International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: 2545-5893(Print) 2545-5877 (Online)
Volume 4, Number 4, December 2019
http://www.casirmediapublishing.com

THE PHILLIPS CURVE: A CASE FOR NIGERIA (A DEVELOPING COUNTRY)

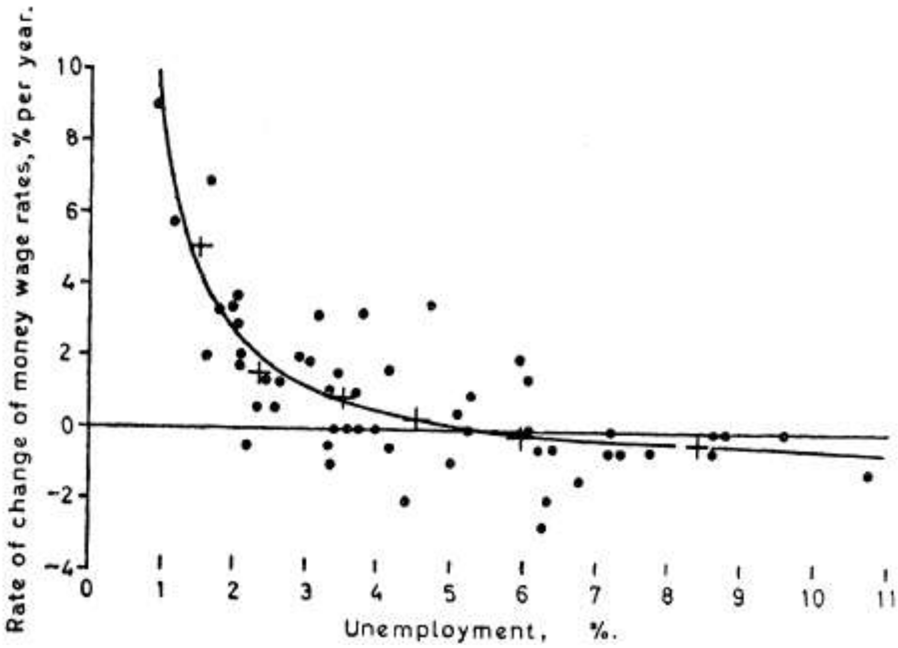
Goluwa, Shadrack Ezekiel; Jimmy, Vincent Gambo & Nanfa, Nimvyap
Department of Economics
Plateau State University, Bokkos
Email: vincentgambo@gmail.com

ABSTRACT
This paper looks at the Phillips curve: a case for Nigeria (a developing country). To achieve this, a method was used to collect time series data on inflation and unemployment in the Nigerian economy from 1985 to 2019. The Ordinary Least Square method was used to analyze the data. The study discovered that there is a negative relationship between inflation and unemployment in the Nigerian economy. The obvious implication of this discovery was that the validity of the Phillips curve was established showing that a negative relationship exists between unemployment and inflation in the Nigerian economy which implies that inflation and unemployment both rise or fall at the same time.

INTRODUCTION

The attainment of economic growth and development is the goal of all nations in the world. For this desired growth and development to be achieved in an economy, it is imperative for some macroeconomic policy instruments to be carefully implemented. Sometimes the economist faces a great problem because some of the policy objectives are incompatible as there are definite areas of conflict between some of the objectives. Although the problem of conflict is reduced by the availability of different policy instruments which affect the objectives in different ways or trade-offs, the problem is in no way eliminated. For example, a developing country that is pursuing the macroeconomic objective of achieving growth or industrialization, maintenance of a healthy balance of payment may be difficult to achieve as machinery, raw materials and technical services may have to be imported. This may lead to a deficit in the balance of payment although this deficit may be considered worthwhile as it is for a productive and self-adjusting purpose. Also, a rise in the level of prices can lead to a rise in investment, increase in supply and a fall in the level of unemployment in the economy. The simple law of supply says that the higher the price, the higher will be the quantity that will be supplied with all things being equal. A higher quantity supplied as a result of as a result of a rise in price implies increase in employment of resources, including labour, to meet the increased supply level. Because of these conflicts in national objectives, the economist is therefore engaged in an intricate game and he can never win because the more of one problem he solves, more of other problems he ends up creating.

