Analysis on Unemployment and Inflation in Indonesia for The Periode of 1980 -2016 using Philipps Curve Approach

Sarastri Mumpuni Ruchba*, Fakhry Hadiyan

Faulty of Economics, Universitas Islam Indonesia, Yogyakarta
*Corresponding author: sarastri.mumpuni@uii.ac.id

Abstract

This research was carried out using annual report data on the employment level and Consumer Price Index obtained from Indonesian Statistics Book of 1980-2016 published by Central Bureau of Statistics (BPS, Ind) aimed to look into the relationship between unemployment and inflation in Indonesia in the period of year 1980 – 2016. The analysis method used is *Vector Error Correction Model* (VECM), which is a restricted VAR model, because of the existing cointegration that presented the long period relationship between the unemployment and inflation variable rate in VAR model. VECM could analyse the long and short period inter variable relationship. The result of the analysis showed the significant presence of negative relationship with the IHK within the short period of the lag 2 unemployment variable rate. Hence, within three years (lag 3) the IHK variable and the unemployment rate significantly affected each other with a positive relationshipship. In the long period, the unemployment rate variable had a positive influence to the IHK variable. Furthermore, the *Impluse Response Function* (IRF) explained the effect of the shock on one variable towards another variable. At the first to the second period the IHK variable had not responded to the given shock, while it experienced a negative decrease in the third period. At the fourth period the IHK variable responded towards the positive, and then the trend pointed out at a positive realationship until the tenth period.

Keywords: Phillips Curve, Unemployment Rate, Inflation, Consumer Price Index, *Vector Error Correction Model* (VECM).

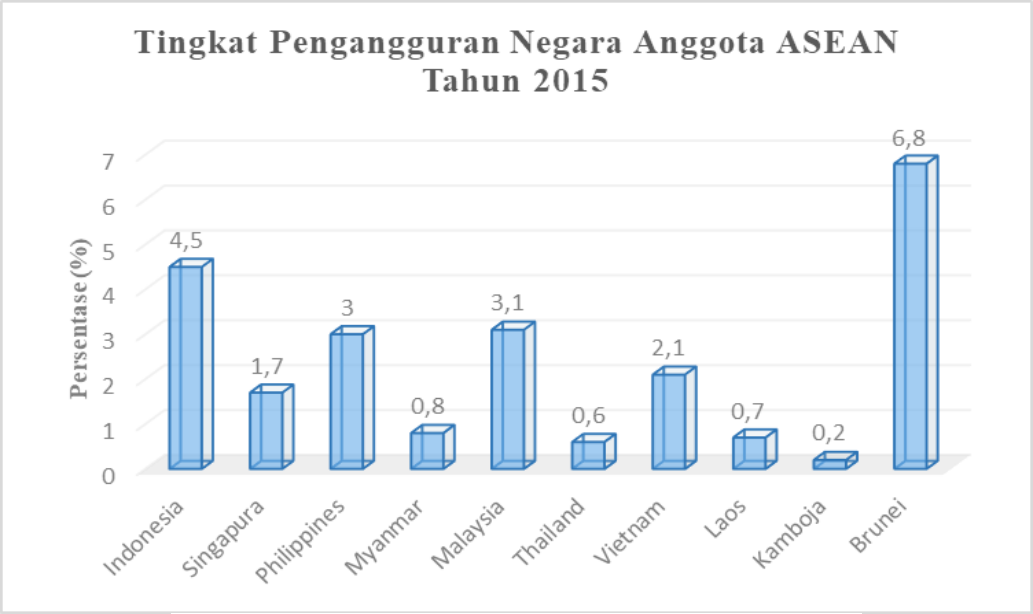
Introduction

Low absorption of labor and the periodically raise of products price is a problem in a country's economy. This can cause poverty, due to the per capita income and the increasing price of basic needs. To overcome this problem an economy policy of a country is highly required. In general, the economy policy carried out by each country is aimed to achieve high employment, stable price and rapid economic growth (Friedman, 1968). In the implementation economy is devided into two i.e. monetary policy and fiscal policy.

