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Relationship Between Growth and Unemployment in Petroleum Exporting Countries: Case of Congo

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Abstract

The purpose of this article is to examine relation between growth and unemployment in Congo. To this, the error correction model ARDL is used. The estimation results show the existence of relation significantly negative between growth and long term unemployment on the period 1991.Q1-2016.Q1. Such a result accounts an unemployment existence of a structural character in Congo. In this regard, the resolution of unemployment problem in Congo goes through the policies of the offer. In other words, the Congolese government must put in place policies aiming to increase productivity of production factors. To be specific, the government can favor the augmentation of a prospective GDP, urging companies with important manpower to invest, by an increase of productive public investment.

Keywords: *Growth, Employment, ARDL, Congo*
JEL Classification: C32; E23, E24, 055

INTRODUCTION

A high economic growth and weak unemployment are part of the four objectives of the economic policy. However, these two objectives of economic policy are interdependent according to the Law of Okun (1962). In fact, this law brings to the fore a cimetric relation between growth and unemployment, occasioning unemployment-growth dilemma. Unemployment rises when the effective GDP goes out of its prospective level. For this purpose, unemployment has a contra cyclic character, which suggests that to remedy unemployment problem, the government has to act on global demand. Though relation between growth and unemployment are well comprised to a short term (Okun, 1962), it's not the same to a long term. For this purpose, the long term relation sign between growth and unemployment is undetermined. In such a context, it appears to be opportune for this article to bring elements of information on empirical basis.

The problematic related to young people unemployment in Africa seems relevant for at least three reasons. First, brain drain, insecurity and poverty are byproducts of unemployment. Then, it could also be a source of social and political unrest. In accordance with the second point, the Arab spring of 2011 is a perfect example. Finally, many Africans risk their lives to reach Europe, this is also one of the dynamics linked to young people unemployment. Since then, to remedy different social problems that scourge Africa, the promotion of creative growth of employment is necessary.

Though a high growth level is a remedy to unemployment problem, it isn't less only in Africa, important growth levels are not translated by unemployment reduction. In fact, the recent economic growth was not translated by corresponding progression of employment and the few many job creations have been essentially observed on the informal sector. So many factors might explain this state of fact. First, the offset between training offers (teachings taught) and skills most wanted by employers. According to EY (2015), professional and technical skills are those that would be most in demand in all sectors in Africa. Second, extractive industries that are the basis of growth in these countries, use a high intensity capitalistic production technique. They are furthermore, relatively isolated to the rest of the economy. Therefore, one of the characteristics of the African economies is the weak diversification of their production basis.

Being an empirical origin, Okun law is a good example of success of statistical induction, where observation precedes theory. It is in fact the inverse relation between growth and unemployment, observed by Okun (1962) on the American economy that efforts have been put into place in order to give a much better theoretical underpinning to this relation. Okun shows that when the actual GDP is inferior to 3% to the prospective GDP, unemployment rate is superior to 1 point to its normal rate. If the Okun gap is 6%, unemployment is superior to 2 points to its normal rate. An employment point is associated to a gap of 3%. This proportionality relation is acceptable in the case of American economy of the 1950s and 1960s, may take different values in other contexts. Furthermore, this law may even be questioned in some economies in which production is done on the basis of a production technique a high intensity capital.

Many works based on linear relation in African countries have invalidated the existence of symmetric relation between growth and unemployment (Moosa, 2008, Bankole and Fatai, 2013; Babalola and Saka, 2013; Moroke, 2014; Alhdiy and al., 2015). However, works completed in some African countries validate the inverse relation between growth and unemployment (Furceri, 2012; Makaringe et Khobai, 2018; Phiri, 2014). Moosa (2008) proceeds to the verification of the Okun law in North Africa (Algeria, Egypt, Morocco and Tunisia) on the period 1990-2005. By using co-integration approach, study results show that Okun law is not applicable for two reasons: inadequacy between work offer and demand, work market stiffness and public sector's prevalence, hydrocarbon and mining. Furceri proceeds to the verification of the Okun law in Algeria for the period 1980-2008 from regression in statistical panel (Least Squares) and dynamic (GMM). Study results validate Okun law but with a weak coefficient (-0.05). By using quarterly data on a period stretching from 1990-2014, Bouaziz and Andari (2015) validate Okun law in Tunisia from co-integration analysis with -0.7 coefficient.