Considering the incompatibility of some macroeconomic objectives, Professor Arthur W. Phillips conducted and published an empirical research in 1958 titled "The relation between Unemployment and the Rate of Change of Money wage rates in the United Kingdom, 1861-1957 which was published in the quarterly journal Economical (Phillips, 1958). He produced what may be considered a trade-off theory between the level of unemployment and the rate of inflation. He gave a rough estimate of the cost by way of unemployment of variations in the rate of inflation. The Phillips curve is a single-equation empirical model named after a New Zealand born economist Professor. Arthur William Phillips, describing a historical inverse relationship between rates of unemployment and corresponding rates of rise in wages that result within an economy. In the years following Phillips' 1958 paper, many economists in the advanced industrial countries believed that his results showed that there was a permanently stable relationship between inflation and unemployment.



Source: wikipedia

The Phillips Curve

From the diagram above, it can be seen that there exists negative relationship between inflation and unemployment. This implies as the rate of change of money wages rate (inflation) increases, the rate of unemployment decreases and vice versa. One implication of this for government policy was that governments could control unemployment and inflation with a Keynsian policy. They could tolerate a reasonably high rate of inflation as this would lead to lower unemployment-there would be a trade-off between inflation and unemployment. For example, monetary policy or fiscal policy could be used to stimulate the economy, raising Gross Domestic Products and lowering the unemployment rate. Moving along the Phillips curve, this would lead to a higher inflation rate, the cost of enjoying lower unemployment rates. However, since 1974, seven Nobel Prizes have been given to some economists for, among other things, work critical of some variations of the Phillips curve. Some of the Authors that have received the award include Thomas Sargent, Christopher Sims, Edmund Phelps, Edward Prescott, Robert A. Mundel, Robert E. Lucas, Milton Friedman and F.A. Hayek (Domitrovic, 2011). Some of this criticism is based on the United States' experience during the 1970s, which had periods of high unemployment and high inflation at the same time. In the 1970s many countries experienced high levels of both inflation and unemployment also known as stagflation.

International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: 2545-5893(Print) 2545-5877 (Online)
Volume 4, Number 4, December 2019
http://www.casirmediapublishing.com

Some people have gone further to advance the argument that if there is a trade-off between the level of inflation and the rate of unemployment, why is that some countries, especially the developing countries (Nigeria inclusive), have a high rate of inflation and at the same time experience a high rate of unemployment a phenomenon that is usually styled stagflation (Afolabi, 1998). The Nigerian experience over time shows that unemployment and inflation have both become common problems that are difficult to control. We see prices of goods and services increasing and at the same time unemployment is also rising as job seekers do not find jobs according to their skills, education and expertise in the economy. Theories based on the Phillips curve suggested that this could not happen, and the curve came under heavy attacks headed by Milton Friedman. Considering the arguments for and against the Phillips curve, it has become pertinent at this point that the validity of the Phillips curve be tested in a developing country, Nigeria in particular.

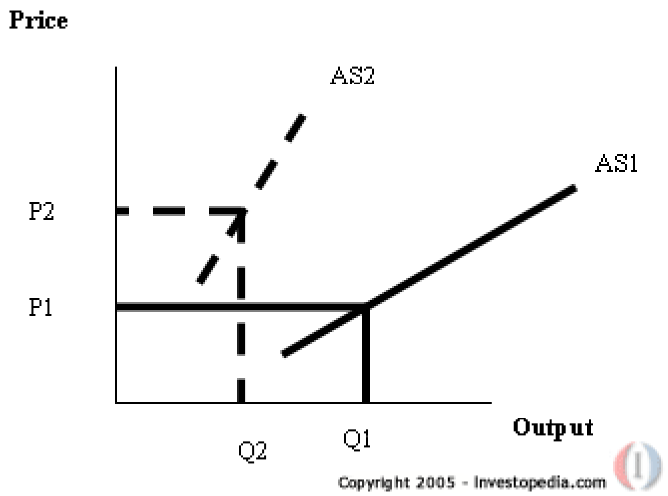
THE LITERATURE

Inflation

Inflation is a sustained increase in the general price level of goods and services in an economy over a period of time (Blanchard, 2000). There are basically two types of inflation and they include cost-push inflation and demand pull inflation.