Monetary policy is an integral part of a macro economy policy. The monetary policy is aimed to support the achievement of macro economy target that is high economic growth, price stability, equitable development and balance of payment. (Iswardono, 1997). Price stability is meant by low inflation rate. Economic growth was implied on its ability to absorp labor because of the output increase produced by the existing sectors. It means ideally unemployment and low inflation rate were required for the man welfare. However, the empirical data showed the *trade-off* presence between the two target whereas the decrease of inflation reta will be followed by the increased of unemployment rate. *Trade off* between unemployment and inflation rate was pointed out for the first time by Philips (1958) in the British economy in the 1861-1957 period. The observation result carried out by Philips is known as Philips Curve (Samuelson, 2004).

Looking into the unemployment data and work-force in 2016, Indonesia had a total of 7.03 million unemployment out of 124.44 million of work-force. Further, due to the *International Labour Organization* (ILO), data in 2015, Indonesia was a country with highest unemployment rate, second in Southeast Asia (Fig. 1, pg.3). According to ILO in 2015, Indonesia had 4.5% unemployment rate compared to other countries that are member of to *Association of Southeast Asian Nations* (ASEAN), Indonesia has higher unemployment rate compared to Malaysia,

Singapore, Thailand, Philippines, Cambodia, Laos, Myanmar and Vietnam. Obviously, compared to other ASEAN countries, the Indonesian government had not maximally resolved this unemployment problem.



Source: www.ilo.org, processed using Microsoft Excel 2013

Figure 1. ASEAN Countries Unemployment Rate in 2015

According to Bank Indonesia (www.bi.go.id) the inflation rate in Indonesia was 3.02% and was considered mild inflation rate. However, in 1997 during the monetary crisis, Indonesia experienced a heavy inflation rate that reached 11.05% and later increased to 77.63% in 1998 (BPS, Indonesian Statistics).

This was also followed by the tendency of post crisis increasing unemployment rate. The tendency of increasing unemployment rate needed to be seriously looked into by the policy maker that is the government. This is because unemployment is a serious fundamental problem for macro as well as micro economics.

Bank Indonesia as the executor of the monetary policy in Indonesia in controlling inflation, working under the frame work called *Inflation Targeting Framework* (ITF). This framework has been implemented since July 2005, while previously *Base Money* policy was implemented as the monetary policy target (bi.go.id). The monetary policy implemented by Bank Indonesia was to achieve a controlled inflation.

Based on the Finance Minister Regulation (PMK) No. 93/PMK.011/2014 on the inflation target in year 2016, 2017 and 2018 dated 21 May 2014 the inflation target set by the government was 4%, 4%, and 3.5% respectively with 1% deviation.

In the fiscal policy, one of the policies implemented by the government was arranging for the State Budget (APBN) On of the target of the State Budget Plan 2017 was reducing the unemployment, assuming the Indonesian Government simultaneously would like to have a controlled inflation (lower tendency) and reduced the unemployment. Of course, this was not analogous to the theory presented by Philipps in the Philipps Curve that stated there was *a trade–off* between inflation and unemployment. Therefore, proof was needed on the presence of Philipps curve in Indonesia for the Indonesian government policy effectivity in pressing the inflation and reducing the unemployment.

Literature Review

Inflation

Inflation is a tendency of prices to rise in general and continuously (Sukirno, 2004). However, if the price rises only for one or two products it could not be called as inflation, except if the price raise spread or resulting the rise of prices of most of the other products. (Boediono, 2011). The products price rise does not have to be at the same percentage. Inflation is a continuous rise of price and the price rise occurred at the entire products and services group (Pohan, 2008). It could be possible that the price did not rise simultaneously, however it is positive that inflation is the continous rise of products prices in a certain period. A price raise that occurred only once, even in a big percentage is not an inflation (Nopirin, 2000).

According to Milthon Friedman, inflation is a monetary phenomenon that happened anywhere and unavoidable. Inflation is said tobe monetary phenomenon only if a price rise occurred fast and continuously. This was agreed by many monetarist economist (Mishkin, 2004).