Bankole and Fatai (2013) have studied relation between growth and unemployment in Nigeria from annual data from 1980-2012. The use of the correction error model with estimation objectives, enlightens the inapplicability of the Okun law in Nigeria. The results of Bankole and Fatai are relatively close to those of Moroke (2014). He (Moroke) examines the applicability of the Okun law in South Africa from quarterly data of the period 1990-2013 and uses the correction error model. Estimation results show that relation between growth and unemployment is significantly positive, which questions the inverse relation between growth and unemployment in South Africa. By resorting to ARDL

approach on the period 1980-2013, Udude and Nnachi (2017) also reveal the inapplicability of Okun law in Nigeria.

On the other hand, the existence of a negative relation between growth and unemployment is verified whether in long or short term in the works of Makaringe and Khobai (2018). This study aimed at studying the impact of unemployment on economic growth in South Africa through quarterly data on the period stretching from 1994-2016. By using ADRL model, the estimation results suggest that there exists long term relation between economic growth and unemployment. Empirical results have confirmed that there exists a negative relation between economic growth and unemployment in long and short term. The existence of an inverse relation between growth and unemployment in long term is not unprecedented in economic literature. Phiri (2014) had already found such a result in the case of South Africa, based on the cointegration approach, and over a period from 2000 to 2013. The results of the study show that in the long run there is a significantly negative relationship between growth and unemployment. However, Alhdiy et al. (2015), based on the cointegration approach, and the quarterly data for the period 2006-2013, reveal the absence of the long-run relationship between growth and unemployment in Egypt.

Apart from studies having enlightened the tie between market of goods and services and work market from relation between growth and unemployment, a study based on Congo focused on relation between employment and economic growth (Ndinga, 2013). The latter uses the correction error model on the period 1968-2011, and show that there exists long term relation which is positive and significant between growth and unemployment in Congo. This result is confirmed in filigree, the existence of an inverse relation between unemployment and long term economic growth in Congo.

As regard works developed above, the applicability of the Okun law is questioned in Sub-Saharan Africa. A plausible explanation to this observation may be tied to strong contribution of the primary sector in the GDP, reflecting a weak diversification of most economies. To this, it is legitimate to add the weak efficiency on work markets. In such a context, the existence of a structural unemployment seems to be one of the common characteristics of Sub-Saharan African countries' economies.

In such a context, one can estimate that unemployment that characterizes African economies is structural. Taking as a basis Congo, country member of Central Africa Monetary and Economic Community, petroleum exporting country, the analysis of the relation between unemployment and growth raise the question of the existence of the inverse relation between two long term variables. The validation of such a relation accounts what unemployment and productivity have to deal with simultaneously in order to hope an improvement of macroeconomic performances of the Congolese economy. The purpose of this article is to empirically verify the existence of a symmetric relation between growth and unemployment in Congo.

