Does Phillips Curve Apply in ASEAN Countries?

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Abstract- This study aims to prove again whether the applied Phillips curve occurred in 10 ASEAN countries namely Indonesia, Philippines, Malaysia, Singapore, Brunei Darussalam, Thailand, Vietnam, Laos, Cambodia, and Myanmar over the past ten years (2008-2017). The research is quantitative and is processed using the dynamic panel data method. The results of the study are in the short and long term there is a trade-off between the variables of inflation and unemployment, so it is concluded that the Phillips curve applies in 10 ASEAN countries.

Index Terms- inflation, unemployment, Phillips curve, dynamic panel data.

I. INTRODUCTION

Inflation and unemployment are the macroeconomy indicators to see a country's economic stability. For the last few years, unemployment is highly increasing and the opportunity to get a job is becoming more difficult. Most economists agree that in the short-run, there is an inverse relationship between unemployment and inflation. While in long-run, such a relationship does not exist. Inflation is simply defined as the increase in the prices generally and continuously. Inflation can be the effect of both demand and supply, so the approaching policies to control it should consider both sides. On the demand side, the inflation control is needed to keep the people's purchasing power, while on the supply side, the inflation control is needed to maintain the production costs to keep the businessmen surviving and competing. If the inflation is uncontrolled, the businessmen will dismiss their employees and such action will increase the unemployment. Unemployment is an unavoidable problem of a country and it may lead to social problems such as crimes as well as economic problems. The condition may decrease people's well-being and their purchasing power.

Both variables are economically related. When unemployment is high, inflation is low and vice versa (Umaru & Zubairu, 2012). Every economy will put an effort to maintain both at a low level, mostly in one-digit level, because by then, the country's macroeconomic policy tends to be stable. The stability is important to achieve the economy's growth and development effectively, as well as to reach the economic goals and objectives (Orji, Orji-Anthony, & Okafor, 2015). Inflation and unemployment are very important to any economic growth and development. Both factors are especially used in assessing the poverty level in a developing country. Thus, the countries will be encouraged to escalate their production level to help to reduce the inflation effect in the economy. Besides, the increase in goods and services will raise the living standard, hence creating social harmony in a country.

Inflation and unemployment cannot be totally eradicated, but both can be controlled using the policy instrument. Certain inflation and unemployment are needed to maintain the market's equilibrium. The relationship between unemployment and inflation is stated in a Phillips curve, in which there is a trade-off between both variables. The classic economist defined the long-run Phillips curve as a natural unemployment level in an economy. This explains that in the long-run, inflation and unemployment are not meant to be related (Phillips, 1958). The validity of the Phillips hypothesis was examined by Furuoka & Munir (2014) in Malaysia, but the study finding of Al-zeaud (2014) in Jordan concluded that there is no causality between unemployment and inflation. This study also found that the Phillips curve did not apply to Rusia (Alisa, 2015). Such findings raise questions, how about countries of ASEAN?. ASEAN (Association of Southeast Asian Nations) is an international organization in Southeast Asia consists of Indonesia, Philippines, Malaysia, Singapore, Brunei Darussalam, Thailand, Vietnam, Laos, Cambodia, and Myanmar. Most ASEAN countries are developing country, with an exception of Singapore and Brunei Darussalam who have a high income per capita. Countries in ASEAN most definitely have inflation and unemployment problem at different magnitudes, both in short-run and long-run. Based on the problem, this study aims to review the relationship between inflation and unemployment in ten ASEAN countries.

II. LITERATURE REVIEW AND HYPOTHESIS

Many pieces of research about inflation and unemployment have been conducted in developed countries. Inflation is described as an economic situation when the increase in the money supply is faster than the production of new goods and services in the same economy (Hamilton, 2001). Inflation is further described as a sustained rise in prices of goods and services within a certain period (Balami, 2006). According to Keynes theory, inflation occurs because people spend beyond their economic ability. This theory highlights how the struggle for economic resources between groups of people can lead to aggregate demand that is greater than the number of goods available. The inflation rate can digger between one country to another, or within a country in a different time period. According to its rate, inflation is divided into three categories: creeping inflation, galloping inflation, and hyperinflation.