There are some macro economy indicators to measure the inflation flow within a certain period, among others are:

a. Consumers Price Index

Consumers Price Index is the index number that indicated the product and service price rate that has to be bought by a consumer at a certain period. The Consumer Price Index number is obtained through calculating the prices of products and service consumed by the people at a certain period. Each of products and services were valued based on its priority. The product and service considered very important were given high value.

According to Bank Indonesia the inflation is measured using Consumers Price Index. In Indonesia it is grouped into seven (7) groups of purpose based on the *Classification Of Individual Consumption By Purpose* (COICBP), those are food stuff, processed food, beverages and tobacco, housing, clothing, health, education and sport, and transportation and communication groups.

b. Wholesale Price Index

Wholesale Price Index also known as Producer Price Index, look into inflation from the producer view and emphasized more on the number of products at the wholesaler level. This means that the price of raw ingredients, raw material and semi finished material, were included into the calculation. The measurement used to calculate the Producer Price Index was the sale

c. Gross National Product Deflator /Deflator GNP

GNP deflator covered a number of product and service that included into the GNP calculation. GNP Deflator is obtained by deviding the nominal GNP (based on the applied price) with real GNP (constant price) then this can be interpreted as part of the whole GNP components (consumption, investment, government expenses and netto export) (Nugroho, 2012).

Unemployment

Unemployment is a criteria implemented to one who does not have an occupation but whithin the last four weeks is actively looking for a job (Kaufman dan Hotchkiss,1999). According to the Central Bureau of Statistics (BPS) in the employment indicator (www.bps.go.id) , unemployment is one who does not have an occupation but is looking for a job or preparing for a new business or one who does not look for a job because he has already a job but has not started working as yet.

Unemployment is a situation where one who belongs to a working force woud like to have a job but they have not got the job yet.(Sukirno, 2004). Unemployment may take place because of unbalanced working force market. This presented that number of working force is exceeded the required number of working force. One who does not work but not actively

looking for a job does not consider as unemployed. The main factor that caused unemployment is lack of agregate spending.

Businessmen produced goods and services looking for profit. The profit coud only be earned if their products were sold. The higher the demand, the larger goods and services they produced. The increased production will require additional working force. In this regard, there is a close relationship between the achieved Gross Domestic Product (GDP) with the recruited working force. The higher the Gross Domestic Product (GDP) is, the larger number of working force recruitment in economy.

Philips Curve

In 1958, A.W. Phillips an economist, published an artcle entitled *"The Relationshipship between Unemployment and the Rate of Change of Money Wages in United Kingdom 1861-1957"*. In the article Phillips showed a negative corelationship between unemployment rate and inflation. Phillips showed that there was a tendency that in years where the unemployment rate was low it would be followed by high inflation rate, whereas in years where the unemployment rate was high there was a tendency that it would be followed by a low inflation rate(Samuelson,2004).

A.W. Phillips (1958) in Mankiw (2012) described the relationship distribution between inflation and unemployment rate based on the assumption that inflation was a reflextion of the presence of an increased of aggregate demand. The increased aggregate demand, adapted to the demand theory that is if the demand increased the price will also rise. Due to the high price (inflation) to fulfil the demand producers will increase production capacity by increasing the number of the working force (working force was the only input that may increase the output). As the result of increasing demand for the working force, the prices will increase (inflation) this will reduce unemployment.

Research Method

A quantitative secondary data which is a time series data was used in the research. Unemployment level data, inflation data and Consumers Price Index (IHK) were obtained from the Central Bureau of Statistics. The Central Bureau of Statistics issued a publication called "Statistik Indonesia".

Data Analysis Method

The research used the time series methodology and *Vector Auto Regression* (VAR) or *Vector Error Correction Model* (VECM) approach.

