Journal of Global Economics, Management and Business Research

Volume 16, Issue 1, Page 1-10, 2024; Article no.JGEMBR.10461
ISSN: 2454-2504

Rational Expectations of Inflation and Augmented Philips Curve Hypothesis in Sub-saharan Africa: Evidence from Dynamic Panel Data Model

Obed I. Ojonta [a*] and Edith C. Obiefuna [a]

[a] Department of Economics, University of Nigeria, Nsukka, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.56557/JGEMBR/2024/v16i18570

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://prh.ikprress.org/review-history/10461

Original Research Article

Received: 23/12/2021
Accepted: 28/02/2022
Published: 10/01/2024

ABSTRACT

The study focuses on how rational expectations influence augmented Philips curve hypothesis in sub-Saharan African countries using dynamic robust instrumental variable system Generalized Method of Moments (GMM) approach, with panel data from twenty-six countries in the region for the period 2009 to 2016. The two stage system GMM results show that with rational expectations on augmented Philips curve, the relationship between inflation and unemployment is positive and significant. When output gap is used as a proxy for unemployment in the model, the results reveal that the relationship between inflation and unemployment is negative but statistically insignificant. The findings suggest that the rational expectations of inflation on augmented Philips curve hypothesis are invalid in Sub-Sahara African countries. This lead to the recommendation that proper policy for the provision of enabling environment for ease of doing business to enhance productivity should be vigorously pursued in order to reduce inflation and unemployment rate.

**Corresponding author: E-mail: obed.ojonta@unn.edu.ng;*

Keywords: Inflation; unemployment; Philips curve; system GMM; Africa.

JEL Code: *E24, E31, P24.*

1. INTRODUCTION

The deflation rate is most desired for every developing region like sub-Saharan Africa to achieve robust growth and development. Most developing regions have not substantially achieved deflation rate to guarantee for improvement of condition of living and adequate investment [1]. Indeed, underdeveloped regions such as sub-Saharan Africa are characterised by high rate of inflation and high level of unemployment [2-4]. Such high level of inflation and unemployment rate are serious impediment in consumption pattern both for food and non-food in sub-Saharan Africa. In addressing the relationship between unemployment and inflation rate for economic growth and development in Africa, Philips in 1958 developed an augmented Philips curve hypothesis to explain how unemployment influences inflation rate. The hypothesis argued that unemployment in an economy has a negative influence on inflation. World Development Indicator [5] report revealed that overtime for half a decade from 2012-2016, sub-Saharan Africa has recorded high level of unemployment and low inflation rate. The continent success stories show that some countries which include, Nigeria, Niger, Benin, Ghana, Cameroon and Togo had witnessed high level of unemployment and inflation rate. Clearly, high level of unemployment as witnessed by these countries was supposed to guarantee these countries a potential deflation rate and enhanced consumption [6]. However, economy in Africa appears to have been captured by high unemployment and inflation rate. This is because the continent is still characterized by unfavourable exchange rate, high dependency ratio, unemployment rate, inflation and high level of extreme poverty. For instance, Urama & Iheonu [7] explained that Nigeria, which is Africa's largest and most populous economy, is presently regarded as the world's poverty headquarters with over 93 million people living in poverty. This phenomenon was traced to have caused by inadequacy for inclusion of rational expectations of inflation in the Philips curve hypothesis.

The report from World Development Indicator in 2018 revealed that the sub-Saharan Africa region experienced high unemployment and inflation rate for half a decade due to inadequate inclusion of rational expectations of inflation to the augmented Philips curve hypothesis which is one of the bedrocks to achieve economic and development growth. However, it has been recently observed that poor utilization of augmented Philips curve hypothesis in sub-Sahara Africa contributed major issues threatening the economic growth of many African countries in terms of job creation, consumption enhancement and poverty [8].

The relevance of augmented Philips curve hypothesis in promoting economic and development growth in sub-Saharan African countries cannot be overemphasized. Obviously, without adequate utilisation of augmented Philips curve hypothesis, countries in sub-Saharan Africa will continue to face a lot of challenges such as poor education, poor health service delivery, poor output production and low level of productivity. It can be therefore argued that these challenges for non utilisation of augmented Philips curve hypothesis are the issues presently confronting most developing countries. This scenario could have been substantially avoided if these countries in the region were able to reduce employment in order to achieve healthier economic growth. Unfortunately, for many of these countries, inflation and unemployment are still persisting due to non utilisation of augmented Philips curve hypothesis.