Creeping inflation is characterized by a low rate of inflation (less than 10 percent per annum). The price of increase rises slowly with a low percentage in the relatively long time period. Galloping inflation is characterized by the exceptionally high price rises (around double or even triple digit) and sometimes occurs in a relatively short time period and is accelerated. It means that the prices of this week/month are higher than last week/month. It damages the economy greater than creeping inflation. The hyperinflation is the most damaging inflation. The prices may rise 5 or even 6 times higher. People will no longer want to keep their money. The money value drops sharply that it is better to be exchanged with goods. The circulation of money is faster as the prices rise in acceleration. This situation is most likely comes when the government experiences a budget deficit that is solved by printing more money.

The Phillips Curve states that there is a trade-off between inflation and unemployment. It means that when inflation is high, the unemployment will be low and vice versa. In such a case, unemployment becomes the output and inflation is described as the change of prices. The condition when the unemployment is simultaneously high followed by the high inflation is called the stagflation. A. W. Phillips (1958) described how the relationship between the inflation and unemployment level is based on the assumption that inflation is the depiction of the aggregate demand increases. When the aggregate demand increase, it would suit the theory of demand that if the demand rises, the prices will rise too. The high price (inflation) will encourage the producers to increase the production capacity by adding more manpower (in an assumption that manpower is the only input that can increase the output). As the effect of the increase in demand for manpower, the price will rise (inflation) and the unemployment will decrease.

The study about the relationship between the unemployment level and the inflation that is in line with the Phillips curve has been done in various countries. Furuoka and Munir study in Malaysia found that there is a strong relationship between the unemployment level and inflation using the error correction model (ECM) approach within 30 years time period (1975-2004). A study conducted by Al-Zeaud (2014) using the Granger causality investigated that there was no trade-off between the unemployment and inflation in the economy of Jordan within 28 years time period (1984-2011). This study recommended the productive projects creation and intensive labors, replace the foreign labor with local labor, as well as keep controlling the inflation to solve the unemployment. The same occurrence happened in Russia in the study finding by Alisa (2015) that used two time approaches, long-run (1999-2015) and short-run (January until December 2014). The study finding shows that a certain level of inflation and unemployment is needed to maintain the equilibrium of the market and the Phillips curve does not really apply to Russia modern situation. Research by Ningsih (2010) also found that there is no relationship between inflation and unemployment level in Indonesia, as well as study finding by Qomariyah (2013) in East Java. Based on the Phillips theory and previous empirical research, the hypothesis built in this study stated that the unemployment level significantly affects inflation.

The main source of inflation and unemployment is fiscal and monetary policies as well as the balance of payments. The increase of circulation money causes monetary policy inflation while the fiscal policy especially involves the deficit of budgets. The fiscal policy inflation also closely relates to the aforementioned explanation about the monetary policy inflation because the printing of money mostly used for paying the government deficit. Furthermore, in the balance of payment aspect, the high exchange value is also important. This is because the increase of the exchange value leads to the increase of import prices as well as escalate the inflation expectation that will cause inflation (Umaru, Donga, & Musa, 2013). A study conducted on the inflation and unemployment in UE within 1998-2007 time period found that there was a negative relationship between inflation and unemployment (Popovic & Popovic, 2009). Another study conducted using the economic situation in Nigeria found that there was no tradeoff between both factors (Abachi, 1998). There was also an examination in the relationship between money, inflation, and output using the co-integration and the granger's causality test. The study showed that the co-integration vector was unavailable in the series used. Granger concluded that the money supply caused output and inflation. It further confirmed that the monetary policy has a bigger input in the stability of prices in the economy of Nigeria just because the variation of the price level was highly affected by the money supply. Therefore, the inflation in the economy will especially become a monetary problem (Omoke & Ugwuanyi, 2010). The inflation has an alarming effect especially on the fixed incomes in an economy; this will drastically affect the people's living standard because it causes the decreases of real income, saving, and capital form (Buhari, 1987). The economic

growth is greatly affected by the inflation hence the limitation of economic development in a country will trouble the population (Adamson, 2000).