VAR model forming was preceded with stationarity test, where the regular VAR (unrestricted VAR) will be obtained if the data is stationaired at the level rate. However, if the data was not stationaired at the level rate, but stationaired at similar differentiation process, then a cointegration test should be carried out to detect if the data had a long period relationship or nor.

If the data was stationaired in the differentiation process but not cointegrated, then the VAR model could be formed using differentiation data (VAR in difference) However, if there was a cointegration then Vector Error Correction Model (VECM) which was a restricted VAR model, was formed, considering there was a cointegration that showed the long relationshipship among the variables in VAR model.

VECM Specification restricted the long period relationship between the variable so that it would converged into a cointegraetd relationship while still let a short period dynamical change. The periodinology for this cointegration is known as an *error correction*, because should a deviation take place on the long period balance, it would be corrected through gradual short period partial adjustment. The model that would be used in observing causality relationship betwn inflation and unemployment rate in this research referred to the following model developed by Rousseau and Xiao (2007):

$$X_{1,t} = a_{1,0} + \sum_{i=1}^{k} a_{1,i} X_{1,t-i} + \sum_{i=1}^{k} b_{1,i} X_{2,t-i} + \mu_{1,i}$$

$$X_{2,t} = a_{2,0} + \sum_{i=1}^{k} a_{2,i} X_{1,t-i} + \sum_{i=1}^{k} b_{2,i} X_{2,t-i} + \mu_{2,i}$$

Notes:
X_1 = Consumers Price Index
X_2 = Unemployment rate

Result and Discussion

Level Unit Root Test Result and *First Difference*

Table 1. ADF Test Result Using Level Grade Intercept

Variable	t-Critical		
	Level	Mackinnon (5%)	Prob.
Unemployment Grade	-1,47913	-2,945842	0,5326
Consumers Price Index	3,354621	-2,945842	1,0000

Source: Microsoft Excell Processing and Eviews 10 Student Version.

Table 1 explained that the Unemployment rate and the Consumers Price Index were not stationair and the level grade. This condition could be concluded that the variable of ADF t-statistic profitability on Unemployment level is lower than the Mackinnon Critical Value.

Table 2, explained that the unemployment variable level and the Consumers Price Index were stationary at the *first difference* level. This condition could be concluded that the variable of ADF t-statistic profitability on Unemployment level is lower than the Mackinnon Critical Value.

Table 2. ADF Test Result using *First Difference* Level Intercept

Variable	t-critical		
	1st	Mackinnon (5%)	Prob.
Unemployment level	**-5,632078**	-2,948404	0,0000
Consumers Price Index	**-4,608751**	-2,948404	0,0007

Source: Microsoft Excell Processing and Eviews 10 Student Version

Lag Optimal Test Result

Lag optimal is used to omit the autocorrelationship problem. Based on Table 3 the lag optimal length is at lag 4. The choice of lag 4 as an optimal lag because of the test result that showed the lowest AIC value at lag 4 is 8,110236.

Table 3. Optimal *Lag* Test Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-210.5876	NA	7986.536	14.66121	14.75551	14.69074
1	-113.5973	173.9136*	13.11586	8.248091	8.530979*	8.336688*
2	-112.0299	2.594334	15.59670	8.415855	8.887337	8.563517
3	-105.8687	9.348014	13.60571	8.266808	8.926882	8.473535
4	-99.59843	8.648670	11.90324*	8.110236*	8.958903	8.376028
5	-96.69314	3.606560	13.32649	8.185734	9.222993	8.510591
6	-93.99456	2.977745	15.43737	8.275487	9.501338	8.659408
7	-92.36246	1.575817	19.77336	8.438791	9.853235	8.881777
8	-85.47863	5.696963	18.29803	8.239906	9.842942	8.741957

Source: 10 Students Version Eviews Processing

Cointegration Test Result

H0 : Model does not have a cointegration

H1 : Model has a cointegration

H0 is denied if the result appeared at Trace Statistical Value is bigger than the Critical Value this means that the model has a longperiod relationship. However if the Trace Statistical value is smaller than the Critical Value than the model does not have a longperiod relationship.

