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Inflation, Unemployment and Labor Force Change in Indonesia: What Does the Connection?

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Abstract

The issue of relationship between inflation and unemployment is one of the topics which have been discussed for long time. Philips Theory says that inflation rate has a relationship to unemployment rate, it becomes very interesting to observe the data of Indonesian Phenomena refer to the above theory therefore, this objective of this paper is to narrow the gap in literature by examining the long-run relationship between the change of labor force level, LF (t), inflation, ? (t), unemployment, UE (t), in Indonesia. It also to investigate the individual relationship between the change rate of LF and inflation, and change rate of LF and unemployment. Therefore, we use two different methods to test the cointegration. First is the Engle Granger approach based on the unit root test in the residuals of linear regression, which also includes a number of specification tests, Second method is the Johansen cointegration rank test based on a VAR representation, which is also proved to be an adequate one via a set of appropriate tests. This study used vector time series analysis to analyze the linear lag relationship between inflation, unemployment rate and the change in labor force participation. Under the empirical framework, the study adopted Vector Auto Regression (VAR) model. Results of this research, It is obtained from the Pearson correlation coefficient (correlation Pearson coefficient =0.059, for a significance level at 12% higher than the 5% the chosen one), that between the two variables there is a direct negative relationship, but of a very low and statistically insignificant medium intensity. This fact tell us to state that in the long run (23 years) between inflation and unemployment in Indonesia there is no significant relation. On the other hand, we noticed that there is also direct significant relationship between inflation and labor change. The Pearson coefficient = 0.080 for a significant level; at 13.5% greater than 5% from the chosen one, Which means that only 9.5% of the change in labor force was influenced by inflation. This denotes a very low and statistically insignificant medium intensity.

Keywords: inflation, labor force in Indonesia, unemployment

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INTRODUCTION

The issue of relationship between inflation and unemployment is one of the topics which have been discussed for long time. The discussing regarding this topic began by British economist AW Phillips which had discovered the relationship between inflation and unemployment. This concept has become an essential tool in analyzing the macroeconomic phenomena. Phillips has analyzed annual wage inflation and unemployment rates in the UK for the period 1860 – 1957. He found that in these two variables, there an inverse and stable relationship. After this finding many economists from others conducted similar topic for their studies and also have found a similar curves, are known today as Philips curve.

Nowadays, the topic of inflation, unemployment and labor participation change rate still becoming relevant and interesting topic to be investigated due to today economy brings so many new phenomena which are could not be found in the last era. The economic phenomena happened in developed countries may be different compared to developing countries or even on the same developed countries, such the several researches have been conducted by Kitov regarding the above issues, he found the different findings. The important feature of his empirical study gave the fact that coefficients in the linear dependencies between inflation and unemployment sometimes are positive and sometime is negative. Such in US has positive slope and the other case such in Germany, the increasing of inflation results in decreasing unemployment rate or has a negative slope (Kitov, 2007).

The studies of Kitov invite us to conduct a similar study in different country. If the Kitov's studies have been done in developed countries in this study, we place Indonesia as a sample of study. Indonesia becomes a strategic study due to this country is one of big 4 countries over the world which is including as a developing country in this region. As a

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developing country with the population is more than 240 million people, Indonesia has nice and interesting experiences in facing and maintaining the labor force to investigate. This country also keeps successfully their economic growth at 6% for more than 20 years.

According to Hasoloan, Indonesia during past two decades had experienced a high turbulence and socioeconomic structural changes that has influenced the labor force in this country. From the, Center Bureau of Statistics, before economic crisis 1998 the level of unemployment shows that Indonesia has a low unemployment rate, from the table it is obvious that from 1980 till 1997 Indonesia can maintain their level of unemployment below 5%, only in 1994 the unemployment reached 7.2%. Surprisingly, when the economic crisis happened which increased inflation rate from 6% to 58.3% the unemployment rate does not deeply influence, the percentage just slightly increased from 4.7 in 1997 to 5.6% in 1998 (see table 1), this number still on the level of nature unemployment rate. It means the Economy of Indonesia lies on the level of full employment.