III. RESEARCH METHOD

This is quantitative research using secondary data. The data analysis method used was the dynamic panel data analysis mode. The Error Correction Model (ECM) is a short-run balance that requires the co-integration relationship between variables. The estimation of the short-run was previously conducted after estimating the long-run. The variables of this study were inflation and unemployment. According to the Bank of Indonesia, inflation is simply defined as the increase of the prices generally and continuously in a certain time period. In this study, the inflation variable is stated in percentage. According to the Central Bureau of Statistic, in the employment indicator, the unemployment is the resident, who does not work but is looking for a job or is preparing for a business, or the resident who does not look for a job because he has been accepted to work but has not started working. In this study, the unemployment variable is stated in a percentage. The model specification of the long-run relationship formulation was stated in the following equation:

$$\text{Log INF}_{it} = \beta_0 + \beta_1 \text{LogUNM}_{it} + \varepsilon_i \;..\; (1)$$

While the formulation of the short-run relationship was stated in this following equation:

$$\text{DLogINF}_{it} = \beta_0 + \beta_1 \text{DlogUNM}_{it} + \beta_2 \text{BlogUNM}_{it} + \beta_3 \text{ECT} \;........................\; (2)$$

In which
INF	= inflation
UNM	= unemployment
B	= operation lag
D	= changes
DLogINF	= LogINF- BLogINF
DLogUNM	= LogUNM - BLogUNM
BLogINF	= Log INF – LogINF-1
BLogUNM	= LogUNM - LogUNM-1
ECT	= LogUNM-1 - LogINF-1
β_1, β_2	= coefficient
i	= cross section
t	= time series
ε_i	= the error component on the unobservable individual specific effect.

IV. RESULTS AND DISCUSSION

Before doing a regression using the ECM test, we had to make sure that the variables used had been stationer. An initial test was conducted to test all the variables using the unit roots test, with the result as follows:

Table I: The Estimation Result of Unit Roots Test on Inflation (INF) Variable at the Level Difference

Test	Probability value	Significance level	Conclusion
LLC	0,0000	0,05	Stationer
IPS	0,0000	0,05	Stationer
ADF	0,0000	0,05	Stationer
PP	0,0000	0,05	Stationer

Table II: The Estimation Result of Unit Roots Test on Unemployment (UNM) Variable at the Level Difference

Test	Probability value	Significance level	Conclusion
LLC	0,0000	0,05	Stationer
IPS	0,2385	0,05	Not Stationer
ADF	0,1700	0,05	Not Stationer
PP	0,1010	0,05	Not Stationer

Based on the estimation result on table I and II in the level stage, the finding showed that the data used in inflation variable was stationer, but only one test in the unemployment variable data that was stationer, so it can be concluded that the data in the unemployment variable was not stationer yet. The variable had not been stationer because its probability value or statistic value was bigger than significance level 5%. Therefore, the test was continued by the first level integration test, which was the higher unit roots test to get stationer data. The integration level test was done because there was a variable that had not been stationary on the previous test. An integration level test with level 1 unit roots test (first difference) was then conducted and resulted in this following finding:

Table III: The Estimation Result of Unit Roots Test on Inflation (INF) Variable at the 1st Difference

Test	Probability value	Significance level	Conclusion
LLC	0,0000	0,05	Stationer
IPS	0,0000	0,05	Stationer
ADF	0,0000	0,05	Stationer
PP	0,0000	0,05	Stationer

Table IV: The Estimation Result of Unit Roots Test on Unemployment (UNM) Variable at the 1st Difference

Test	Probability value	Significance level	Conclusion
LLC	0,0000	0,05	Stationer
IPS	0,0000	0,05	Stationer
ADF	0,0000	0,05	Stationer
PP	0,0000	0,05	Stationer