Table 4 showed that Statistical Trace value is bigger than the critical value with 10% signification level. This means that the zero hypotheses that stated that the model does not have a cointegration are denied and alternative hypotheses that stated that a model has a cointegration is accepted.

Table 4. Cointegration Test Result

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.1 Critical Value	Prob.**
None *	0.356275	14.59152	13.42878	0.0681
At most 1	0.015381	0.496023	2.705545	0.4813

Trace test indicates 1 cointegrating eqn(s) at the 0.1 level
* denotes rejection of the hypothesis at the 0.1 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: 10 Version Eviews Processing

Stability Test Result

VAR Model is stated stable if in deperiodinating the optimum lag from the obtained result the entire variable has less than one Polynominal Characteristic Modulus Roots. According to the test result in Table 5, it was clarified that the utilized model was stable. This was recognized from the less than one modulus range value. In this regard, the *Impulse Response Function* (IRF) and *Variance Decomposition* (VDC) analysis result is valid.

Table 5. VAR Stability Test Result

Root	Modulus
0.995814 - 0.036977i	0.996500
0.995814 + 0.036977i	0.996500
-0.093955 - 0.165837i	0.190602
-0.093955 + 0.165837i	0.190602

Source: 10 Version Eviews Processing

Granger Causality Test Result

Table 6. *Granger* Causality Test Result

Null Hypothesis	*Obs*	*Lag* 4	
		F-statistik	Prob.
Unemployment level *Granger Causality* Consumers Price Index	33	5,28166	**0,0034**
Consumers Price Index *does not Granger Cause* Unemployment level		0,95061	0,4522

Source: 10 Version Eviews Processing

According to the result obtained from Table 6, those that had causality relationship to lag4 were those that had profitability value less than alpha 0.05 which meant that one variable

affected another variable. It was obvious that unemployment level variable statistically affected the Consumers Price Index with the prob value less that 0.05 that was 0.0034. On the other hand statistically the Consumers Price Index was insignificantly affected the unemployment level proved by the higher prob value from 0.05 to 0.4552. In this regard, it could be concluded that a one way causality between unemployment level variable and Inflation occurred.

Vector Error Correction Model (VECM) Test Result

Table 7. Short-period VECM Estimation Result

Variable	D(CPI)	D(Unemployment Level)
	coefficient (T-statistic)	coefficient (T-statistic)
CointEq1	0,02707	-0,011493
	[1,94167]	[-2,20594]
D(CPI(-1))	-0,0836	0,05346
	]-0,37549]	[0,64242]
D(CPI(-2))	0,04444	0,041062
	[0,21878]	[0,54098]
D(CPI(-3))	0,02692	**0,133106**
	[0,14431]	**[1,90949]**
D(CPI(-4))	-0,1507	0,083014
	[-0,80374]	[1,18462]
D(Unemployment Level(-1))	-0,4609	0,101058
	[-0,9036]	[0,53017]
D(Unemployment Level(-2))	**-1,4735**	0,071428
	[-2,94556]	[0,382]
D(Unemployment Level(-3))	**1,3939**	0,120513
	[2,48135]	[0,57405]
D(Unemployment Level(-4))	0,53384	0,226946
	[0,85211]	[0,96932]

Source: 10 Version Eviews Processing

The estimation result in Table 7 on lag 2 unemployment level variable showed that there were significant negative relationship between the unemployment level variable and the Consumers Price Index.

This relationship could be reconized from the t-statistic value (2.94556) that is bigger than the t-table value (1.697) with significant level at 5%.

This correspond to the Phillips Curve theory that stated the unemployment level had a negative relationship towards inflation. The estimation result within the two years (lag 2) showed the unemployment level variable had negative influence to the inflation that was interpreted through Consumers Price Index variable. This could take place for example because of the expansive government policy.

Expansive policy will cause the increased of production by a company, resulting in the decrease of the unemployment level because the company will recruit many more working force. This will benefit the company, workers wages and increasing people income. The increase of circulated money resulting in increased inflation.