Table 1 Population and Labor Force in Indonesia (in million)

Information	1980	1985	1990	1995	1998	2000	2005	2010	2015
Population	148	164.6	179.4	194.8	198405	206.63	218.086	237.641	244.78
Labor Force	52.421	63.826	77.803	86.361	92.736	95.651	105.83	116.262	119.24
Employment	51.553	62.458	75.851	80.11	87.673	89.538	94.453	107.806	111.81
Unemployment	868	1.368	6.251	5.858	5.062	8.9	11.376	8.456	7.427
Unemployment Rate	1.70%	2.10%	2.50%	7.20%	5.60%	6.10%	11.24%	7.14%	6.14%

Source: Center Bureau of Statistics (BPS)

Moreover, the low unemployment rate which achieved by Indonesia in the above era effected by several factors, Amir (2005) identified that the dominant factors due to the economic growth has attractively emerged the informal economic sectors that absorbed large number of uneducated unemployed. Additionally, the government of Indonesia invested huge

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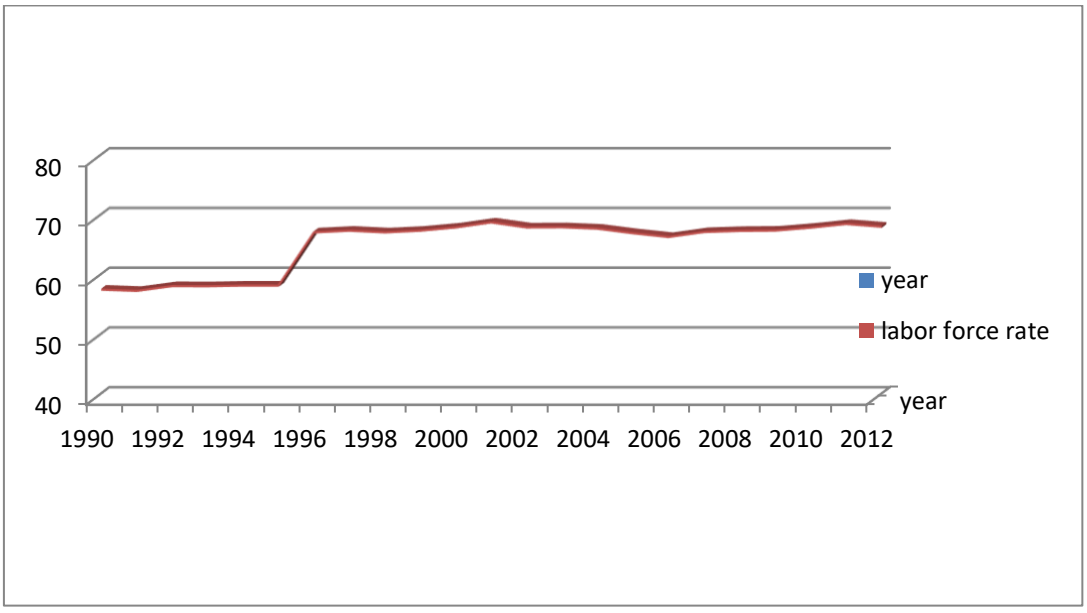
number of investment in government development projects such as: social and public facilities (schools, hospitals, roads), besides that, low unemployment caused by high growth of farming sector that provides more job opportunities for rural citizens.

On the other hand, after crisis of economy in 1998 the unemployment rate shows that having gradually increased due to the high population growth in Indonesia and the increase of education development sector reveals more graduates which entering the labor market to compete to others while the increase of job opportunities provided by government and companies are lower than the increase of labor force due to the impact of economic crisis made economy slowly run. Based on the above table, we could see that from 1998 the unemployment increased to 11.24% in 2005 and decreased gradually to 6.14% in 2015. The high portion of unemployment rate comes from the un-skill labors that 35% of them could not pursue primary school, since in 2000s the national production no more generated from farming sector but more is generated from Industries and services.