Cost-push inflation

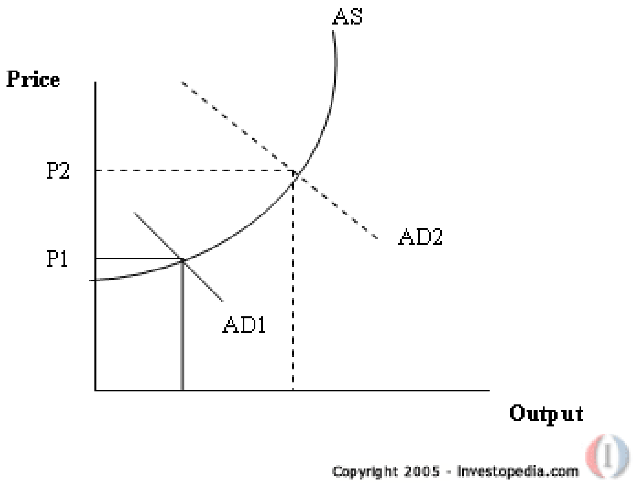
Cost-push inflation fundamentally means when prices "push up" by boost in costs of any of the four factors of production (labor, capital, land or entrepreneurship) when corporations are previously running at full production competence. To envisage how cost-push inflation functions, using a plain price-quantity graph showing expressing happenings when Aggregate supply curve shifts. The graph express the level of output, is attained at each price level. As costs of production rises, aggregate supply diminishes from AS1 to AS2, causing a rise in the price level from P1 to P2. The justification after this rise is that, for corporations to uphold (or increase) profit limits, they will need to move up the retail price paid by consumers, thus causing inflation.



Source: Investopedia

Demand-Pull Inflation

Demand-pull inflation takes place when aggregate demand rises, classified by the four sections of the macroeconomics households, businesses, governments and foreign buyers. When these four sectors concomitantly want to acquire more output than an economy is able to produce, they contend to buy restricted amounts of goods and services. Consumers' fundamental nature is to "propose prices up", causing inflation. This extreme demand is also referring as "too much money chases too few goods", generally takes place in a growing economy. Demand-pull inflation is a rise in aggregate demand that is more rapidly than the equivalent boost in aggregate supply. When aggregate demand boosts without a change in aggregate supply, the 'quantity supplied' will increase. Coming across once more at the price-quantity graph, we observe the association between aggregate supply and demand. If aggregate demand amplifies from AD1 to AD2, in the short run, this will not (shift) aggregate supply, but change in the quantity that is supplied in same Aggregate supply curve. The foundation following that supply curve is not shifting because the Aggregate demand increases more rapidly than aggregate supply in an economy. As corporation raise production, the cost to produce each supplementary production boosts, as signified by the transform from P1 to P2. The justification behind this alteration is that to meet the need of demand, firm has to pay more to its labor for overtime work or employ more machinery, thus escalating the cost of production. Just like cost-push inflation, demand-pull inflation can occur as corporations, to preserve profit levels, forward the higher cost of production to consumers' prices.



Source: investpedia

Unemployment

Unemployment is a situation in which able-bodied people who are able and willing to work cannot find work to do. There are various types of unemployment and they include seasonal unemployment, disguised unemployment, frictional unemployment, classical unemployment, structural unemployment and structural unemployment.

International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: 2545-5893(Print) 2545-5877 (Online)
Volume 4, Number 4, December 2019
http://www.casirmediapublishing.com

Types of Unemployment

Seasonal Unemployment

It is also known as underemployment and it principally happens in which a person doesn't get the type of work he is proficient of doing; he may poses skill and proficiency.

Disguised Unemployment

When more people are occupied in some actions than the number of person requisite for that, this is called disguised unemployment. For example: in an industry, on a machine, 8 labourers are required to work on but are employed 10 labourers then this unemployment for 2 labours is called disguised unemployment.