Some extant studies both in developing and underdeveloped countries have been carried out to examine the validity of augmented Philips curve hypothesis. These studies for instance in the developing countries like [9-21]. focused on how adaptive expectations of inflation influences augmented Philips curve without considering the important role of rational expectations of inflation on augmented Philips curve hypothesis. Studies for developing countries like [22,23] also investigated adaptive expectation on the Philips curves hypothesis without putting into consideration the effect of rational expectations of inflation on augmented Philips curve hypothesis in the developing countries. Thus, the effect of rational expectation on the Philips curve hypothesis in sub-Saharan Africa is yet to be investigated in order to provide evidence that can support government policies for the job creation and inflation reduction in the region. It is the goal of this study to fill this gap in the literature by

considering the rational expectations of inflation on the augmented Philips curve hypothesis.

The research hypothesis for the study:

1. There is no significant influence of rational expectation of inflation on augmented Philips curve hypothesis in Sub-Saharan Africa
2. There is no significant contributing factors of rational expectations on augmented Philips curve hypothesis in Sub-Saharan Africa.

Consequently, the key questions asked in this study are: (i) how does a rational expectation of inflation influence augmented Philips curve hypothesis in Sub-Saharan Africa and (ii) what are the contributing factors of rational expectations of inflation on augmented Philips curve hypothesis in Sub- Saharan Africa? In other words, the objectives of this study are twofold, namely: (i) to ascertain the influence of rational expectations on the Philips curve hypothesis in sub-Saharan Africa; and (ii) to determine other contributing factors of rational expectations that significantly influence the Philips curve hypothesis in sub-Saharan Africa. These objectives are important because exposing the factors influencing the Philips curve hypothesis in sub- Saharan Africa will enable policymakers to frontally address them, thereby achieving employment creation and inflation reduction. To achieve these objectives, this study employed World Development Indicator for 2018 to construct a measure of Philips curve hypothesis.

The different sections of this paper would be determined as follows. The next Section provides review of empirical related literatures. Another section which is 3 showcases the method approach such as data descriptions and detailing the model specification. The empirical results are in Section 4, while Section 5 concludes the paper.

2. LITERATURE REVIEW

Some studies in the literature have shown how adaptive expectations of inflation influences augmented Philips curve hypothesis from different perspectives, both in developed and underdeveloped economies. In developed economies, for instance, [24-42]. found that adaptive expectations of inflation is significant and has a positive influence on augmented Philip curve hypothesis. However, some studies in the developed countries like [43-52] examined in aggregation the two components of inflation forecast, rational and adaptive expectations to examine their influence on the augmented Philips curve hypothesis. The result of these components shows that inflation is significant and has a negative influence on the augmented Philips curve hypothesis.

Some studies that focused on developing countries also abound in the literature. For instance, [53,54] employed aggregate data to forecast the influence of adaptive expectations on augmented Philips curve hypothesis in Ghana. Orji et al. [25,26] Ojapinwa and Esan [24] employed Autoregressive Distributed Lag (ARDL), Autoregressive Integrated Moving Average (ARIMA), and a multivariate time series Vector Autoregressive (VAR) models respectively for the study. The result shows that adaptive forecast is significant and has negative influence on the augmented Philips curve hypothesis.

3. METHODOLOGY

3.1 Empirical Model and Data

This study examined the effect of rational expectations on Philips curve hypothesis in Africa for the period 2009-2016 using dynamic panel approach. A representation of the expectations augmented Philips curve is generally specified in a dynamic panel form as:

$$\pi_{\mathrm{it}} = \alpha_{\mathrm{i}} + \pi_{it}^{e} + \beta_{\mathrm{i1}} \mathrm{unem}_{\mathrm{it}} + \varepsilon_{\mathrm{it}} \qquad (1)$$

From equation 1 above, *I* represents country and *t* represents time period. π stands for inflation rate measured by consumer price index. π^{e} stands for expected rate of inflation. $\beta_{i1,}$is coefficients to be estimated with vector of core explanatory variable unemployment (unem) measured as total unemployment as a percentage of total labour force with a priori expectation sign to be negative, α_i is country specific effects, and ε is the error term assumed to independently and identically distributed with zero mean and constant variance.