METHOD

Model specification

This study has adopted Okun model type (1962). However, it is legitimate to underline that there are two specification classes of Okun law: the gap and the

first difference model. Basing on Okun model, we bring a change by considering unemployment as an independent variable, whereas economic growth represented by actual GDP as dependent variable. Since then, the writing model permitting to determine relation between growth and unemployment may be represented as the following:

$$LPIBR_t = \beta_0 + \beta_1 LCHO_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Or PIBR means actual GDP, CHO symbolizes unemployment and L means logarithm. Elasticity calculated indicates variation in percentage (respectively percentage points) of actual GDP because of 1% unemployment variation. Such a specification is close to that of Makaringe end Khobai (2018), in their study of long term impact of employment on growth in South Africa. If applicable, except the key explanatory variable, such as unemployment, two control variables, oil price and inflation can be taken into account. So, we are going with estimation objectives, use the following equation:

$$LPIBR_t = \beta_0 + \beta_1 LCHO_t + \beta_2 LPPETR_t + LIPC_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots \quad (2)$$

From equation 2, Okun coefficient (CO) may be like this: $CO = \frac{1}{\beta_1}$.

Economic growth measure as a variable describing the evolution of wealth creating process within a nation was done through the evolution of its rate. Explanatory variables approved in the model are respectively unemployment, oil price and inflation. Oil price is taken into account because the petroleum section plays a major role in the GDP. However, the expected indication of its relation with growth is negative, because of the vulnerability of economies of petroleum exporting countries to external chocks (oil price fluctuation). Furthermore, in view of the fact that a minimum inflation is necessary growth, it is taken into account through a proxy variable, price index to consumption (IPC). So, one has to expect inflation influence on growth to be positive.

Data Source

Data used are of secondary type and are relative to the period 1991-2016, or 26 observations. They have been compiled on the World Bank official web sites (WID, 2016). It's all about unemployment variables, actual GDP, oil price and inflation rate. Furthermore, it should be first noted that all variables have undergone a smoothing by logarithm introduction. Second, annual data have transformed into quarterly data (1991.Q1-2016.Q1). In this regard, the quarterly method of collected annual data (Denton, 1971), mostly used by IMF economists has been approved. In fact, it is important to acknowledge that econometric rests on a certain number of relatively binding conditions but necessary for the validation of estimation results.

RESULT AND DISCUSSION

Before estimating short and long term coefficients, we are going to determine the integration order of variables.

Variables' Stationarity Test

In this case, we use the Dickey and Fuller test (1981), done on explained variable and the four explanatory selected variables have brought about results presented in the following chart N°1.

Table 1. Variables Integration Order

Variable	LPIBR	LCHO	LPPETR	LIPC
Integration order	I(1)	I(0)	I(1)	I(0)

Source: Eviews

A remarkable fact spring from these tests of unitary root: explained variable (LPIBR) is I (1) whereas explanatory variables are either I (1), or I (1). So, ARDL model application is well appropriate for this article. Before applying this model, it is important to determine the optimal lag.

Optimal Number of Delays

An important step in the case of dynamic models is the determination of the optimum number of delays. To do so, different criteria are often used, most common are: Akaike information criterion (AIC) and Schwartz information criterion (SIC). If applicable, the test indicates from criteria LR, FPE, AIC, and SIC, the existence of an optimal delay equal to 2. So, the number of delay 2 is approved.

Table 2. Identification of optimal offset

VAR Lag Order Selection Criteria
Endogenous variables: LPIBR LCHO LPPETR LIPC
Exogenous variables: C
Sample: 1991Q1 2016Q4
Included observations: 93

Lag	LogL	LR	FPE	AIC	SC	HQ
0	112.5615	NA	1.14e-06	-2.334655	-2.225726	-2.290673
1	925.8732	1539.171	4.07e-14	-19.48114	-18.93650	-19.26123
2	1045.100	215.3770	4.43e-15*	-21.70107*	-20.72071*	-21.30523*
3	1048.323	5.545952	5.86e-15	-21.42631	-20.01023	-20.85454
4	1054.932	10.80072	7.24e-15	-21.22434	-19.37254	-20.47664
5	1070.388	23.93170	7.44e-15	-21.21264	-18.92513	-20.28901
6	1094.391	35.10107*	6.40e-15	-21.38474	-18.66152	-20.28518
7	1098.647	5.858008	8.51e-15	-21.13219	-17.97325	-19.85670
8	1105.929	9.396709	1.07e-14	-20.94471	-17.35006	-19.49329