Frictional Unemployment

It is practiced by a worker while he quits from one job and looks for another. Pertains for fresh

Graduates productive part of economy amplifies workers long-term welfare and competence.

Classical Unemployment

It is real wage unemployment as well. Real wages are positioned above market clearing level

Structural Unemployment

This is caused due to disparity between job vacant by employers and potential workers. Pertain to geographical place, proficiency, and many other aspects.

Cyclical Unemployment

The aspect of unemployment is related to cyclical trend, carried out with business cycle in both production and growth. When there is boom in the economy then cyclical unemployment is very low whereas output production is at its height. Similarly, when there is low production in an economy, calculated through GDP, we will see that business cycle is going to bottom and this cyclical unemployment will increase.

Non-accelerating Inflation Rate of Unemployment. (NAIRU)

In the 1970s, many countries experienced high levels of together inflation and unemployment also known as stagflation. Theories pedestal on the Phillips curve recommended that this could not come about, and the curve appeared under a determined attack from a group of economists headed Milton Friedman. Friedman disagreed that the Phillips curve relationship was only a short-run phenomenon. He disagreed that in the long-run employees and employers will seize inflation into relation, resulting in employment agreement that increase pay at rates near expected inflation. Milton Friedman, who disapproved of the origin for the original Phillips Curve in a speech to the American Economic Association in 1968, launched the idea of the NAIRU (Hameed, Khalid, Ghayur, Atif & Sonia, 2012). Economists both in the United States and the UK have further developed it. Jhingan(1997) started that the economist believe the inverse relationship between unemployment and inflation relates to the short run only. That in the long run there is no trade off (inverse relationship) between inflation and unemployment as the curve shifts with changes in expectation of inflation. The NAIRU is defined as the rate of unemployment when the rate of wage inflation is established. Jhingan(1997) defined the natural rate of unemployment as the rate of unemployment at which the actual rate of inflation equals the expected rate of unemployment. It is thus an equilibrium rate of unemployment toward which the economy moves in the long run. Instead of being downward slopping from left to right as it is in the short run, the Phillips curve in the long run is a vertical line at the natural rate of unemployment (Jhingan, 1997).

The NAIRU supposes that there is deficient contest in the labour market where some workers have combined bargaining power through membership of trade unions with employers. And, some employers have a level of monopsony power when they procure labour input. Correspondence of the perception of the NAIRU, the equilibrium level of unemployment is the result of a negotiating process between firms and workers. In this model, workers have in their wits a target real wage. This target real wage is inclined by what is experiencing to unemployment – it is understood that the lower the rate of unemployment, the higher workers' wage demands will be. Employees will look for to negotiate their share of an increasing level of profits when the economy is taking pleasure in a cyclical expansion. Whether or not a business can assemble that objective real wage during pay discussions rely partly on what is experiencing to labour efficiency and also the capacity of the business to relate a gain on cost in product markets in which they control. In highly competitive markets where there are many challenging suppliers; one would look forward to lower gains (i.e. lower profit margins) because of competition in the market. In markets conquered by monopoly suppliers, the gain on cost is usually much higher and possibly there is an amplified share of the 'producer additional that workers might decide on to negotiate for. If actual rate decline beneath the NAIRU, theory recommends that the balance of supremacy in the labor market lean to control to employees rather than employers. The outcome can be that the economy practice acceleration in pay settlements and the growth of middling earnings. Ceteris paribus, an increase in wage inflation will cause a rise in cost-push inflationary pressure.

Theoretical Literature

THEORETICAL LITERATURE

There are at least two different mathematical derivations of the Phillips curve. First, there is the traditional or Keynesian version. Then, there is the new Classical version associated with Robert E. Lucas, Jr.

The Traditional Phillips Curve

The original Phillips curve literature was not based on the unaided application of economic theory. Instead, it was based on empirical generalizations. After that, economists tried to develop theories that fit the data.