Based on the estimation result on the tables above with the integration degree test using unit roots test level 1 (first difference), it can be seen that all the variables tested were stationer, which was seen by their probability values that were lower than the significance level 5%. It could be concluded that all the variables were stationer on the 1st level of unit roots test (first difference). Because all the variables were stationer, a co-integration test (Johansen) was conducted to see the variables in the long-run. The result of the co-integration test is shown in table V. The variables were co-integrated or were considered to have a long-term relationship when their probability value was less than the significance level of 5%. Then, based on the finding on table V, it can be seen that the probability value of PP panel and ADF panel were less than 5%, which were 0.0403 and 0.00269; it showed that the observed variables had a long-run relationship or were co-integrated. Furthermore, an estimation of co-integration panel balance and error correction method was conducted in the short-run through regression panel.

Table V: Residual Pedroni Co-integration Test

Pedroni Residual Co-integration Test				
Series: UNM INF				
Null Hypothesis: Co-integration				
Trend assumption: No deterministic intercept or trend				
Automatic lag length selection based on SIC with a max lag of 1				
User-specified bandwidth: 2 and Bartlett kernel				
Alternative hypothesis: common AR coefs. (within-dimension)				
	Statistic	Prob.	Weighted Statistic	Prob.
Panel PP-Statistic	-1.747673	0.0403	-5.521034	0.0000
Panel ADF-Statistic	-1.530677	0.0269	-5.299156	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
	Statistic	Prob.		
Group PP-Statistic	-2.626787	0.0043		
Group ADF-Statistic	-2.436556	0.0074		

The ECM test was conducted to find out whether the independent variable affected the dependent variable in the short-run period. According to the previous tests, the variables were stationary on the first difference and the variables were co-integrated, so the ECM estimation was then conducted to the variables. The ECM estimation equation used was stated as follows:

$$DLINF_{it} = \beta_0 + \beta_1 DLUNM_{it} + \beta_2 BLUNM_{it} + \beta_3 ECT \quad .... \text{ (3)}$$

The ECM estimation equation in short-run finding was shown in table 6. The estimation finding was stated in a short-run ECM regression equation as follows:

$$DLINF_{it} = 0,428722 - 1.407346 DLUNM_{it} - 0,555122 BLUNM_{it} + 0,560572 ECT \quad ....(4)$$

Based on the calculation with ECM analysis above, we found out the ECT variable value, in which ECT was used as the indicator that the model specification was considered as good or not according to the significance and the coefficient of the error correction (Insukindro and Aliman, 1999: 54). Came from the ECM linear regression function above, it could be seen that the ECT coefficient value (error correction term) was 0. 560572. It means that the proportion of the cost of imbalance in the inflation development to the unemployment on the previous period which was suited to the current period was around 0. 560572%. Assessed by its significance level, the ECT showed 0.0000 values which were significant on 5% level. It means the model specification was valid and indicated a short-run and a long-run relationship.

Table VI. ECM Test Result

Dependent Variable: D(LINF)
Method: Panel Least Squares
Periods included: 9
Cross-sections included: 10
Total panel (unbalanced) observations: 77

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.428722	0.176843	2.424303	0.0178
D(LUNM)	-1.407346	0.605506	-2.324247	0.0229
LUNM(-1)	-0.555122	0.137226	-4.045323	0.0001
LUNM(-1)-LINF(-1)	0.560572	0.093357	6.004606	0.0000
R-squared	0.362101	Mean dependent var		-0.121312
Adjusted R-squared	0.335886	S.D. dependent var		1.090739
S.E. of regression	0.888878	Akaike info criterion		2.652838
Sum squared resid	57.67766	Schwarz criterion		2.774594
Log-likelihood	-98.13425	Hannan-Quinn criter.		2.701539
F-statistic	13.81271	Durbin-Watson stat		1.776454
Prob(F-statistic)	0.000000			