Our major interest is on the rational expectation of future inflation rate π^{e} by economic agent which entered the equation with a coefficient of unity in accordance with “natural rate” hypothesis of Lucas which signalled that agents put into

consideration the anticipated real purchasing power of the prices they pay and receive. However, the way in which people form expectations changes as a result of changes in inflation behaviour. This situation changes the way expectations about inflation rate are formed. People could not expect the rate of inflation in the present year to be the same as the previous year. This change in expectations changes the nature of the relation between unemployment and inflation. Hence, the rational expectations of economic agents about future prices are assumed to be based on factors that cause price changes which include the experience of past inflation, external debt, broad money supply, real income level, and interest rate. Therefore, the functional form for π^e is expressed thus:

$$\pi^e = \mathrm{f}\left(\pi_{\mathrm{t\text{-}1}}, extd, ms, ri, \mathrm{int}\right) \quad (2)$$

Subsuming equation (2) into (1) will yield

$$\pi_{\mathrm{it}} = \alpha_{\mathrm{i}} + \phi_{\mathrm{i1}}\pi_{t-1} + \beta_{\mathrm{i1}}\,\mathrm{extd}_{\mathrm{it}} + \beta_{\mathrm{i2}}\mathrm{ms}_{\mathrm{it}} + \beta_{\mathrm{i3}}\mathrm{ri}_{\mathrm{it}} + \beta_{\mathrm{i4}}\,\mathrm{int}_{\mathrm{it}} + \beta_{\mathrm{i5}}\mathrm{unem}_{\mathrm{it}} + \varepsilon_{\mathrm{it}} \quad (3)$$

From equation (3), $\pi_{\mathrm{t\text{-}1}}$ denotes past inflation rate with a priori expectation sign to be positive; $extd$ denotes external debt with a priori expectation sign to be positive; ms denotes money supply proxied by broad money supply (M2) with a priori expectation sign to be positive; ri denotes real income proxied by real gross domestic product with a priori expectation sign to be negative as increase in real income rises real money demand thereby declining the growth of money; and int denotes interest rate with a priori expectation sign to be positive.

Even though this study estimated the aforementioned model, we re-estimated the model with output gap as a proxy for unemployment in order to check for robustness of our result to alternative model specifications. The output gap is measured in this study as $\left(Y - \overline{Y}\right)$ which is the difference between the log of actual real gross domestic product and the potential real gross domestic product. Potential GDP is estimated using Hodrick Prescott filter. We employed annual time series data for twenty-six Sub-Saharan African countries which include: Angola, Benin, Botswana, BurkinaFaso, Burundi, CaboVerde, Cote d'Ivoire, Guinea-Bissau, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, South Africa, Tanzania, Togo, Uganda and Zambia. We excluded other African countries due to lack of data for some of the variables. The countries include: Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Cameroon Central African Republic, Chad, Comoros, Congo (Brazzaville), Congo (Democratic Republic), Madagascar, Mauritania, Namibia, Réunion, Seychelles, Somalia, Sudan, Swaziland, Western Sahara and Zimbabwe. The data for study was sourced from World Development Indicators which was conducted in 2018. The choice of this dataset followed the study by [55]. However, their study used Robust Instrumental Variables System Generalized Method of Moments (GMM) estimation approach to estimate the model in equation (3). The dynamic panel data estimator has been found very suitable in a situation where unobservable indicators influence the dependent and independent variables to ensure that some of the independent variables are correlated with dependent variable. This is likely to be the case in regressions of variables on financial sector development and economic growth. So, in dealing with this potential endogeneity bias introduced by the lagged endogenous regressor, the Difference GMM estimator and the System GMM estimator have been proposed, among other estimators in literature.

The preference for dynamic sys-GMM panel model cannot be overemphasized. One, it addresses the problem of estimation omission of Static panel [56]. The static panels are often mis-specified because the impacts of the lagged dependent variables are not taken care of [57]. Again, sys-GMM helps to address the problem of endogeneity since sometimes there could be a correlation between the independent variable and the error term in model, and this is easily addressed in dynamic panel by including the lag of the dependent variable in the model [58]. Thirdly, the sys-GMM estimator performs better than the differenced-GMM (DIF-GMM) in multivariable dynamic panel models. Since, This is because the sys-GMM estimation is more suitable when variables are “random walk” [59] and the DIF-GMM estimator may have a problem of weak instrumentation in this case [60]. Fourthly, it has been argued by that sys-GMM is more consistent even in the presence of persistent series, and in the midst of dramatic reduction existing in finite sample bias occasioned by the manipulations of additional