International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: 2545-5893(Print) 2545-5877 (Online)
Volume 4, Number 4, December 2019
http://www.casirmediapublishing.com

Money Wage Determination

The traditional Phillips curve story starts with a wage Phillips Curve, of the sort described by Phillips himself. This describes the rate of growth of money wages (gW). Here and below, the operator g is the equivalent of "the percentage rate of growth of" the variable that follows.

$$GW = Gw - f(U)$$

The "money wage rate" (W) is shorthand for total money wage costs per production employee, including benefits and payroll taxes. This equation tells us that the growth of money wages rises with the trend rate of growth of money wages (indicated by the superscript "T") and falls with the unemployment rate (U). The function f() is assumed to be monotonically increasing with U so that the dampening of money-wage increases by unemployment is shown by the negative sign in the equation above. There are several possible stories behind this equation. A major one is that money wages are set by bilateral negotiations under partial bilateral monopoly: as the unemployment rate rises, all else constant worker bargaining power falls, so that workers are less able to increase their wages in the face of employer resistance. During the 1970s, this story had to be modified, because (as the late Abba Lerner had suggested in the 1940s) workers try to keep up with inflation (Phelan, 2012). Since the 1970s, the equation has been changed to introduce the role of inflationary expectations (or the expected inflation rate, gP^{ex}). This produces the expectations-augmented wage Phillips curve:

$$GW = Gwt - f(U) + \lambda \cdot gP^{ex}.$$

The introduction of inflationary expectations into the equation implies that actual inflation can feed back into inflationary expectations and thus cause further inflation. The late economist James Tobin dubbed the last term "inflationary inertia," because in the current period, inflation exists which represents an inflationary impulse left over from the past.

The parameter λ (which is presumed constant during any time period) represents the degree to which employees can gain money wage increases to keep up with expected inflation, preventing a fall in expected real wages. It is usually assumed that this parameter equals unity in the long run. In addition, the function f (U) was modified to introduce the idea of the non-accelerating inflation rate of unemployment (NAIRU) or what's sometimes called the "natural" rate of unemployment or the inflation-threshold unemployment rate:

[1] $gW = gW^T - f(U - U^*) + \lambda \cdot gP^{ex}.$

Here, U^* is the NAIRU. As discussed below, if $U < U^*$, inflation tends to accelerate. Similarly, if $U > U^*$, inflation tends to slow. It is assumed that $f(0) = 0$, so that when $U = U^*$, the f term drops out of the equation.

Assume that the trend rate of growth of money wages equals the trend rate of growth of average labor productivity (Z). That is:

[2] $gW^T = gZ^T.$

Assuming U equals U^* and λ equals unity, expected real wages would increase with labor productivity. This would be consistent with an economy in which actual real wages increase with labor productivity. Deviations of real-wage trends from those of labor productivity might be explained by reference to other variables in the model.

Pricing Decisions

Next, there is price behavior. The model assumes that the average business sets a unit price (P) as a mark-up (M) over the unit labor cost in production measured at a standard rate of capacity utilization (say, at 90 percent use of plant and equipment) and then adds in the unit materials cost. The standardization involves later ignoring deviations from the trend in labor productivity. For example, assume that the growth of labor productivity is the same as that in the trend and that current productivity equals its trend value:
$gZ = gZ^T$ and $Z = Z^T$.
The markup reflects both the firm's degree of market power and the extent to which overhead costs have to be paid. Put another way, all else equal, M rises with the firm's power to set prices or with a rise of overhead costs relative to total costs.
So pricing follows this equation:
$P = M \times$ (unit labor cost) + (unit materials cost)
$= M \times$ (total production employment cost)/(quantity of output) + UMC.
UMC is unit raw materials cost (total raw materials costs divided by total output). So the equation can be restated as:
$P = M \times$ (production employment cost per worker)/(output per production employee) + UMC.
This equation can again be stated as:
$P = M\times$ (average money wage)/(production labor productivity) + UMC
$= M\times (W/Z) + UMC$.
Now, assume that both the average price/cost mark-up (M) and UMC are constant. On the other hand, labor productivity grows, as before. Thus, an equation determining the price inflation rate (gP) is:
$gP = gW - gZ^T$.