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source : author from Eviews

ARDL Model Estimation

To examine relationships between consumption (LPIBR) and explanatory variables, the study resort to co-integration approach based on autoregressive models with a stepped delay (ARDL : Auto Regressive Distributed Lag) developed by Parasan and Shin (1995, 1999), Parasan and al. (1996), and Parasan (1997). In fact, traditional co-integration approach (Engle and Granger, 1987; Johansen, 1988) to determine the existence of a long term relation between variables presents serious bounds: necessary to have integrated series of the same order I (0) or I (1) and lacks

power towards samples of small size. Co-integration approach proposed by Parasan, Shin, and Smith and based on ARDL model, allows to solve these bounds. This approach allows to test long term relationships between variables I (0) and I (1) and provides strong estimations long and short term relationships for samples of small size centered under 80 observations (Narayan, 2005). That's how we get the following ARDL specification:

$$\Delta LPIBR_t = \alpha_0 + \sum_{i=1}^{P} \alpha_{1i} \Delta LPIBR_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \Delta LLCHO_{t-i} + \sum_{i=0}^{q} \alpha_{3i} \Delta LPPETR_{t-i} + \sum_{i=0}^{q} \alpha_{4i} \Delta LIPC_{t-i} + \beta_1 LPIBR_{t-1} + \beta_2 LCHO_{t-1} + \beta_3 LPPETR_{t-1} + \beta_4 LIPC_{t-1} + \varepsilon_t$$

Δ : operator of first difference ; α_0 : constant ; $\alpha_1 \ldots \alpha_4$: short term effects ; $\beta_1 \ldots \beta_4$: long term dynamic of model ; $\varepsilon \sim iid(0, б)$: error term (white noise).

As regard the application of ARDL model, it is important to estimate an ARDL model (p, q) which will serve as a bound test manner, which, in turn will confirm or disconfirm co-integration relationship in long term. Basing on delays' criteria selection, ARDL model has been estimated with a maximum of 2 delays for all variables. Chart 3 shows that all coefficients of ARDL model (1, 1) are significant (Prob < 5% and even 1% in the great majority of cases). Likewise, the model is totally significant, Prob. (F-statistic). The R-square of 0,999 show that 99, 9% variations of checking account balance are explained by significant variables of the model. Moreover, all variables are significant.

Table 3. ARDL model results (1, 1)

Variable Indépendante: LPIBR				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LPIBR(-1)	1.619813	0.077082	21.01407	0.0000
LPIBR(-2)	-0.638296	0.075169	-8.491506	0.0000
LCHO	-0.177401	0.087505	-2.027334	0.0456
LPPETR	-0.005664	0.001856	-3.051225	0.0030
LIPC	-0.195714	0.049717	-3.936549	0.0002
LIPC(-1)	0.348586	0.092131	3.783604	0.0003
LIPC(-2)	-0.147728	0.049567	-2.980400	0.0037
C	0.381612	0.125206	3.047879	0.0030
R-squared	0.999681			
Adjusted R-squared	0.999656			
F-statistic	40732.95	Durbin-Watson stat		1.896522
Prob(F-statistic)	0.000000			

Source: author from Eview

Bounds Test

The primary objective of this test is to enlighten on the existence or the non-existence of long term relationship between variables. For this purpose, the results of chart 4 show that the value of F= 8.182 over exceeds those of superior bounds of critical values to 5%. For this purpose, zero hypothesis is rejected from the absence of a long term relationship and to conclude on the existence of a long term relationship between variables.