Table 1. Percentage share of employment and inflation rate by quintile in sub-Saharan Africa

Indicator Name	1992-1996	1997-2001	2002-2006	2007-2011	2012-2016
Unemployment rate	7.9	8.4	7.92	7.25	6.88
Inflation rate	13.33	5.91	6.03	6.93	5

Source: Author's computations from WDI 2018 using SPSS

moment conditions Finally, sys-GMM is better suited for unbalanced panel data series to avoid the weakness of magnifying gaps since GMM estimators assume cross-sectional independence of the disturbances of the error terms. More so, dynamic short panel specification is justified for this study given the small panel we have. We conducted robustness test for the system GMM as proposed by [57,58].

3.2 Descriptive Analysis

Table 1 shows the percentage share of unemployment of labour force and inflation rate by quintiles in sub-Saharan Africa. The table shows that 1992-1996, unemployment rate of labour force and inflation rate in sub-Saharan Africa is 7.9 and 13.33 percent respectively. In the second quintile of 1997-2001, unemployment rate of labour force increased to 8.4 percent by 0.5 percent while the inflation rate decreased to 5.91 percent from 13.33 percent. The table also shows that for a decade from 2002-2011 there was a consistent decrease in unemployment rate of labour force but increase in inflation rate during the period. This implies that augmented Philips curve hypothesis holds in sub-Saharan Africa for two decades from 1997 to 2011. The table as well revealed that after the period, there was decrease in unemployment rate of labour force from 2011 to 2016 showing also decrease in inflation. This of cause implies that there is a mismatch in the line of taught by augmented Philips curve hypothesis which says increase in unemployment rate decreases inflation rate. This is shown clearly in quantitative terms in Table 1.

4. EMPIRICAL RESULTS AND DISCUSSION

To avoid the problems of serial correlation, heteroscedasticity, reverse causality and potential endogeneity of the regressors, and to correct for unobserved country heterogeneity and omitted variable bias usually associated with dynamic panel data methodology, the application of robust instrumental variable system GMM procedure was adopted, which produces consistent estimates of the parameters of interest and their asymptotic variance covariance [54-57]. We also subjected the estimates to three important specification tests, namely: the Sargan/Hansen tests for exogenous instruments, the Arellano-Bond test for error serial correlation at the second order (AR2), and Difference-in-Hansen test, in order to test for exogeneity of instrument subsets. The results of the empirical analyses of the models in this study are reported in Table 1.

Also regressions with suffix ''END'' treat lagged inflation rate &lnm2gdp as endogenous. Regressions with suffix ''CL'' follow [58] and collapse the instrument matrix while "a" denote lag (1'3).The empirical result from the panel of 26 African countries is presented in Table 1. The result in column 1 indicates that the relationship between inflation and unemployment is negatively and statistically insignificant. However, a closer look at the result in column 1 showed that the numbers of instruments exceed the number of groups in the model and thus, the outcome of the analysis may be weak, and the exogenous variables in the model may not be strictly exogenous.

Therefore, when system GMM follows and collapse the instrument matrix with lag interval specification in column 2 and 3 to account for too many instruments, the number of instruments becomes lesser than the number of groups in the model in line with the basic assumption of the system GMM. The outcome in column 2 and 3 validated the choice of using collapse instrument matrix as a better approach for the estimation of the panel data employed in this study. Therefore, in column 2, we observed that the relationship between inflation rate and unemployment rate is positively and statistically significant. This suggests that on the average, one percent increase in unemployment rate results to a 0.4 percent rise in inflation rate. This finding does not support the postulation of the Phillips curve hypothesis that inflation rate has an inverse relationship with unemployment. The positive relationship between inflation and unemployment in sub-Saharan African countries is not surprising, owing to the present stagflation being witnessed in most of sub-Saharan African countries suggesting that the Phillips curve relation does not exist in sub-Saharan African countries.

