The Relationship between Inflation and Unemployment in Ghana: Analysis of the Philips Curve

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Abstract

The aim of this study is to explore the relationship between inflation and unemployment in Ghana. The study also aims to test for the existent of the Philips curve in Ghana using the new Keynesian Philips curve model on annual time series data sampled from 1970 to 2013. The sample period was divided into two subsamples -from 1970 to 1982 and 1983 to 2013- in order to test for the effect of the Economic Recovery Programme on the relationship between inflation and unemployment. The empirical estimate reveals that, changes in unemployment does not brings about changes in inflation both subsample periods. Again, the study rejects evidence of the Philips curve in Ghana. This is attributed to the fast growing labour force that lack the appropriate skills to earn them a job placement, alarming rate of rural-urban migration, imperfect market information which has resulted in mismatch of that makes inflation unresponsive to changes in unemployment. Monetary policies to influence inflation would not bring about any trade-off between inflation and unemployment. To reduce the ever increasing unemployment in Ghana, policy direction should focus on creating job opportunities for both uneducated and educated individuals.

Keywords: Inflation, Unemployment, Philips curve, Ghana

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1.0 Introduction

In the Ghanaian economy, a day will never pass by without hearing politicians, economist and ordinary citizen arguing about unemployment and inflation. In some cases, inflation and unemployment are high for a particular month and then reduces for another month. Although intensive research on the relationship between inflation and unemployment has uncovered some important results, the linkages between these two macroeconomics variables as well as the precise relationship is still open, and has long been a controversial topic.

The general inclusive concept that provided a negative correlation between inflation and unemployment, which has been at the center of policy discussion, was first presented in 1958 and later became known as the Philips curve. Philips (1958) observed that, one stable curve can be used to represent inflation and unemployment trade-off. This model has been at the heart of many economists because it throws light on the effect of monetary policy in an economy. The Philips curve has played a central role in macroeconomics by enhancing policy makers' understanding of an economy whenever they deem it fit to formulate monetary policy (Fuhrer et.al, 2008). It further emphasize the need for policy makers to act cautiously when managing monetary policies since it can push the two variables in opposing directions.

The trade-off between inflation and unemployment has been confirmed by researchers using different econometric models. Berument et.al (2008) studied the effect of policy shocks on unemployment in Turkey. Using Vector Autoregressive techniques, the study tried to find out how policy shock affects unemployment in nine sectors. The estimated result showed that, unemployment decreases whenever there is a positive income and money shock. Lui (2009) observed that higher inflation rate provides incentives for workers to work which generates employment since firms are induced by the higher prices to produce more. This ultimately implies a fall in unemployment when price increases. Golosov and Lucas (2007) noted that, monetary policy shock tends to have greater and faster effects on general prices and little effect on economic activities.

Notwithstanding the empirical studies that confirms the inverse relationship between inflation and unemployment, the contributions of Phelps (1968), Friedman (1968), Lucas (1973) as well as the oil shocks of the 1970's have cast doubt on the validity of the Philips curve. The implication of the oil shocks which took place during the 1970's and 1980's is that if OPEC should cut output and raises world prices of oil today, then there is a possibility for some economies to simultaneously experience high inflation and unemployment which may contrast the general notion presented by Philips (1958). In such a situation, relying on the Philips curve for inflation forecast and for policy purposes will pose serious consequences. The reason being that policy makers would be torn between fighting unemployment either by expanding aggregate demand or reducing inflation by compressing aggregate demand. While this situation may put policymakers off in applying a Philip-based curve for inflation forecast, several studies have concluded that, the increased inflation experienced by U.S between 1970s and 1980s was as a result of productivity slowdown and also policy makers learning about the persistence of trade-off in inflation and unemployment (see for instance; Orphanides 2003, Primiceri, 2006). Other studies have also shown that the simultaneous high inflation and unemployment was due to the fact that, monetary policy makers operated with misspecified Philips curve (Sargent et.al 2006). In spite of these contrasting arguments, the conflicting views have highlighted an important role of some Philips curve in the conduct of monetary policies hence trade-offs between inflation and unemployment as shown by the Philips curve can never be overlooked.