Table 2, Labor Force Rate in Indonesia 1990-2012, source: IFS



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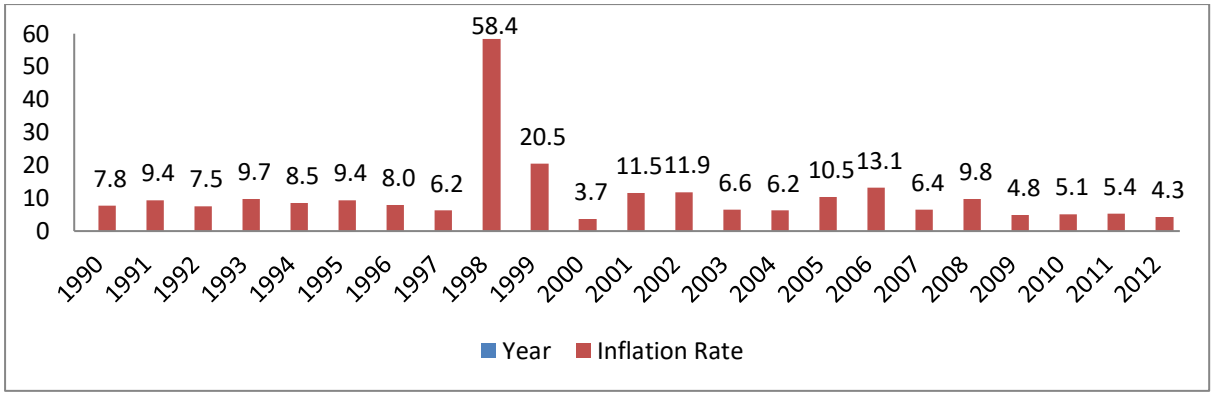
Labor force in Indonesia almost increases every year, this evidence can be seen from the table 2. This increase caused by the increasing of population growth, increasing of Indonesia live expectation as well as the growth of education level in Indonesia. During 2 decades labor force rate rises from 57.5% in 1990 to 67.88%. The increasing of labor force rate becomes a blessing for economy of Indonesia if it can be properly utilized by providing new job opportunities which may drive growth of economy, meanwhile if government could not provide new Industries, it become a calamity for Indonesia.

Table 3 Inflation Rate 1990-2015 (source: IFS)



The government of Indonesia is facing 2 problems in its policies; they have to maintain the inflation rate in moderate rate and also should decrease the unemployment rate to keep full employment economy. Therefore, Indonesia implements inflation targeting framework (ITF) in its macroeconomic policy in order to maintain the low inflation rate. On the other hand, as we explained above, the population growth that has pushed new additional labor force becomes a problem for Indonesia, hence in their national budget and programs always include the program of unemployment reduction. Maintaining the balance between low inflation rate and low unemployment rate are becoming the interested job for the government of Indonesia. Based on the graph 3, it could be seen that in period 1990 until 1997 (before economic crisis), and

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Indonesia can maintain their inflation rate at average 8%. When the economic crisis attacked Indonesia the inflation rate increased to 58.4%, and after 2000 the inflation rate fluctuated in the level 3.7% -13.1%.

Refer to the Philips Theory as we quoted above that inflation rate has a relationship to unemployment rate, it becomes very interesting to observe the data of Indonesian Phenomena, therefore, this objective of this paper is to narrow the gap in literature by examining the long-run relationship between the change of labor force level, *LF (t)*, inflation, π *(t)*, unemployment, *UE (t)*, in Indonesia. It also to investigate the individual relationship between the change rate of LF and inflation, and change rate of LF and unemployment. From this research we hope could give beneficial contribution for the monetary authority of Indonesia in measuring and evaluating the policy related to the area of labor market and controlling inflation.

The consist of this paper are divided becomes five sections. Section I discusses the introduction, in which the background and the rationale of the study. Section II explains the review of literatures which related to the aim of study. Section III covers the methodology and data are used for analyzing the topic of research. Section IV shows the findings and discussion. Section V gives our conclusion and suggestion.

LITERATURE REVIEW

Kitov has done the series of research paper in the area of change rate of labor force level, inflation and unemployment. His studies in this topic which has been published are labor study in America, Japan, Austria, German and Canada. One of them is the study for America; Kitov has measured the relationship between inflation, unemployment and labor force, his study found that in America Labor force change becomes driving force for inflation, The inflation lags two and a half years behind the labor force change, and Unemployment is a

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lagged linear function of the labor force change and inflation with lag times of six and three years respectively. Regarding the stagflation and disinflation that occurred in USA, Kitov saw as a natural result due to the inflation and unemployment is the lag and dependence of labor force change. In this case, the forecasting of population growth becomes something very important to predict the next inflation rate (Kitov : 2006). Elmeskov and Pichelmann (1993), has argued that between unemployment and labor force participation in the long-run appears has a negative relationship. Other similar research by Kitov, has been also conducted in Austria, from statistical test, he found that level of reliability and the predictive power of the link between inflation and labor force of the link indicates the inflation and unemployment in Austria does not be controlled by the National Bank of Austria, instead the price inflation will be likely controlled by the change in labor force (Kitov, 2013).