The constant value on the short-run was 0.428722 according to the estimation above, which indicates that the change of inflation on the unemployment was 0.428722% if all the explanatory variables were zero. The ECM estimation result above showed that in the short-run, the unemployment variable has a negative and significant relationship with the inflation rate. On the short-run, the coefficient of unemployment variable was -1.407346 with a probability value of 0.0229 which means it is insignificant on the significance level 5%. After the ECM estimation result on the short-run was obtained, the next step was finding the long-run coefficient. The formula used to calculate the long-run coefficient according to Widarjono (2009) was stated as follows:

Constanta = (β_0 / β_3)

B(LUNM) = (β_2 + β_3) / β_3

Based on the formula and the short-run regression result, the long-run coefficient could be calculated with the result as follows:

$$DL\ INF_{it} = 0,428722 - 1.407346 DLUNM_{it} - 0,555122 BLUNM_{it} + 0,560572 ECT \quad ....(5)$$

The number of long-term regression coefficient was calculated of using this following formula:

Constanta (C) $= (\beta_0 / \beta_3)$

$\qquad = (0.428722 / 0.560572)$

$\qquad = 0.764793817$

BLUNM $= (\beta_2 + \beta_3) / \beta_3$

$\qquad = (-0.555122 + 0,560572) / 0,560572$

$\qquad = -0,009722212312$

Table VII: The Long-term ECM Estimation Result

Variable	Coefficient	T – Statistic	Prob.
C	0.7647	2.4243	0.0178
BLUNM	-0,0097	-4.0453	0,0001

Based on the result shown in table 7, the result of long-term ECM regression was stated as follows:

$$\text{DLINF}_{it} = 0{,}7647 - 0{,}0097\text{BLUNM}_{it} + 0{,}560572\text{ECT} \dots\dots\dots\dots\dots\dots\dots\dots (6)$$

According to the study findings, on the short and long-run, the inflation and unemployment relationship in ten ASEAN countries (Indonesia, Philippines, Malaysia, Singapore, Brunei Darussalam, Thailand, Vietnam, Laos, Cambodia, and Myanmar) is negative and significant. Such finding is in line with the Phillips theory that on the short-run, there is a tradeoff between inflation and unemployment, and is suitable with previous researches by Safdari, Hosseiny, Sachsidaa, Divinob & Cajueiroc (2011), Prado, Rao & Sheremirov (2018), as well as the study by Furuoka (2007) and Furuoka & Munir (2014) in Malaysia, the study by Insukindro & Sahadewo (2010) in Indonesia, the study by Erdal, Dogan, & Karakas (2014) in Turkey, as well as the research by Singh (2016) in India and Bhattarai (2016) in OECD countries.

ASEAN (Association of Southeast Asian Nations) is a geopolitical and economic organization found by the countries in Southeast Asia with the objective to improve the economic growth, develop the cultures of the member countries, maintain the stability and the peace as well as provide the opportunity to the members to discuss the differences peacefully. The countries in Southeast Asia are mostly developing countries, which are the countries that are developing anything inside, including the governmental system and the economy. Even though most of the countries are developing countries, there is also a developed country in Southeast Asia, which is Singapore. The economy in Singapore is supported by the service sector, manufacture, and construction that it takes up a lot of manpower. The increasing inflation rate in 2011 was caused by the housing and car prices that were relatively high.