Table 4. test bounds results

Significance	I0 Bound	I1 Bound	
10%	2.37	3.2	
5%	2.79	3.67	F-statistic:
2.5%	3.15	4.08	8.182099
1%	3.65	4.66	

Source: author from Eviews

Long Term Coefficient and Short Term Dynamic

Table 5 short and long term coefficients' results of estimation

Variable dépendante: ΔLPIBR			
Variable	Coefficient	t-Statistic	Prob.
ΔLCHO	0.012665	0.974780	0.3323
ΔLPPETR	0.003503	0.466150	0.6422
ΔLIPC	-0.198394	-4.345836	0.0000
ΔLIPC (−1)	0.147381	3.086706	0.0027
CointEq(-1)	-0.019323	-4.084979	0.0001
Variable	Coefficient	t-Statistic	Prob.
Variable dépendante: LPIBR			
Variables	Coefficient	t-Statistic	Prob
LCHO	-4.099505	-2.328804	0.0221
LPPETR	-0.306421	-4.273593	0.0000
LIPC	0.278294	1.926895	0.0571
C	20.646056	22.827445	0.0000

Source: author from Eviews

The test results' bounds have demonstrated that there is exist a long term relationship between two variables which is confirmed by the correction error model. In fact, we find, as expected, an adjustment coefficient that is negative (-0. 0193) between 0 and -1 and strongly significant (probability=0. 0001) The results of estimations are of good quality. In fact, the diagnostic tests in terms of errors (see appendix) shows that the probability linked to Jacque Bera statistic is equal to 0, 393 superior to 5%, normality hypothesis of variables is accepted. In other words, there's 39, 3% chance to make a bad a decision. In addition, ARCH test shows that the probability of « Obs*R-squared » is equal to 0. 9861, superior to 5%, zero hypothesis of homoscedasticity of residues is accepted. The White test also corroborates homoscedasticity hypothesis of errors, for the y relative is equal to 0. 1883, superior to 5%. « Obs*R-squared » probability tied to Breusch-Pagan-Godfrey reveals that there's no correlation of errors. Finally, stability tests of the model of cu sum and cu sum squared show that the model is structurally and punctually stable.

The results of our estimations show that relationship between growth and unemployment is not significant in short term. On the other hand, relationship between growth and unemployment in long term in negative. Hypothesis of symmetric relationship between growth and unemployment is verified. This result is not unprecedented in economic literature. In fact, such a result had already been found in the works Phiri (2014), Makaringe and Khobai (2018) in the verification of a long term relationship between growth and unemployment in South Africa. Our results suggest that to improve the performances of the Congolese economy, productivity and unemployment must be addressed simultaneously. So, this result

enlightens on the character of structural unemployment in Congo, which can result from the inadequacy of trainings as compared to job offers in work market. Another plausible explanation to the existence of a structural unemployment in Congo may be due to the important contribution of the petroleum sector to the GDP. However, it should be noted that the petroleum sector uses a production technique of high capitalistic intensity. In such a context, the solution to the unemployment problem that prevails in Congo goes through policies that favor prospective GDP growth.

Oil price has a negative contribution to growth. In fact, oil price increase of 1 point brings about a decrease of economic growth to 0. 31 point to actual GDP. The effect on inflation on economic growth is differentiated. In fact, in a short term, inflation on growth has a negative effect on economic growth. However, in long term, the impact of inflation on growth is significantly negative. Short term result can be justified by the fact that an important inflation level reduces the purchasing power of households, which reduces households' consumption and at the same time GDP. As for long term result, it is justified by the fact that minimum inflation is necessary for economic growth. This state of fact is corroborated by the Fisher relationship who supports that an augmentation of inflation reduces actual interest rate, which in turn increases private investment, as a result economic growth.

CONCLUSION

The purpose of our article was to empirically verify the link between unemployment and economic growth. To do this, the correction error ARDL model was estimated. The results of our estimations reveal that there is no relationship between growth and unemployment in long term. However, in long term, the results of our estimations confirmed the existence of an inverse relationship between economic growth and unemployment which proves the existence of structural unemployment in Congo. In this regard, the implementation of policies of demand, in other words, policies that aim at regulating macroeconomic fluctuation are weak in order to solve unemployment problem in Congo. The best way to solve unemployment problem in Congo goes through policies of offer which comprise, strengthening work productivity by leading education towards professional training. Furthermore, the government can give preference to increasing prospective GDP, by urging investments of companies generating employment, by increasing productive public expenditures.