Moreover, the research findings of Kitov (2012), confirms the earlier research that there between the rate of labor force change and the rate of inflation exist the relationship in long term period. Money in this case does not play a significant role in the low inflation level. The co-integrating relations among them shows the level of statistical significance indicates that the links as deterministic ones, as adopted in physics. Unlike the New Keynesian Phillips curve models, the relationships proposed in this paper do not use autoregressive properties of any macroeconomic variable under consideration (Kitov: 2012).

Moreover, Cashell (2004) has investigated the connection between inflation and unemployment in America, he elucidated that in the era 1960s it has being a trade-off between the unemployment rate and the rate of inflation as we know as Phillips curve, but in the subsequent years this curve was disappeared. The lack persistence of the trade-off was predicted as natural rat hypothesis. Additionally, he explained the nature rate is the condition

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where the stability of inflation rate in the long run tends to make a consistency of unemployment rate.

Herman (2010) has conducted a research to observe theoretically and empirically the relationship between inflation and unemployment in Romania (1990-2009), her finding is that between the inflation rate and the unemployment rate in Romania has a Phillips type relationship. Statistically, there is a significant relationship among those variables, but one cannot identify a stable due to the aim of the economic policies in reducing or increasing inflation in order to increase or decrease the unemployment and vice versa. She suggested that inflation and unemployment at a low rate can be well maintained in the way government have to make control in productivity of labor through properly wage policy, it means the increasing of wage based on labor productivity (Herman: 2010)

Similarly, using panel data (1980-2010) from World Bank, Katria et.al. (2011), has investigated a trade-off between inflation and unemployment, from the case of SAARC *(The South Asian Association for Regional Cooperation Countries*),the regression model eight regional member countries of SAARC and six expected future member countries, the expected results the test is there is a negative Phillips curve where the estimated coefficients on the unemployment rates are significantly different from zero, meaning, it is statistically significant, hence, this research found any Inflation-unemployment tradeoff in SARRC which that the existence of trade-off in this area could be utilized by the government for making properly monetary and fiscal policies to stabilize business circle.

In the case of Indonesia, papers attempt to investigate the relationship between, inflation, unemployment and labor force are still scanty. Among those are papers written by Priyono (2002), solikin (2003), Mulyati (2009). Research conducted Priyono (2002), attempted

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to measure unemployment rate during the crisis of economy, using the data of Indonesian Family Life Survey (IFLS) conducted by IFLS Lembaga Demografi FEUI (Demography Research Center of Economic Faculty of University of Indonesia) in collaboration with RAND. The finding of this survey shows that during the economic crisis unemployment rate of Indonesia decreased compared to the time before crisis. It indicates that the rise of inflation drops the unemployment rate. Moreover, Solikin (2003)has investigated the Philips Curve and Structural Changes in Indonesia, by using the quarterly data from Center Bureau Bank Indonesia (1974.1 - 2002.4),based on empirical test, the research obtained some important findings , firstly, it can be concluded that the Phillips curve phenomenon exists in the Indonesian economy. Secondly, the existence and behavior of the Phillips curve changes from time to time which in line to the changes of the fundamental structure of the economy, particularly as a result of the economic crisis in 1997. In particular , the pattern of expectations formation and linearity in the Phillips Curve experience the difference (change) significantly between pre-and post- crisis period .