Furthermore at lag 3 unemployment level variable, the estimation report showed a significant positive relationship between unemployment level and Consumers Price Index. The relationship could be recognized from the t-statistic value (2.94556) that was higher than the t-table value (1.697) with significant level at 5%. Similarl situation occurred in Customers Price Index lag 3 variable. The estimation result showed the Consumers Price Index variable affected unemployment level variable with positive and siginificant relationship. The relationship could be recognized from the t-statistic value (1.90949) higher than the t-table value (1.697 with

siginificant level at 5%. It could be concluded that within 3 years (lag 3) Consumers Price Index variable and unemployment level affect each other with a significant positive relationship.

The result corresponds to the research carried out by the State Budget Bureau (APBN (2014)) the research stated that high inflation was also followed by high unemployment level. The phenomenon took place due to the inflation shock that occurred as the result of the increased production cost (cost-push inflation). The increase production cost for example due to the increase world oil price had made the producers increased the product selling price. The people's purchasing power will decrease because of the increse in prices in general and will cause the decrease of demand for products agregately. One of the choices for the producer to respon to the decreasing demand was through decresing the production. This will cause low absorption of the working forces.

Table 8. Long Period VECM Estimation Result

Variable	Coefficient	T statistics
TP(-1)	17,57653	2,43992

Source: 10 Students Version Eviews Processing

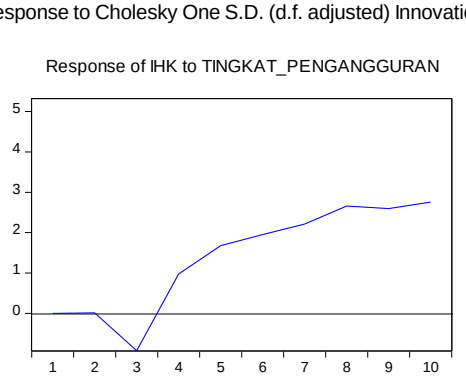
Long period VECM estimation in Table 8 show the unemployment level variable at significant rate of 5% affected the Consumers Price Index variable. This could be learned from the T-statistic value (2.43992) that was bigger than the T-table value (1.697). Unemployment level variable has a positivive influence towards the Consumers Price Index at 17.57653.

This result corresponded to Milton Friedman critic in 1976, that stated that the Philipps curve basic theory only take place within the short period but not for long period, because in the short period sticky price still applied, while in the long period flexible price was applied. This response is also known as *Natural rate hypothesis or Accelerationist hypothesis* (Samuelson, 2004).

The long period of positive relationship between inflation and unemployment could occur for example because there was a government expansive policy that lead to the increasing production and lowered the unemployment because the recruitment for more working force occurred. Next if the company's profit raise this will cause the wage and the income of the workers also raise. With the rise of inflation, the company and the workers expected that the inflation and wage will still raise (increasing inflation expectation level). When the inflation is too high the government will implement a contractive policy that will make the decrease of production and unemployment increase. So that in the long run the inflation will be higher and the unemployment level will increase again.

Impulse Response Function (IRF) Analysis Result

Figure 2. Response of Consumers Price Index to Unemployment Level
Impulse Response Function (IRF) Analysis Result



Source: 10 Version Eviews Processing

Figure 2 showed the Consumers Price Index variable response to the of Umployment level variable in 10 period. From the first to the second period, the Consumers Price Index had not responded to the given shock, while it decreased negatively in the third period. After another shock given to the unemployment level variable in the fourth period, the Consumers Price Index variable responded positively.

By then, the trend showed a positive relationship until the tenth period. This was shown by the Consumers Price Index variable streak in the 4 – 10 periods that was above the horizontal streak.

From the IRF analysis result it could be concluded that in Indonesia the Phillips curva applied only for a short period. This can be seen from the CIP variable that responded to negative schock unemployment level variable at the 2-3 period. After the period the CIP variable responded the schock positively. This corresponded to Milton Friedman critic in 1976 on the basic theory of Phillips curve, stated that it only applied in short period not in a long period (Samuelson, 2004).