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Appendix

Appendix 1: stationarity tests' results

Variables	ADF Test			integration Order
	ADF Statistic in level	Statistic in 1st difference	Critical value of Mckinon	
LPIBR	0.074738	-3.357363	-2.890926	**I(1)**
LCHO	-2.974180	-	-2.892200	**I(0)**
LPPETR	-1.506623	-3.663031	-2.890926	**I(1)**
LIPC	-2.990999	-	-2.990999	**I(0)**

Source : author from Eviews

Appendix 2: Estimation Result ARDL model

Dependent Variable: LPIBR
Method: ARDL
Sample (adjusted): 1991Q3 2016Q1
Included observations: 99 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): LCHO LPPETR LIPC
Fixed regressors: C
Number of models evalulated: 54
Selected Model: ARDL(2, 0, 0, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LPIBR(-1)	1.619813	0.077082	21.01407	0.0000
LPIBR(-2)	-0.638296	0.075169	-8.491506	0.0000
LCHO	-0.177401	0.087505	-2.027334	0.0456
LPPETR	-0.005664	0.001856	-3.051225	0.0030
LIPC	-0.195714	0.049717	-3.936549	0.0002
LIPC(-1)	0.348586	0.092131	3.783604	0.0003
LIPC(-2)	-0.147728	0.049567	-2.980400	0.0037
C	0.381612	0.125206	3.047879	0.0030

R-squared	0.999681	Mean dependent var	22.94224
Adjusted R-squared	0.999656	S.D. dependent var	0.265197
S.E. of regression	0.004916	Akaike info criterion	-7.715386
Sum squared resid	0.002199	Schwarz criterion	-7.505679
Log likelihood	389.9116	Hannan-Quinn criter.	-7.630538
F-statistic	40732.95	Durbin-Watson stat	1.896522
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Source : author from Eviews

Appendix 3: Test Bounds results

ARDL Bounds Test
Sample: 1991Q3 2016Q1
Included observations: 99

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	8.182099	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Source : author from Eviews

Appendix 4: Short and long term coefficient results

ARDL Cointegrating And Long Run Form
Dependent Variable: LPIBR
Selected Model: ARDL(2, 0, 0, 2)
Sample: 1991Q1 2016Q4
Included observations: 99

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LPIBR(-1))	0.631343	0.071787	8.794644	0.0000
D(LCHO)	0.012665	0.012993	0.974780	0.3323
D(LPPETR)	0.003503	0.007515	0.466150	0.6422
D(LIPC)	-0.198394	0.045652	-4.345836	0.0000
D(LIPC(-1))	0.147381	0.047747	3.086706	0.0027
CointEq(-1)	-0.019323	0.004730	-4.084979	0.0001

Cointeq = LPIBR - (-0.009950*LCHO - 0.3064*LPPETR + 0.2783*LIPC + 20.6461)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCHO	-0.009950	0.042728	-2.328804	0.0221
LPPETR	-0.306421	0.071701	-4.273593	0.0000
LIPC	0.278294	0.144426	1.926895	0.0571
C	20.646056	0.904440	22.827445	0.0000

Source : author from Eviews

Appendix 5: Test result of model validity

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.126246	Prob. F(2,89)	0.1253

Obs*R-squared	4.514589	Prob. Chi-Square(2)	0.1046

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.390751	Prob. F(7,91)	0.2188
Obs*R-squared	9.567561	Prob. Chi-Square(7)	0.2144
Scaled explained SS	25.04910	Prob. Chi-Square(7)	0.0007