In Ghana, both monetary and fiscal policies have been used to reduce inflation to its acceptable level while raising employment. Unfortunately, monetary authorities' inability to control inflation and increase employment is partly explained by failure of policy makers to clearly define the link between the two variables in the economy. Some studies argue that instability and failures of these macro variables to stabilize is due to limited role played by institutions to generate employment during economic shocks (Nickell et.al, 2005). Others have also attributed it to the power of workers to bargain (Blanchard, 2006) and also cyclical factors such as profitability of industries (Chen et.al, 2011) which have all contributed to the persistent rate on unemployment. Given the rapid rural-urban migration in Ghana, inability for peoples to search for works that requires their skills, job selectiveness by graduates, the economy cannot escape from high rate of unemployment. Within the contest of Philips curve, does this high rate of unemployment imply low inflation in Ghana? The answer to this question cannot be answered straight forward unless the quantitative dynamic relationships between inflation and unemployment are known for certain. Without it, actions of policy makers are likely to either undershoot or overshoot the targeted equilibrium level of inflation that would ensure higher employment.

In other words, to successfully embark on reducing or stabilizing price and raising employment in Ghana, the trade-off between inflation and unemployment should be empirically proven. Unfortunate for the Ghanaian economy, studies on this trade-off are scarce. Again, policy makers should be conservative to simply assume a negative relation between inflation and unemployment or rely on empirical works that confirms the Philips curve- in other countries- to make policies for Ghana since most of the works done were undertaken in advanced countries. Stated in simple terms, inflation-unemployment correlation are countries specific hence to effectively capture their trade-offs, country characteristics needs to be accounted for. In view of this, a thorough investigation into the quantitative relationship between inflation and unemployment using time series data on Ghana would not only make known to policy makers the actual relationship between them and to assist in choosing optimal inflation rate level, it is also instrumental to avoid cycles and to maintain the economy along its optimal growth path.

The focus of this paper is to give a detailed analysis of the trade-offs between inflation and unemployment using data from Ghana between the periods 1970 to 2013. The study also aims to test the hypothesis of the Philips curves in Ghana. With this goal in mind, the rest of the paper is organized as follows Section, II presents the methodology used in this study; Section III presents empirical results and analysis while Section IV discusses the conclusion and recommendations.

2.0 Methodology
To empirically establish the relationship between inflation and unemployment in Ghana, the study employs the New Keynesian Philips curve model. This model has received most attention in recent years and is recognized as a dynamic extension of the static new Keynesian model. Following Mankiw (2001), the model is derived using three basic relationships. The first concerns the desired price of firms that would maximize profit at a point in time. This is specified below;

$$p_t^* = p_t - \alpha(y_t - y_e) \tag{1}$$

The equation above explains that, the desired price of a firm p_t^* is influenced by the general price level and the deviation of unemployment from its natural rate indicated by

the cyclical gap $(y_t - y_e)$. It follows from the above that a firm's desired relative price rises during economic boom and falls when an economy experience recession. In other words, whenever there is economic boom, unemployment is low since the increasing demand for a firm's product will call for higher employment. However, because higher demand for labour raises the marginal cost of a firm, each firm is likely to raise its relative price.

To derive the second relationship, it is assumed that firms hardly change their desired prices since price adjustment is sporadic. In view of this, a firm can change its price at a point in time; firm adjust its price to be equal to the average desired prices. The adjustment price equation is given below;

$$x_t = \lambda \sum_{j=0}^{\infty} (1-\lambda)^j E_t p_{t+j}^* \qquad (2)$$

Where λ is the rate of price adjustment and also explains the degree to which the weights decline. Equation (2) states that current adjustment price is an average of current general and next period's desired price.

The final equation in the model is the equation for the overall price level. This is shown below;

$$p_t = \lambda \sum_{j=0}^{\infty} (1-\lambda)^j x_{t-j}$$

(3)

According to equation (3), current price is determined by the weighted average of current adjustment prices of firms and the price level that persist in the past. Since λ determines the speed at which the weight decline, the equation above postulates that as the speed of price adjustment in price increases faster, the significant does previous pricing affect current price level in an economy.

