indonesia are mostly in the service sector, and the industry.

Hula (1991) states that the shock could cause a shift of the Phillips curve. On IRF test (Impulse Response Function), response rate of inflation to shocks of its own inflation rate in the first year is as high as 12.9 then in the second year dropped to - 0.7. Then up to the sixth year, the response to the shocks of inflation itself fluctuated up and down. In the year to seven to ten years, seen the inflation response to shocks of inflation itself increasingly towards equilibrium. While the response rate of inflation to shocks than the unemployment rate in the first year to the second year continued to decline to - 6.6. However, the response rate of inflation to shocks increases in the third year until the fourth year. Then, in the fifth to eighth response inflation rate to the unemployment rate has fluctuated up to the tenth year the unemployment rate does not give effect to the inflation rate

The response rate of unemployment to shocks from the rank of inflation in the first to fourth continues to increase until 0.726. However, in the fifth year until the tenth year has decreased. This shows the reaction given by the unemployment level of the inflation rate is likely to weaken and ultimately inflation rate did not affect the unemployment rate. Then in response to the unemployment rate on the unemployment rate itself continued to decline until the sixth year. Although in the seventh to eighth had increased, but in the ninth to tenth year declined.

From the foregoing discussion, that the unemployment rate did not affect the rate of inflation in Indonesia. This implies that the unemployment rate is not the main driver in the level of inflation. The high inflation rate tends to be caused due to the rising price of food and fuel and not due to an increase in aggregate demand.

5. Conclusion

The results show that unemployment rate did not affect the rate of inflation in the short-term and long-term. While the views of causality test results are one-way causality from inflation to unemployment so that it can be concluded that unemployment does not cause inflation. The results of Impulse Response Function (IRF) test show that the inflation rate fluctuates in response to the shock of

unemployment. The unemployment rate responses to shocks from the inflation rate were initially increased until it is eventually diminished. It shows that the shocks caused by the inflation rate are only in the short term. The high inflation rate in Indonesia is not caused by unemployment. High inflation is caused by the rising price of basic commodities and fuel. In addition, most companies in Indonesia applying capital intensive so that employment growth in Indonesia is small. The number of foreign workers who enter Indonesia also increase the likelihood of rising unemployment for local labor who lost in the competition.

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