Suryani (2009) has done a research which attempts to analyze the effect of inflation on unemployment in Indonesia through the Phillips curve approach (1985-2008). This study uses multiple regression Ordinary Least Square (OLS) and Granger Causality Test. In addition, it research also aims to look at the effect of the economic crisis of 1997-1998 using the Chow Breakpoint Test. findings of this research are the inflation rate had no significant effect on the unemployment rate. It could be seen from the coefficient of inflation is positive and significant, meanwhile labor force significantly affects the unemployment rate, each the increase of labor force (1%) would increase unemployment rate by 7.79%. The Granger causality test shows that there is no causal relationship between unemployment and inflation. In addition, the Chow

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breakpoint test suggests that the economic crisis in 1997-1998 did not affects unemployment rate despite inflation rate raised sharply.

METHODOLOGY, DATA AND MODEL SPECIFICATION

The main objectives of this study is to determine the linear lag relationship between inflation (which is measured by GDP deflator) , the unemployment rate and the change in labor force participation in Indonesia from the period of 1990 until 2012. On the other hand, we describe separately other relationship between the change in labor force participation and unemployment. Likewise, we determine the relationship between change in labor and inflation. These relationships are tested for co integration. Therefore, we use two different methods to test the cointegration. First is the Engle Granger approach based on the unit root test in the residuals of linear regression, which also includes a number of specification tests. Second method is the Johansen cointegration rank test based on a VAR representation, which is also proved to be an adequate one via a set of appropriate tests. This study used vector time series analysis to analyze the linear lag relationship between inflation, unemployment rate and the change in labor force participation. Under the empirical framework, the study adopted Vector Auto Regression (VAR) model.

Validity of the VAR analysis was dependent on the stationary condition of the time series. The time series must be free from trends or fixed seasonal pattern in order for the results to hold. Individual variable stochastic structure was tested using the unit root tests, namely, Augmented Dickey-Fuller (ADF) test. Then, the lag of the time series was determined based on Schwarz Criterion (SC). The Co-integration was tested using multivariate test developed by Johansen (1988) and Johansen and Juselius (1990) to determine the maximum likelihood of the estimation of the VAR model.

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The time series property of the series is crucial for cointegration and causality analyses. Nelson and Plosser (1982) argue that most of the macroeconomic series are non-stationary at level, but stationary after first differencing. If the estimated variables are non-stationary, the regression results with these non-stationary variables will be spurious (see Granger & Newbold, 1974). Therefore, it is essential to determine the stationary and the order of integration, I(d) of each series to avoid the spurious regression phenomenon. The results of the unit root tests are presented in Table 4.

Moreover, Data are used in this research taken from International Financial Statistic (IFS) and Center Bureau of Statistics (BPS) from 1990 to 2012. The data are: population and unemployment (BPS), meanwhile inflation and Labor Force Rate dropped from IFS.

In addition, model used in this study estimate the relationship that links inflation and unemployment to labor force change rate. An implicit assumption of the model is that inflation and unemployment do not depend directly on parameters describing real economic activity (Kitov, 2006). Moreover, inflation does not depend on its own previous and/or future values because it is completely controlled by a variable of different nature. As defined in Kitov (2006), inflation and unemployment are linear and potentially lagged functions of labor force:

$$GDPD(t) = a_1 + b_1 \frac{dLFC(t-t1)}{LFC(t-t1)} \qquad (1)$$

$$EU(t) = a_2 + b_2 \frac{dLFC(t-t2)}{LFC(t-t2)} \qquad (2)$$

Where GDPD (t) is the inflation at time t (represented by some standard measure such as GDP Deflator), EU(t) is the unemployment at time t, and LFC(t) is the labor force change at time t, t_1 and t_2 are the time lags between the inflation, unemployment, and labor force, respectively, a_1 , b_1, a_2, and b_2 are country specific coefficients, which have to be determined empirically.

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The coefficients show us how much the change in labor force; change the level of inflation and unemployment. The Linear relationships (1) and (2) define inflation and unemployment separately. These variables are two indivisible features of a unique process, however. The process is the labor force growth or change, which is accommodated in real economies though two channels. The first channel is the increase in employment and corresponding change in personal income distribution (PID). All persons obtaining new paid jobs or their equivalents presumably change their incomes to some higher levels. There is an ultimate empirical fact, however, in the case of Indonesia; the increase in employment is due to the creation of project by the government in many public sector facilities such as school, road, and hospital as well as the development in the agricultural sector, which employs huge number of rural citizen. The second channel of the change in labor force is related to those people in labor who failed to obtain the new paid job. These people do not leave the labor force but join the unemployment. Therefore, total labor force change equals unemployment change plus employment change, the latter process expressed through lagged inflation. The partition of labor force growth between unemployment and inflation is retained through time and the linear relationships hold separately. To account for this effect one should use a generalized relationship as represented by the sum of relationships (1) and (2):

$$GDPD(t) + EU(t) = (a_1 + a_{2)} + b_1 \frac{dLFC(t-t1)}{LFC(t-t1)} + b_2 \frac{dLFC(t-t2)}{LFC(t-t2)} + e_t \qquad (3)$$