The new Keynesian Philips curve is then specified solving equation (2) and (3) simultaneously. This gives the Philips curve equation below;

$$\pi_t = E_t \pi_{t+1} - [\alpha \lambda^2 / (1-\lambda)](y_t - y_e) + \mu_t$$

(4)

Assuming individuals' expectation of future inflation is dependent on current inflation, then it follows that current inflation level is individual's previous level of inflation. In view of this, equation (4) can be rewritten as

$$\pi_t = E_{t-1} \pi_t + \phi (y_t - y_e) + \mu_t$$

(5)

Where $\phi = -(\alpha \lambda^2 / (1-\lambda))$; $\pi_t = p_t - p_{t-1}$ represent inflation rate; $E_{t-1}\pi_t = \pi_{t-1}$; y is the actual growth rate in the economy and y_e represents the potential output growth

Equation (4) shows that current inflation rate is influenced by two parameters. The first is the rate at which of price adjustment λ occur and the rate at which desired relative price response to changes in economic activities and also reflect real rigidities. The equation again reveals that, the current level of inflation depends on expected inflation and deviation of unemployment from its long term equilibrium position. The difference between the actual output and the potential gives the cyclical gap which is used as a proxy for unemployment in Ghana. This is because unemployment data for the period between 1970 and 2013 is unavailable. In other words, the study employs the cyclical gap as a proxy for unemployment. In view of this, if the cyclical gap is greater than zero for a particular period i.e.

$(y - y_e)$ >0, then it implies actual output exceeds the potential output level which is mirrored by low unemployment. It again means that, lower unemployment leads to higher inflation, holding expected inflation constant. If, on the other hand, the cyclical gap is less than zero i.e. $(y - y_e)$ <0, then the actual output deviate negatively from its potential level which signifies an increase in unemployment. In this situation, higher unemployment will lead to lower inflation. To effectively decompose GDP into cyclical and trend component, the study employed the Hodrick–Prescott (H-P) filter procedure to estimate the cyclical gap. According to Ravn and Uhlig (2002), the H-P filter has become a standard method for removing trends in the business cycle.

The symbol ϕ represents the coefficient of unemployment. The estimate for ϕ will show the actual relationship between unemployment and inflation in the economy. If ϕ >0, then a positive relationship between employment. It further indicates that lower unemployment (resulting from increased output) is associated with high inflation. However, if ϕ <0, then it indicates that lower output leads to higher unemployment. The higher unemployment will lead to lower inflation. If the negative relationship holds, then it confirms the hypothesis of the Philips curve. In view of this, the study tests the hypothesis that, the relationship between inflation and unemployment is negative.

2.1 Unit Root Tests

The ADF test is principally concerned with the value of δ and τ hence the null hypothesis if rejected implies the two time series are stationary and integrated of order zero i.e I(0). If, however, the null hypothesis is not rejected, then the first difference is stationary and the variables are integrated of order one i.e. I(1)

3.1 Empirical Results

The unit root test for stationarity revealed that both inflation and the cyclical gap were stationary the levels hence mean reverting.

3.3 Regression Results

Table 1. The estimated inflation-unemployment results from backwards looking Philips curve.

Model 1: OLS, using observations 1970-2013 (T = 43)   Dependent variable: Inflation ($\hat{\pi}$)

Period	Variables	Coefficient	Std. error	t-ratio	p-value	Adjusted R^2	P-value (F)
1970-1982	π_{t-1}	1.04992	0.051195	20.51	0.000***	0.974455	0.000***
	$(y - y_e)$	-0.59914	2.31436	-0.2589	0.8010		
1983-2013	π_{t-1}	0.971202	0.0387583	25.06	0.000***	0.954396	0.000***
	$(y - y_e)$	-0.373326	0.737444	-0.5062	0.6165		
1970-2013	π_{t-1}	0.982960	0.032698	30.06	0.0000***	0.955573	0.000***
	$(y - y_e)$	-0.339069	0.730715	-0.4640	0.6451		

 Note: *** represents significance at 1% level.