Table 2. Two step Sys-GMM panel estimation regression results

	(1)	(2)	(3)
Variables	**SGMM1**	**SGMM2-END-CL-a**	**SGMM2-END-CL-a**
π_{t-1}	0.648***	0.423***	0.569***
	(0.170)	(0.148)	(0.172)
lnrgdp	-1.581	-7.353**	-12.87***
	(3.216)	(3.500)	(3.787)
lnm2gdp	-3.239	-21.49***	-33.69***
	(2.604)	(8.336)	(8.458)
intr	-0.0999	-0.181***	-0.240***
	(0.102)	(0.0698)	(0.0766)
lnextd	0.428	8.996**	16.13***
	(2.657)	(4.222)	(4.726)
unem	-0.193	0.407**	
	(0.269)	(0.188)	
opg			-11.28
			(8.255)
Constant	42.95	49.65**	67.49***
	(46.83)	(21.09)	(22.71)
Observations	182	182	182
Number of crossid	26	26	26
country effect	YES	YES	YES
year effect	NO	NO	NO
Hansen_test	23.72	6.354	3.272
Hansen Prob	1	0.385	0.774
Diff-in-Hansen	-0.71	0.91	0.52
Diff-Hansen Prob	1	0.636	0.771
AR(1)_test	-1.765	-1.653	-1.794
AR(1)_P-value	0.0775	0.0983	0.0729
AR(2)_test	-1.785	-1.159	-0.739
AR(2)_P-value	0.0743	0.246	0.460
No. of Instruments	99	13	13

*Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, SGMM2 denote Two-Step GMM*

However, for robust and more reliable conclusion, output gap was used as a proxy for unemployment to estimate the augmented expectation Philips curve in column 3. The findings reveal that the relationship between inflation and unemployment is negative but systematically insignificant. This insignificant relationship is in line with the finding of [60].

We found that inflation rate own past realizations has positive and significant impact, justifying the use of sys-GMM methodology as well as taking backward looking model of inflation into consideration. Therefore, rational expectation is an important determinant of current and future inflation. [61,62]. substantiate the argument that inflation inertia is fundamental in the rational expectations framework. We also found out that an increase in real income has a negative and statistically significant effect on inflation rate which is consistent with theoretical prediction. This finding is supported by Solomon [62] who found out that rise in income level leads to decline in inflation in Ghana.

External debt is also an important determinant of current and future inflation with regard to expectation Philips curve analysis. The result shows that the growth of external debt impacts positively and significantly on inflation rate with a coefficient of 0.0698. This indicates that a percentage rise in external debt explains inflation surges to about 7 percent. The finding is consistent with Neo-classical theory which argues that relationship between inflation and external debt is positive in that external debt presents disequilibrium temporally in the money market by increasing the supply money vis-à-vis aggregate spending and thus the general price level.

Surprisingly, money supply appears to be driven by a negative inflation in the short-run. Money supply rather had a diminishing impact on inflation which sounds counter intuitive and contrary to theoretical prediction, but with unique feature within Sub-Saharan African perspective. The negative relationship between inflation and money supply could be attributed to the fact that inflation is not seen as a monetary phenomenon in the short-run. A number of studies empirically found similar result such as [60-63].

5. CONCLUSION

This study examines the dynamic relationship between inflation and unemployment in augmented expectation framework in the Sub-Saharan African region. A panel of twenty-six countries in region was employed based on annual data from 2009 to 2016 using Two Step System-GMM model. Overall, there was no evidence of Philips curve hypothesis in Sub-Saharan Africa. An alternative model specification where output gap was used as a proxy for unemployment to estimate the augmented expectation Philips curve. The alternative model specification result affirms our earlier result that no significant trade-off between inflation and unemployment augmented expectation framework in Sub-Saharan Africa. Therefore, the evidence of Philips curve remains doubtful, mostly operational through factors closely related with rational expectations of economic agent in Sub-Saharan African countries. Furthermore, inflation inertia, external debt, broad money supply, real income level, and interest rate are significant determinant of current and future inflation.

The policy implication of this result is that policy makers in Africa should understand that rational expectation is an important ingredient for Philips curve hypothesis. Perhaps the positive relationship between inflation and unemployment could explain why Sub-Saharan Africa is still struggling to leverage the twin devil identified as the coexistence of high inflation and high unemployment. Therefore, a good knowledge of inflation and unemployment relationship and anchoring inflation expectations in the region is important for suitable policy formulation.