Price

Then, combined with the wage Phillips curve and the assumption made above about the trend behavior of money wages this price-inflation equation gives us a simple expectations-augmented price Phillips curve:
$gP = -f(U - U^*) + \lambda \cdot gP^{ex}$.
Some assume that we can simply add in gUMC, the rate of growth of UMC, in order to represent the role of supply shocks (of the sort that plagued the U.S. during the 1970s). This produces a standard short-term Phillips curve:
$gP = -f(U - U^*) + \lambda \cdot gP^{ex} + gUMC$.
Economist Robert J. Gordon has called this the "Triangle Model" because it explains short-run inflationary behavior by three factors: demand inflation (due to low unemployment), supply-shock inflation (gUMC), and inflationary expectations or inertial inflation (Gordon, 2011).
Expectational equilibrium gives us the long-term Phillips curve. First, with λ less than unity:

International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: 2545-5893(Print) 2545-5877 (Online)
Volume 4, Number 4, December 2019
http://www.casirmediapublishing.com

$gP = [1/(1 - \lambda)]\cdot(-f(U - U^*) + gUMC)$.

This is nothing but a steeper version of the short-run Phillips curve above. Inflation rises as unemployment falls, while this connection is stronger. That is, a low unemployment rate (less than U^*) will be associated with a higher inflation rate in the long run than in the short run. This occurs because the actual higher-inflation situation seen in the short run feeds back to raise inflationary expectations, which in turn raises the inflation rate further. Similarly, at high unemployment rates (greater than U^*) lead to low inflation rates. These in turn encourage lower inflationary expectations, so that inflation itself drops again.

This logic goes further if λ is equal to unity, i.e., if workers are able to protect their wages *completely* from expected inflation, even in the short run. Now, the Triangle Model equation becomes:

$- f(U - U^*) = gUMC$.

If we further assume (as seems reasonable) that there are no long-term supply shocks, this can be simplified to become:

$-f(U - U^*) = 0$ which implies that $U = U^*$.

All of the assumptions imply that in the long run, there is only one possible unemployment rate, U^* at any one time. This uniqueness explains why some call this unemployment rate "natural."

New Classical Version

The Phillips curve equation can be derived from the (short-run) Lucas Aggregate Supply Function (Luca, 1973). The Lucas approach is very different from that of the traditional view. Instead of starting with empirical data, he started with a classical economic model following very simple economic principles.

Start with the aggregate supply function:

$$Y = Y_n + a\,(P - P_e)$$

Where Y is log value of the actual output, Y_n is log value of the "natural" level of output, a is a positive constant, P is log value of the actual price level, and P_e is log value of the expected price level. Lucas assumes that Y_n has a unique value.

Note that this equation indicates that when expectations of future inflation (or, more correctly, the future price level) are totally accurate, the last term drops out, so that actual output equals the so-called "natural" level of real GDP (Roberts, 1995).

This differs from other views of the Phillips curve, in which the failure to attain the "natural" level of output can be due to the imperfection or incompleteness of markets, the stickiness of prices, and the like. In the non-Lucas view, incorrect expectations can contribute to aggregate demand failure, but they are not the only cause. To the "new Classical" followers of Lucas, markets are presumed to be perfect and always attain equilibrium (given inflationary expectations).

We re-arrange the equation into:

$$P = P_e + Y - Yn \div a$$

Next we add unexpected exogenous shocks to the world supply v:

$$P = P_e + Y - Yn/a + v$$

Subtracting last year's price levels P_{-1} will give us inflation rates, because

$$P - P_{-1} = \pi$$

And

$$P_e - P_{-1} = \pi_e$$

Where π and π_e are the inflation and expected inflation respectively.
There is also a negative relationship between output and unemployment (as expressed by Okun's law). Therefore, using

$$Y - Yn \div a = -b(U - U_n)$$

Where b is a positive constant, U is unemployment, and U_n is the natural rate of unemployment or NAIRU, we arrive at the final form of the short-run Phillips curve

$$\pi = \pi_e - b\,(U - U_n) + v$$

This equation, plotting inflation rate π against unemployment U gives the downward-sloping curve in the diagram that characterizes the Phillips curve.