The study first tests for the existence of the Philips curve before the introduction of the Economic Recovery Programme i.e. 1970-1982 in other to control for the effect of structural break. The intensity of inflation inertia is shown by the coefficient of the lagged inflation. The estimated result shows that despite recent economic prosperities, there is still a high inertial component of inflation in Ghanaian. Thus, between the periods 1970 and 1982, the estimated coefficient of inflation inertia is 1.04992 and 0.971202 between 1983 and 2013. The coefficients of inflation inertia for the two sub-periods are both statistically significant at 1% level. Again, the estimated coefficient of the inflation inertia for the full sample period (1970-2013) is also positive and significant at 1% level. The positive and significance coefficients have implication for inflation dynamics. It means that, past inflation level has an influence on current inflation in Ghana which is due to the use of inflation indexes to back increases in salaries by trade unions in contract negotiations. Since short-run monetary shocks are transmitted into the real sector of an economy with little effect on average price level, the estimated coefficients for both the sub-sample periods (1970-82 and 1983-2013) and full sample period (1970-2013) which approximately equal to 1.0 implies current inflation is slow to adapt to any unexpected monetary shocks to the economy. In other words, with inflation inertial greater than zero, any newly set price in the economy, by a fraction of firms that are backward-looking, may become sticky hence causing current inflation to slowly adapt to current changes in monetary policy. Again if the fractions of backward-looking firms in Ghana are large, then the implication of the lagged inflation of 0.982960 (for the periods 1970-2013) is that firms will be less likely to react contemporaneously to any current changes on the market hence the rate of inflation would respond less to changes in current real marginal cost of production. In this case, the behaviour of firms during monetary shock is to fix their prices.

The estimated coefficients of unemployment as shown by the output gap for the two sub-periods are negative which confirms the negative relationship between inflation and

unemployment. The estimates show that between 1970 and 1982 the coefficient of the cyclical gap is -0.59914 but statistically insignificant. Trying to find out if policy change (ERP) affects the relationship between inflation and unemployment, the estimated coefficient for the sample period 1982 to 2013 indicates an inverse (-0.373326) relationship between inflation and unemployment even after the introduction of the ERP but statistically insignificant. Again, the full sample periods (1970-2013) estimate came out to be negative (-0.339069) and insignificant. This indicates that as the Ghanaian economy grows faster, the higher output would require higher demand for labour hence more people would be employed during booms. This would eventually increase firms cost of production resulting from wages rise as demand for labour increases. Because firms pass this cost to consumers, inflation would rise if increasing cost of production persists. In other words, decreases in unemployment as output increases beyond its potential level consequently leads to higher inflation resulting from higher cost of production.

Even though the result confirms the existence of the Philips curve (negative relationship between inflation and unemployment), the estimated coefficients are all insignificants hence an increase in unemployment does not have any influence on inflation in Ghana. There are several reasons that can account for this situation. The Ghanaian economy has a fast growing labour force that lack the appropriate skills to earn them a job placement, rural-urban migration is on the alarming rate, market information is imperfect which results in mismatch of skills. The implication of this is that, lack of jobs makes workers accept any wage rate in order to get some job to do. In view of this, labourers do not increase their wages even when demands for labour services are high.

5.0 Conclusion and Policy Implication

The study tried to find the relationship between inflation and unemployment and also, test for evidence of Philips curve in Ghana using the New Keynesian Philips curve model. The results show that, the estimated coefficient of inflation inertial for the periods between 1970 and 1981 (1.0), 1982 and 20013(0.97) and 1970 and 2013(0.99) are high (approximately 1.0). This implies that if firms are backward looking, then with such high coefficient of lagged inflation, current prices would respond less to economic shock since firms may respond less to current changes in the market. Using the output gap to measure unemployment, the estimated result shows that, inflation and unemployment are negatively related, however, the estimated coefficient of output gap is insignificant. In other words, a change in unemployment does not affect inflation in Ghana. The reason being that an increase in employment does not leads to higher inflation resulting from increase in wage rate is due to large labour force, longer time for searching for job etc. The study therefore recommends that inflation dynamics policies based on the Philips curve hypothesis would be less effective in Ghana. Monetary policies to influence inflation would not bring about any trade-off between inflation and unemployment. To reduce the ever increasing unemployment in Ghana, policy direction should focus on creating job opportunities for both uneducated and educated individuals.

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