Given the positive influence of external debt on inflation, the study therefore, recommends that external debt should be evaluated to checkmate wasteful public expenditure which ultimately would help meet future inflation targets and afterward, monetary authority should also improve revenue generation through efficient tax system instead of embarking on external finance. Since real income has significant impact on reducing inflation, proper policies for the provision of conducive environment for ease of doing business and boosting productivity, should be vigorously pursued. Another area that can support validity of augmented Philips curve and rational expectation efficiently in developing countries like Africa is through reduction of high demand and increase in employment. This will go a long way to improve living conditions of people particularly the class of individuals found mostly at lower end income distribution. There is a need to create more industries in Africa. This will help in reducing poverty and engage more people working and reduction of high inflation through adequate policy making. Reduction of inflation and increase in employment can be easily achieved by government through various intervention such as monetary policy and establishment of industries. These policies will go a long way in repositioning the issues of inflation, inequalities and unemployment that are mostly rampant in developing countries like Africa.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Niskanen WA. On the Death of the Philips Curve. Cato Journal. 2012;22(2):193–198. Available:https://doi.org/10.1111/j.1467-9442.2011.01670.x
2. Hossain S, Mitra R. The Determinants of Economic Growth in Africa: A Dynamic Causality and Panel Cointegration Analysis. Economic Analysis and Policy. 2013;43(2): 217–226. Available:https://doi.org/10.1016/S0313-5926(13)50019-1
3. Ojonta OI, Ogbuabor JE. Access to Credit and Physical Capital Stock: A Study of Non-Farm Household Enterprises in Nigeria. Bulletin of Monetary Economics and Banking. 2021; 24(4):631–640. Available:https://doi.org/10.21098/bemp.v24i4.1515
4. Nwosu EO, Ojonta O, Orji A. Household Consumption Expenditure and Inequality: Evidence from Nigerian Data. International Journal of Development

Issues. 2018;17(3): 266–287. Available:https://doi.org/https://doi.org/10.1108/IJDI-06-2017-0113
5. WDI. World Development Indicator; 2018.
6. Philips AW. The relationship between unemployment and the rate of change of money wage rate in the United Kingdom. Economica. 1958;25 :258–299.
7. Urama N, Iheonu C. Addressing Poverty Challenges in Nigeria. African Heritage Institution; 2019.
8. Bourguignon F. The Growth Elasticity of Poverty Reduction; Explaining Heterogeneity across Countries and Time Periods. In Inequality and Growth: Theory and Policy Implications, ed. T. Eicher and S. Turnovsky; 2003.
9. Friedman M. The Role of Monetary Policy. American Economic Review. 1968;58(1):1–17. Available:https://doi.org/10.1257/jep.6.3.79
10. Lipsey RG. The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom. 1862-1957: A further Analysis. Economica. 1960; 27(105):1–31. Available:http://www.jstor.org/page/info/about/policies/terms.jsp
11. Samuelson P, Solow R. American Economic Association Analytical Aspects of Anti-Inflation Policy. The American Economic Review. 1960;50(2):177–194.
12. Phelps, ES. Phillips Curves, Expectations of Inflation and Optimal Unemployment Over Time. Economica. 1967;34(135): 254–281. Available:https://doi.org/10.2307/2552025
13. Leijonhufvud A. Comment : Is There a Meaningful Trade-off Between Inflation and Unemployment ? Journal of Political Economy. 1968;76(4):738–743. Available:https://www.jstor.org/stable/1830372
14. Gordon RJ, Solow R, Perry G, Gordon RJ, Gordon RJ. The Recent of Lessons for Acceleration and Future Its the. Brookings Papers on Economic Activity, 1970;(1):8–47. Available:http://www.jstor.org/stable/2534167
15. Lucas Jr., R. Expectations and the Neutrality of Money. Journal of Economic Theory. 1972; 4(2):103–124. Available:https://doi.org/10.1016/0022-0531(72)90142-1
16. Lucas Jr. R. Some International Evidence on Output-Inflation Trade-offs. American Economic Review. 1973;63(3):326–334. Available:http://www.jstor.org/stable/1914364
17. Lucas Jr. R. Econometric Policy Evaluation: Critique; 1976. Available:https://doi.org/http://dx.doi.orgI10.1016/S0167-2231(76)80003-6
18. Okun AM, Fellner W, Wachter M. Inflation : and Its Mechanics Costs Welfare Costs. Brookings Papers on Economic Activity, 1975;(2):351–401. Available:https://doi.org/10.1109/TNSRE.2009.2039602
19. Turner P. The Phillips Curve, Parameter Instability and the Lucas Critique. Applied Economics. 1997;29(1):7–10. Available:https://doi.org/10.1080/00036847327344
20. Atkeson A, Ohani LE. Are Philips Curves Useful for Forecasting Inflation? Federal Reserve Bank of Minneapolis Quarterly Review. 2001;25(1):2–10. Available:http://www.minneapolisfed.org.
21. Demers F. The Canadian Phillips Curve and Regime Shifting. In Bank of Canada Working Paper. 2003;32.
22. Reichel R. On the Death of the Phillips Curve: Further Evidence. Cato Journal. 2004;24(3): 341–348. Available:https://doi.org/10.1525/sp.2007.54.1.23.
23. Phelps ES. Phillips Curves, Expectations of Inflation and Optimal Unemployment Over Time. Economica. 1967;34(135):254–281. Available:https://doi.org/10.2307/2552025
24. Ojapinwa TV, Esan F. Does Philips Relations Really Exist in Nigeria? Empirical Evidence. International Journal of Economics and Finance. 2013;5(9):123–134. Available:https://doi.org/doi: 10.SS39/ijef.vSn9p 123
25. Orji A, Anthony-Orji OI, Okafor JC. Inflation And Unemployment Nexus In Nigeria: Another Test of the Phillips Curve. Asian Economic and Financial Review. 2015;5(5):766–778. Available:https://doi.org/10.18488/journal.aefr/2015.5.5/102.5.766.778
26. Shadman-mehta F. Does Modern Econometrics Replicate The Phillips Curve ? ∗ [IRES, Universit´e Catholique de Louvain]; 1996.