Equation (3) balances labor force change, inflation and unemployment, the latter two variables potentially lagging by different times behind the labor force change. The

Importance of this generalized relationship is to estimate to coefficients of those variations and determine the macroeconomic interpretation related to this study.

RESULTS AND DISCUSSIONS

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Based on the statistical analysis of the data on the inflation rate and unemployment rate from 1990 to 2012, it is obtained from the Pearson correlation coefficient (correlation Pearson coefficient =0.059, for a significance level at 12% higher than the 5% the chosen one), that between the two variables there is a direct negative relationship, but of a very low and statistically insignificant medium intensity. This fact tell us to state that in the long run (23 years) between inflation and unemployment in Indonesia, there is no significant relation, the monetary theory being confirmed, according to which in the long run the two variables are independent, there being a size of the unemployment rate wish does not influence inflation and this is the size of the natural unemployment rate. Moreover, based on the data in table 1, Apendix 1, it is shown that, the inflation in Indonesia was influenced by unemployment only in the proportion of 5.9%. This means, the changes in inflation are largely explained by other factors than the unemployment. On the other hand, we noticed in table 1 Appendix 1 that there is also direct significant relationship between inflation and labor change. The Pearson coefficient = 0.080 for a significant level; at 13.5% greater than 5% from the chosen one, Which means that only 8% of the change in labor force was influenced by inflation. This denotes a very low and statistically insignificant medium intensity.

Unit Root Test

In order to determine whether the variables are stationary for investigating the causality relationship, the Augmented Dickey Fuller (ADF) unit root test has shown that the null hypotheses of non- stationary for all the time series failed to be rejected At Level. However, the null hypotheses are rejected for all the time series at first difference. The results clearly indicate that all variables are stationary at I(1). Therefore, all the estimated variables are integrated of order one *I*(1). With these findings, we can proceed to the Johansen's cointegration test to examine the potential long run equilibrium relationship. In order to

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implement the Johansen's cointegration test, the following vector error-correction model (VECM) is estimated.

$$\Delta Z_t = \mu D_t + \sum_{t=1}^{k-1} \Gamma t \Delta Z_{t-1} + \Pi Z_{t-1} + \varepsilon_t$$

Where Δ is the first difference operator. Z_t is a vector of endogenous variables (ln *GDPDt,* ln UE*t* and *LFCt*). *Dt* is the deterministic vector (constant and trend, etc); μ is a matrix of parameters *Dt*. The matrix Π contains information about the long run relationship between *Zt* variables in the vector. If all the variables in *Zt* are integrated of order one, the cointegrating rank, *r*, is given by the rank of Π = ab where *a* is the matrix of parameters denoting the speed of convergence to the long run equilibrium and *b* is the matrix of parameters of cointegrating vector. To determine the number of cointegrating rank, we use the likelihood ratio (LR) trace statistic.

Table: 4 ADF test results

Variables	Test Statistics	
	ADF	Critical Value
At level		
GDPD		
EU		
LFC		
First difference		
GDPD	-6.42054(0)	…
EU	1.39026(1)***	10%
LFC	-7.31140(0) **	5%

Note: The values in parentheses show the lag difference. The lag difference was determined according to Akaike info criterion. *, **and *** show, 1% , 5% and 10% significance levels, respectively. EViews was used

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Co integration Test

Two-period lag was found using Schwarz Criterion test. Based on the results from the maximum Eigen value and trace statistics as reported in Table 5, the null hypothesis of no co integration vector hypothesis (r = 0) is rejected at 5 percent significance level. In other words, at least one co integration vector exists for series of variables in the system. The existence of the co integrating vector suggests that the variables in the system have a long-run equilibrium. Therefore, all three variables involved in the relationship are co integrated.