Empirical Literature

Hameed, Khalid, Ghayur, Atif and Sonia (2012) wrote on revisiting the Phillips curve; a case study from Pakistan. They used the OLS/TLS methodology and discovered that GDP and interest rates are negatively related to unemployment. They further discovered that there is a negative relationship between unemployment and inflation. The time series data was gotten from the period of 1992 to 2010. This implies that the Phillips is still working in the Pakistan economy. Reichel (2004) used the co-integration method and discovered that the Phillips curve exist in the Japan and United States of America's economy. Another by Dinardor and Moore (1999) used a panel estimate and found a Phillips curve for the bulk of OECD (The Organisation for Economic Cooperation and Development) countries. Some of the OECD countries include Belgium, France, Ireland, Israel, Mexico, USA, and Spain amongst others. Patrick (2013) did a time series exploration of the German economy using the ADF tests, inflation and unemployment were recorded as integrated in the first order and reported upon further examination of co-integration. The paper consequently estimated a Phillips curve by using the concept of co-integration and an error correctional model. It was discovered that there is no negative relationship between inflation and unemployment in the short run. Furthermore this study found a significant evidence of a negative relationship and unemployment in the long run, thus contradicting the theory of natural rate of unemployment. These results are consistent with the discoveries of Shreiber and Wolter(2002) and Franz(2005)

METHODOLOGY

The paper makes use of time series data for the analysis to test the validity of the Phillips curve in Nigeria. After it was discovered the variables were stationary at levels (see appendix A and B) using the Augmented Dickey Fuller test stationary test method, the

International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: 2545-5893(Print) 2545-5877 (Online)
Volume 4, Number 4, December 2019
http://www.casirmediapublishing.com

Ordinary Least Square method was found to be appropriate for the analysis of the model and it was used to estimate the model that was formulated. The model was a simple linear regression which had inflation as the dependent variable(Y) and unemployment as the independent variable(X). The model was specified mathematically as:

INFL=f (UNEMP)

Where $INFL_t$ = Inflation.

$UNEMP_t$=Unemployment.

The model was further specified econometrically thus:

$INFL_t = a + bUNEMP_t + u_t$...1

Where $INFL_t$ = Inflation.

a=intercept of the model.

b=parameter or coefficient of the independent variable.

$UNEMP_t$=Unemployment.

U_t=error or stochastic term.

Estimates for inflation and unemployment were obtained from the National Bureau of Statistics and regressed. The results obtained and the various tests conducted are presented below:

FINDINGS AND DISCUSSION

The paper makes use of time series data for the analysis to test the validity of the Phillips curve in the Nigerian economy and the results below were obtained.

Dependent Variable: INFL
Method: Least Squares
Date: 02/01/20 Time: 22:55
Sample: 1985 2019
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEMP	-0.990621	0.342801	-2.889785	0.0068
C	29.87284	4.859007	6.147930	0.0000

R-squared	0.201951	Mean dependent var	18.07171
Adjusted R-squared	0.177768	S.D. dependent var	17.17904
S.E. of regression	15.57744	Akaike info criterion	8.384970
Sum squared resid	8007.673	Schwarz criterion	8.473847
Log likelihood	-144.7370	Hannan-Quinn criter.	8.415650
F-statistic	8.350860	Durbin-Watson stat	1.057279
Prob(F-	0.006764		

statistic)