Available:https://sites.uclouvain.be/econ/DP/IRES/9615
27. Soskice D, Iversen T. The Nonneutrality of Monetary Policy with Large Price or Wage Setters. Quarterly Journal of Economics. 2000;115(1):265–284.
28. Hansen M, Pancs R. The Latvian Labour Market in Transition : The Beveridge and Phillips Curves as Indicators of Normalization. 2001;1:1–7.
29. Bhanthumnavin K. The Philips Curves in Thailand. St. Anthony's College, University of Oxford Working Paper; 2002.
30. Islam F, Hassan K, Mustafa M, Rahman M. Rational Expectation11.pdf. 2003;107.
31. Islam F, Shahbaz M, Shabbir M. Phillips curve in a small open economy: A time series exploration of North Cyprus (No. 28397); 2011.
Available:http://mpra.ub.uni-muenchen.de/28397/
32. Holden S. Monetary Regimes and the Co-ordination of Wage Setting. European Economic Review. 2005;49(4):833–843.
Available:https://doi.org/10.1016/j.euroecorev.2003.08.007
33. André FJ, Cardenete MA, Lima MC. Using A CGE Model to Identify the Policy Trade-Off Between Unemployment and Inflation. the Efficient Phillips Curve. Economic Systems Research. 2012;24(4):349–369.
Available:https://doi.org/10.1080/09535314.2012.691088
34. Grammy AP. The Inflation – Unemployment Trade-Off Under Stagflationary Conditions : The Case of Post-Revolution Iran. DE GRUYTER. 2013;9(1):37–50.
Available:https://doi.org/10.1515/rmeef-2012-0045
35. Ormerod P, Rosewell B, Phelps P. Inflation/Unemployment Reimes and the Instability of Philips Curve (Economics Discussion Papers, No2009-43); 2009.
Available:http://hdl.handle.net/10419/28249%0A
36. Cruz-rodríguez A. A Phillips Curve to the Dominican Republic. 2009;15158.
37. Coricelli F, Cukierman A, Dalmazzo A. Monetary Institutions, Monopolistic Competition, Unionized Labor Markets and Economic Performance. Scandinavian Journal of Economics. 2006;108(1):39–63.
Available:https://doi.org/10.1111/j.1467-9442.2006.00441.x
38. Paul BP. In search of the Phillips curve for India. Journal of Asian Economics. 2009; 20(4):479–488.
Available:https://doi.org/10.1016/j.asieco.2009.04.007
39. Del Boca A, Fratianni M, Spinelli F, Trecroci C. The Phillips curve and the Italian lira, 1861-1998. North American Journal of Economics and Finance. 2010;21(2):182–197.
Available:https://doi.org/10.1016/j.najef.2009.07.001
40. Sánchez M. Inflation Uncertainty and Unemployment Uncertainty: Why Transparency about Monetary Policy Targets Matters. Economics Letters. 2012;117(1):119–122.
Available:https://doi.org/10.1016/j.econlet.2012.05.008
41. Furuoka F. Does the "Phillips curve" really exist? New empirical evidence from Malaysia. Economics Bulletin. 2007;5(16):1–14.
Available:http://economicsbulletin.vanderbilt.edu/2007/volume5/EB-07E20006A.pdf
42. Tang CF, Lean HH. Is Phillips Curve Stable in Malaysia ? New Empirical Evidence. Malaysian Journal of Economic Studies. 2007; 44(2):95–105.
43. Schreiber S, Wolters J. The Long-Run Phillips Curve Revisited: Is the NAIRU Framework Data-Consistent? Journal of Macroeconomics. 2007;29(2):355–367.
Available:https://doi.org/10.1016/j.jmacro.2005.08.003
44. Russell B, Banerjee A. The Long-Run Phillips Curve and Non-Stationary Inflation. Journal of Macroeconomics. 2008;30(4):1792–1815.
Available:https://doi.org/10.1016/j.jmacro.2007.11.001
45. Gerlach S, Lydon R, Stuart R. Unemployment and Inflation in Ireland: 1926–2012. Cliometrica./ 2015;10(3):1–20.
Available:https://doi.org/10.1007/s11698-015-0134-1
46. Binder CC. Whose expectations augment the Phillips curve? Economics Letters. 2015; 136(2015):35–38.
Available:https://doi.org/10.1016/j.econlet.2015.08.013
47. Sovbetov Y, Kaplan M. Empirical examination of the stability of expectations Augmented Phillips Curve for developing and developed countries. Theoretical and Applied Economics, XXVI. 2019;2(619):63–78.
48. Coibion O, Gorodnichenko Y, Ulate M. Is Inflation Just Around the Corner? The