Table: 5 Co integration results trace test results

Variables	Eigen Value	Null Hypotheses	Alternative Hypotheses	Trace test statistic	5% critical value
GDPD	0.658827	$\delta = 0$	$\delta < 0$	32.07824	29.79707
EU	0.262630	$\delta \leq 1$	$\delta = 1$	9.495539	15.49471
LFC	0.137140	$\delta \leq 2$		3.097567	3.841466

Note: ** represents 5% significance level. EViews was used for the calculations

Table: 3 Maximum Eigen Value Test results.

Variables	Eigen Value	Null Hypotheses	Alternative Hypotheses	Maximum Eigen test statistic	5% critical value
GDPD	0.658827	$\delta = 0$	$\delta < 0$	22.58270	21.13162
EU	0.262630	$\delta \leq 1$	$\delta = 1$	6.397972	14.26460
LFC	0.137140	$\delta \leq 2$		3.097567	3.841466

CONCLUSION

The linear lag relation relationship between inflation, unemployment and labor force change is proven through Engle Granger approach based on the unit root test in the residuals of linear

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regression, which also includes a number of specification tests. The Johansen co integration rank test based on a VAR representation proved the cointegration between the macroeconomic variable. It is obtained from the Pearson correlation coefficient (correlation Pearson coefficient =0.059, for a significance level at 12% higher than the 5% the chosen one), that between the two variables there is a direct negative relationship, but of a very low and statistically insignificant medium intensity. This fact tell us to state that in the long run (23 years) between inflation and unemployment in Indonesia there is no significant relation, the monetary theory being confirmed, according to which in the long run the two variables are independent, there being a size of the unemployment rate wish does not influence inflation and this is the size of the natural unemployment rate. Moreover, based on the data in table 1, it is shown that, the inflation in Indonesia was influenced by unemployment only in the proportion of 3.5%. This means that the changes in inflation are largely explained by other factors than the unemployment. On the other hand, we noticed in table 1 that there is also direct significant relationship between inflation and labor change. The Pearson coefficient = 0.080 for a significant level; at 13.5% greater than 5% from the chosen one, Which means that only 9.5% of the change in labor force was influenced by inflation. This denotes a very low and statistically insignificant medium intensity.

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Appendix1 Unit root of Lngdpd AT 1st difference

Null Hypothesis: D(LNGDPD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*

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Augmented Dickey-Fuller test statistic		-6.420540	0.0000
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGDPD,2)
Method: Least Squares
Date: 11/27/13 Time: 18:24
Sample (adjusted): 1992 2012
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDPD(-1))	-1.384482	0.215633	-6.420540	0.0000
C	-0.019288	0.062046	-0.310873	0.7593

R-squared	0.684508	Mean dependent var	-0.014869
Adjusted R-squared	0.667903	S.D. dependent var	0.493358
S.E. of regression	0.284312	Akaike info criterion	0.412901
Sum squared resid	1.535828	Schwarz criterion	0.512379
Log likelihood	-2.335458	Hannan-Quinn criter.	0.434490
F-statistic	41.22333	Durbin-Watson stat	2.030459
Prob(F-statistic)	0.000004		

LN UE 1st difference Unit root

Null Hypothesis: D(LNUE) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.852143	0.3464
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNUE,2)
Method: Least Squares
Date: 11/27/13 Time: 18:26
Sample (adjusted): 1993 2012

Appendix2

Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNUE(-1))	-0.610228	0.329471	-1.852143	0.0815

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D(LNUE(-1),2)	-0.332091	0.238869	-1.390265	0.1824
C	0.008986	0.015796	0.568867	0.5769

S.E. of regression	0.062832	Akaike info criterion	-2.559223
Sum squared resid	0.067114	Schwarz criterion	-2.409863
Log likelihood	28.59223	Hannan-Quinn criter.	-2.530066
Durbin-Watson stat	2.088809		

LFC first difference

Null Hypothesis: D(LFC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.311409	0.0000
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFC,2)
Method: Least Squares
Date: 11/27/13 Time: 18:08
Sample (adjusted): 1992 2012
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFC(-1))	-1.478039	0.202155	-7.311409	0.0000
C	0.005542	0.967562	0.005728	0.9955