Heteroskedasticity Test: ARCH

F-statistic	0.000297	Prob. F(1,96)	0.9863
Obs*R-squared	0.000303	Prob. Chi-Square(1)	0.9861

Heteroskedasticity Test: White

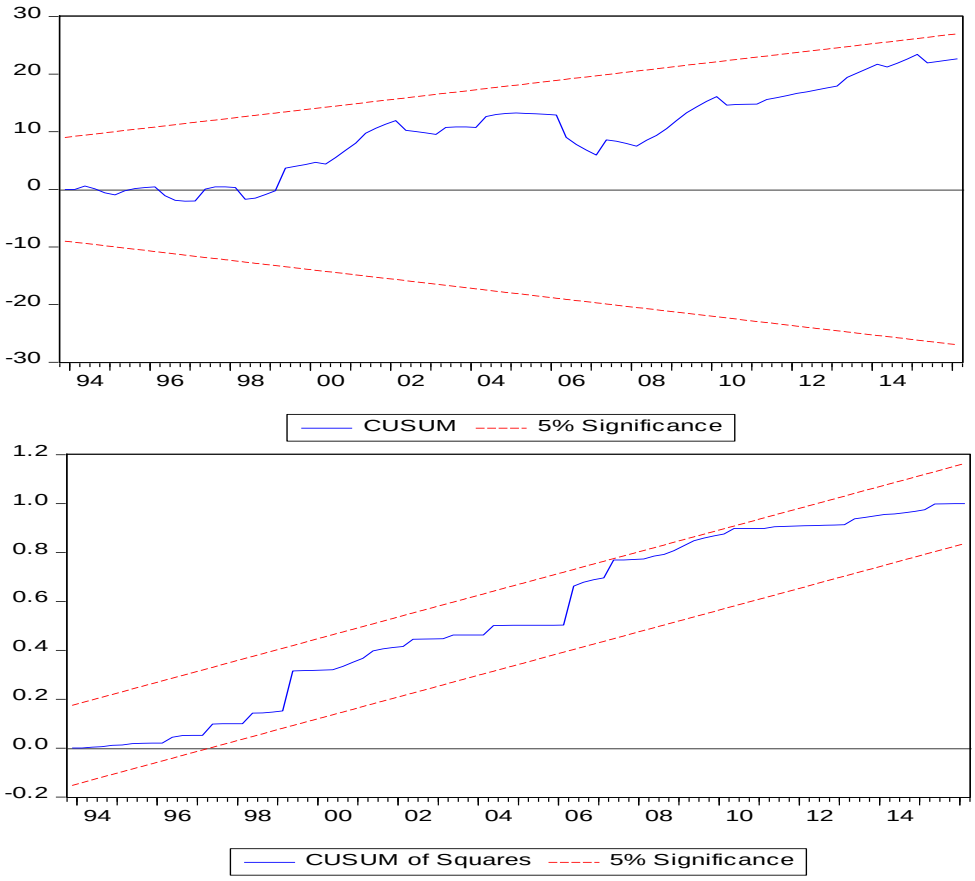
F-statistic	1.461433	Prob. F(7,91)	0.1910
Obs*R-squared	10.00467	Prob. Chi-Square(7)	0.1883
Scaled explained SS	26.19350	Prob. Chi-Square(7)	0.0005

Ramsey RESET Test
Equation: UNTITLED
Specification: LPIBR LPIBR(-1) LPIBR(-2) LCHO LPPETR LIPC LIPC(-1) LIPC(-2) C
Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.903365	90	0.0602
F-statistic	3.622798	(1, 90)	0.0602

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	8.51E-05	1	8.51E-05
Restricted SSR	0.002199	91	2.42E-05
Unrestricted SSR	0.002114	90	2.35E-05


30
20
10
0
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94
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06
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12
14
CUSUM
5% Significance
1.2
1.0
0.8
0.6
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-0.2
94
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12
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CUSUM of Squares
5% Significance