Phillips Curve and Global Inflationary Pressures. AEA Papers and Proceedings. 2019;109:465–469.
Available:https://doi.org/10.1257/pandp.20191055

49. Ball L, Mazumder S. A Phillips Curve with Anchored Expectations and Short-Term Unemployment. Journal of Money, Credit and Banking. 2019;51(1):111–137.
Available:https://doi.org/10.1111/jmcb.12502
50. Alnaa SE, Ahiakpor F. ARIMA (autoregressive Integrated Moving Average) approach to predicting inflation in Ghana. Journal of Economics and International Finance. 2011; 3(5):328–336.
Available:http://www.academicjournals.org
51. Okoroafor DOK, Adeniji SO, Olasehinde T. Estimating and Forecasting the Impact of Inflation on Economic Growth in Nigeria Using Threshold Analysis. CBN Journal of Applied Statistics. 2018;9(1):1–22.
52. Gali J, Gertler M. Inflation Dynamics: A Structural Econometrics Approach. Journal of Monetary Economics. 1999;44(2):195–222.
53. Gali J, Gertler M, Lopez-Salido J. Robustness of the Estimates of the Hybrid New Keynesian Philips curve. Journal of Monetary Economics. 2005;52(6):1107–1118.
54. Baum C, Christopher F. An Introduction to Modern Econometrics Using Stata. Stata Press; 2006.
55. Bond S. Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice. Portuguese Economic Journal. 2002;1(2):141–162.
56. Roodman D. A Note on the Theme of too Many Instruments. Oxford Bulletin of Economics and Statistics. 2009;71(1):135–158.
57. Arellano M, Bond S. Some Tests of Specification for Panel Data: Monte Carlo Evidence and An Application to Employment Equations. The Review of Economic Studies. 1991;58(2): 277–297.
58. Arellano M, Bover O. Anther Look at the Instrumental Variable Estimation of Error-Components Models. Journal of Econometrics. 1995;68(1):29–51.
59. Esu GE, Atan JA. The Philip's Curve in Sub-Saharan Africa: Evidence from Panel Data Analysis. Journal of World Economic Research. 2017;6(5):60–66.
Available:https://doi.org/10.11648/j.jwer.20170605.11
60. Sarafidis V, Roberson D. On the Impact of Error Cross-sectional Dependence in Short Dynamic Panel Estimation. The Economic Journal. 2009; 12(1):62–81.
61. Blundell R, Bond S. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. Journal of Econometrics. 1998;87(1): 115–143.
62. Blundell R, Bond S. GMM Estimation with Persistent Panel Data: An Application to Production Functions. Econometric Reviews. 2000;19(3):321–340.
63. Solomon S. The Expectations - Augmented Philips Curve Evidence from Ghana. International Journal of Economics, Commerce and Management. 2014;2(11):1–21.

Peer-review history:
The peer review history for this paper can be accessed here:
https://prh.ikprress.org/review-history/10461