R-squared	0.737774	Mean dependent var	-0.056784
Adjusted R-squared	0.723973	S.D. dependent var	8.439096
S.E. of regression	4.433755	Akaike info criterion	5.906763
Sum squared resid	373.5054	Schwarz criterion	6.006242
Log likelihood	-60.02101	Hannan-Quinn criter.	5.928353
F-statistic	53.45670	Durbin-Watson stat	2.323378

Appendix 3 Descriptive statistic

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	LNGDPD	LFC	LNUE
Mean	1.028575	0.783402	0.773581
Median	0.984748	0.074427	0.803316
Maximum	1.876629	15.35677	1.031411
Minimum	0.655753	-1.224490	0.399489
Std. Dev.	0.247544	3.260340	0.203895
Skewness	1.643201	4.110067	-0.592035
Kurtosis	7.119621	18.99148	2.156040
Jarque-Bera	26.61456	309.8273	2.026196
Probability	0.000002	0.000000	0.363092
Sum	23.65723	18.01826	17.79236
Sum Sq. Dev.	1.348117	233.8560	0.914611
Observations	23	23	23

Correlation coefficient

	LNGDPD	LFC	LNUE
LNGDPD	1	-0.08022682896122754	0.0591664812900415
LFC	-0.08022682896122754	1	-0.1425251979129866
LNUE	0.0591664812900415	-0.1425251979129866	1

Johansen co integration

Date: 11/27/13 Time: 18:40
Sample (adjusted): 1992 2012
Included observations: 21 after adjustments
Trend assumption: Linear deterministic trend
Series: LNGDPD LFC LNUE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.658827	32.07824	29.79707	0.0268
At most 1	0.262630	9.495539	15.49471	0.3215
At most 2	0.137140	3.097567	3.841466	0.0784

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Appendix4

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**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.658827	22.58270	21.13162	0.0310
At most 1	0.262630	6.397972	14.26460	0.5627
At most 2	0.137140	3.097567	3.841466	0.0784

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LNGDPD	LFC	LNUE
-2.128299	0.409197	1.356298
-1.804382	-0.099387	-4.938115
-4.666795	-0.167670	2.235861

Unrestricted Adjustment Coefficients (alpha):

D(LNGDPD)	0.180147	0.030097	0.039077
D(LFC)	-2.596243	0.822850	0.803584
D(LNUE)	0.001361	0.022685	-0.010030

1 Cointegrating Equation(s): Log likelihood -15.63566

Normalized cointegrating coefficients (standard error in parentheses)

LNGDPD	LFC	LNUE
1.000000	-0.192265	-0.637269
	(0.03829)	(0.46733)

Adjustment coefficients (standard error in parentheses)

D(LNGDPD)	-0.383407
	(0.09427)
D(LFC)	5.525581
	(1.74674)
D(LNUE)	-0.002896
	(0.02762)

2 Cointegrating Equation(s): Log likelihood -12.43667

Normalized cointegrating coefficients (standard error in parentheses)

LNGDPD	LFC	LNUE
1.000000	0.000000	1.985387
		(0.96490)
0.000000	1.000000	13.64086
		(5.31211)

Adjustment coefficients (standard error in parentheses)

0.070724

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-0.437713

Appendix5

D(LNGDPD)		
	(0.12179)	(0.01838)
D(LFC)	4.040845	-1.144154
	(2.21691)	(0.33457)
D(LNUE)	-0.043829	-0.001698
	(0.03256)	(0.00491)

Cointegration regression

Dependent Variable: LNGDPD
Method: Fully Modified Least Squares (FMOLS)
Date: 11/27/13 Time: 18:46
Sample (adjusted): 1991 2012
Included observations: 22 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFC	0.002683	0.020375	0.131704	0.8966
LNUE	0.101373	0.355017	0.285544	0.7783
C	0.933596	0.291511	3.202614	0.0047

R-squared	-0.008848	Mean dependent var	1.030937
Adjusted R-squared	-0.115043	S.D. dependent var	0.253104
S.E. of regression	0.267267	Sum squared resid	1.357198
Durbin-Watson stat	1.354084	Long-run variance	0.093777