Another ASEAN country, Indonesia, has a characteristic inflationary behavior given its nature or characteristic as a developing country, which has imperfect information or problematic institutions. Indonesia also has an open economy so that any internal or external shock may contribute to inflation. An in-depth knowledge regarding the factors that influence the inflation behavior in Indonesia is extremely necessary (Insukindro & Sahadewo, 2010). The relationship between the unemployment level and inflation level in Malaysia may be an interesting example. There is an inverse relationship between the unemployment level and inflation level. In the 1970s, the unemployment level of Malaysia was above 5%. In 1981 and 1982, it decreased to below 5%. Since 1983, the unemployment level has gradually increased and reached 8.7% in 1987. However, since 1988, the unemployment rate was declining due to the economic boom and it reached 2.6% in 1997. From 1998 to 2004, the unemployment rate remained around 3.5% (Furuoka, 2007). Compared to the unemployment rate, there were greater fluctuations in the inflation rate in Malaysia between 1975 and 2004. In the second half of the 1970s, the inflation rate in Malaysia was around 4%. In 1980, the inflation rate increased and reached 6,6% and continued increasing to 9.7% in 1981. However, since 1982 the inflation rate has declined and reached less than 1% in 1985. In the first half of the 1990s, the inflation rate was stable at 4%. Because the Asia economy was on the crisis in 1997, the inflation rate in Malaysia increased to 5.2% in 1998. From 2000-2004, the inflation rate was stable and remained at around 1.5% (Furuoka, 2007). Inflation and unemployment are the important measures of the economic performance and they are often seen through the Phillips curve. The Phillips Curve reflects the short-run aggregate supply curve that can affect the aggregate demand curve through monetary and fiscal policies. At all times, expected inflation and the supply shocks can be out of control of policymakers. However, by changing the aggregate demand, policymaker may change output, unemployment, and inflation (Mankiw, 2007).

The Phillips Curve does not only have a strong theoretical basis but also implies politic. There is a little doubt that one of the main policy targets of the Central Bank is stabilizing the price by controlling inflation. Many central banks tend to use the monetary-fiscal to keep the inflation target as low as possible. However, if the tradeoff between inflation and unemployment occurs, the central banks are able to keep the low inflation level just by sacrificing high unemployment. In other words, the governors of the central bank will face a serious dilemma to decide whether they would like to have the combination of low inflation and high unemployment, or vice versa. In this context, the "Phillips Curve" becomes an important criterion for the decision makers of the central banks until 1980 when that hypothesis was strongly argued by several economists that owned different thoughts. This is a warning to policy makers (government) on how far they are able to reduce the inflation rate or the unemployment rate without too much-risking others because of the tradeoff relationship between these macroeconomic variables.

On the other hand, the high unemployment rate problem has become the only important political issue in many countries including ASEAN countries. The political leader in ASEAN countries may be worried about the high unemployment rate in their countries. They may be against the central bank initiative to stabilize the price market if such monetary fiscal negatively impacts the unemployment rate. In other words, the central bank and the political leader may have a different opinion about the consequences of the price stabilization policy. At every point of time, the policy makers who control the aggregate demand may choose the combination of inflation and unemployment. The high inflation causes the side attitude in capital flows and the loss of purchasing power in personal income as well as an increase of needs for external sources. In addition, it may cause the income distribution gap. The phenomenon of unemployment is easier to understand compared to the direct effect of inflation on society. This may lead to destructive social patterns, cause social unrest, and diverse family integrity. For this reason, it seems like the better idea for macroeconomic policymakers to pay attention to the reciprocal interaction of these two factors instead of making choice between them. It seems that this is the best way to keep the inflation rate at an optimal and stable level by economic means and to state a natural and appropriate unemployment rate. Thus, there is a need for strong institutional collaboration and inter-ministerial relations to handle these macroeconomic variables.

V. CONCLUSION

According to the study findings, on the short and long run, the inflation and unemployment relationship in ten ASEAN countries (Indonesia, Philippines, Malaysia, Singapore, Brunei Darussalam, Thailand, Vietnam, Laos, Cambodia, and Myanmar) were negative and significant. This finding is in line with the Phillips theory which states in the short-run there is a tradeoff between inflation and unemployment. On the other hand, the high unemployment problem seems to become the only important political issue in many countries, especially the ASEAN country. The political leader in ASEAN countries may worry about the high unemployment rate in their countries. They may be against the central banks initiative to stabilize the price level if the monetary policy negatively impacts the unemployment rate. In other words, the central bank and the political leader may have a different opinion on the consequences of the price stabilization policy. Based on the study findings, there are some suggestions of alternative policies such as utilizing the modern technology efficiently to create more sustainable job and increasing the wage of the labor, as well as developing the infrastructure especially electricity, which in turn may generate employment.

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