Forecast Error Decomposition Variance (FEDV) Analysis Result

Table 9 explained the effect of one variable change towards the other in 10 periods. At the first period the CPI was very much influenced by the CPI shock it self at 100%. Starting the second period the CPI varian was explained by the variable itself at 99.9985% while the rest at 0.001499% was explained bt the unemployment level variable.

Table 9 . *Forecast Error Decomposition Variance* (FEDV) Analysis Result

Variance Decomposition of IHK:			
Period	S.E.	IHK	TINGKAT_PE...
1	2.616124	100.0000	0.000000
2	3.599632	99.99850	0.001499
3	4.414681	95.64508	4.354923
4	5.410925	93.86419	6.135805
5	6.420081	88.80857	11.19143
6	7.408857	84.63603	15.36397
7	8.613073	82.03367	17.96633
8	10.15055	80.18683	19.81317
9	11.61703	79.87702	20.12298
10	13.06766	79.64756	20.35244

Source: 10 Version Eviews Processing

The VDC analysis result in the third period at the unemployment level variable had contributed 4.35% to the CPI. Shock at the CPI variable provided continous decreasing influence to the variable itself in the 1st period to the 10th. The unemployment variable contribution to the CPI variable keep on decreasing until the 10th. The ontributionof unployment level variable increased continuously until the last period that is the 10th period with 20.35% shock.

Conclusion and Implication

Conclusion

The research was using time series of data period from 1980 to 2016 with VECM method had concluded the following:

1. The VECM estimation result in short period showed the unemployment level variable at lag 1 and lag 4, did not have significant influence to the CPI variable.

2. The VECM estimation result in short period showed the unemployment level variable at lag 2 had a sigificant negative influence to the CPI variable. This meant that if an unemployment level increased the previous two years it will decrease the inflation of the present year.
3. The VECM estimation result in short period showed the unemployment level variable and CPI at lag 3 significantly and positively influenced one another. This means, if a decrease in unploymen level/inflation occurred in the previous three years this will increase the inflation/unemployment level in the present year.
4. The VECM estimation result in long period showed the unemployment level variable had a significant positive influence to the CPI variable; this mean if the unemployment level increase occurred it will increase inflation in the long period.
5. The VECM estimation result in short and long period showed the Phillips curve in Indonesia only applied in short period but unapplicable to the long period, this is corresponded to Milton Friedman critic in 1976 stated that the basic theory of Phillips curve only took place in short period, but not in a long period (Samuelson, 2004)

Implication

It was expected that the conclusion result had the implication on the economics matter as well as the following researches. In this regard the implication will be as followed:

The research result on the relationship of inflation and unemployment in Indonesia was suspected to have negative relationship (trade-off), some results turned out to show an opposite relationship which a positive relationship. Then, the Phillips curve in Indonesia only applied to short period not long one.

Based on the above conclusion it was advisable for the government to review the policies intended to achieve low inflation as well as low unemploymet level. During January 2018, according to Central Bureau of Statistics raw material/support import reached 11.28 billion US dollar or increased 2.34% from the previous month. The big dependency on imported raw material could cause inflation when the rupiah exchange rate continuously depressed. To overcome the dependency, effort and means from the government is needed to increase in country raw material and industrial technology competitiveness.

According to Sriyono (2013), Inflation Targeting, the monetary strategy policy that had been used in Indonesia could not be fully expected to improve the economy, the problem was, when the government used the interest rate to fulfill the simultaneously set inflation target that can affect other economy variable so that another more comprehensive policy is needed to achieve maximum result. Moreover, some countries had left this policy system as it was considered inappropriate for the particular country.

The government as the executor of the fiscal policy has to decide a comprehensive, coordinated and sustainable policy strategy. This is to achieve low inflation and low unemployment level.

Adding/researching other variable that could affect the inflation/unemployment is advisable in the implication for further research. So that which variable influenced the inflation/unemployment could be recognized. This will present consideration to look for solution to obtain low inflation and low unemployment level.

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