Source: Eviews 10 computation

REGRESSION LINE

INFL= 29.87-0.990UNEMP

The results above show that unemployment has a negative coefficient of -0.990. This means that a unit change in unemployment affects inflation negatively by -0.990 percent. This goes further to mean that an increase in unemployment in the Nigerian economy by 1 unit causes the inflation in the economy to fall by 0.990 percent. This is in tandem with the theory of Prof. Phillips who postulated that there is a negative relationship between unemployment and inflation in the economy. This goes to say that the Phillips curve exists in the Nigerian economy. The results agree with the works of Hameed, Khalid, Ghayur, Atif and Sonia (2012) and Reichel (2004) that discovered a negative relationship between inflation and unemployment in Pakistan and the United States of America and Japan respectively. Even though the Nigerian economy seems to is experiencing raising inflation and unemployment at the same time (stagflation) as against the empirical results obtained. The probability value of unemployment (0.0068) implies that the coefficient is statistically significant because it is less than 0.05 at 5%. The Breusch-Godfrey Serial Correlation LM test was done to test for autocorrelation. The probability value of the F-statistic was obtained to be 0.019(see appendix D) which is less than 0.05 at 5%. This implies the presence of some degree of autocorrelation in the model. The Breusch-Pagan-Godfrey Heteroscedasticity test was done to test for heteroscedasticity. The probability value of the F-statistic obtained was 0.500(see appendix E). This is greater than 0.05 at 5%. We therefore accept Ho and conclude that the model is homoscedastic or there is no heteroscedasticuty in the model. The Variance Inflation Factor (VIF) method was used to test for multicolinearity in the model. It was discovered that the centered values of the VIF were all less than 10(see appendix F) indicating the absence of multicolinearity in the model.

The coefficient of multiple determinations R^2 measures the goodness of fit of the model. The R^2 obtained was 0.20 or 20 percent. This means that the variables in the model do not have the satisfactory explanatory power on the dependent variable. The implication is that about 20% systematic variation in the dependent variable (inflation) is explained by the variation in the independent variable (unemployment) while about 80% of the systematic variation in the dependent variable remained unexplained. It is rather attributed to stochastic or error term. The adjusted R^2 is a modified version of the R-squared that has been adjusted for the number of predictors in the model. The adjusted R-squared increases only if the introduction of a new independent variable in the model improves the model. It decreases when the introduction of a new independent variable in the model does not improve the model. The adjusted R-squared obtained is 0.0.17 which is a reduction from the obtained R-squared. This implies that the introduction of new independent variable in the model will not improve the model. The F statistics tests the joint statistical significance of the parameters in the model. The probability of the F

International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: 2545-5893(Print) 2545-5877 (Online)
Volume 4, Number 4, December 2019
http://www.casirmediapublishing.com

statistics obtained was 0.0067 which is less than 0.05 at 5% shows that the value is statistically significant.

CONCLUSION

A cursory look at the Nigerian economy shows that both inflation and unemployment are both rising at the same time. However, the Phillips curve's presence and workability has been empirically established in the Nigerian economy using time series date from 1985 to 2019. The obvious implication of this discovery is that the validity of the Phillips curve has been established showing that a negative relationship exists between unemployment and inflation in the Nigerian economy.

REFERENCES

Afolabi, L.(1991). *Monetary economics*. Heinemann Educational Books PLC, Ibadan

Blanchard, O.(2000).Macroeconomics(https://books.google.com/books?id=Dxu3AAAAIAAJ&pg=PA149) (Second ed.) Prentice Hall New Jersey.pp 149-155 ISBN0-13-013306-X

Dinardo, J and Moore, M.(1999). The Phillips curve is back? using panel data to analyze the Relationship between Unemployment and inflation in an Open Economy. *NBER working papers7328*

Domitrov, B.(2011). "The Economics Nobel Goes to Sargent & Sims: Attackers of the Phillips Curve" (https://www.forbes.com/sites/briandomitrovic/2011/10/10/the-economics-nobel-goes-to-sargent-sims-attackers-of-the-phillips-curve/. Forbes.com. Retrieved on the 12 April 2019.

Franz, W. (2005) Will the German NAIRU Please stand up? German Economic Review, 2, 131-153

Gordon, R.J. (2011). "The History of the Phillips Curve: Consensus and Bifurcation". Economica.78 (309):doi:10.1111/j.14680335.2009.00815.X (https://doi.org/10.1111%2Fj.1468-0335.2009.00815x).

Hameed G, Khalid M, Ghayur A K, Atif H, & Sonia K(2012) Revisiting of Philips Curve; a Case Study from Pakistan. Retrieved from https://www.researchgate.net/publication/303458400 on 1st April 2019.

Jhingan, M.L.(1997). *The Economics of Development and Planning*,New Delhi.Vrinda Publications(P) LTD.

Lucas, R.E.(1972). Some International Evidence on Output-Inflation Trade-off: American Economic Review. 63

Patrick, N. (2013). An Empirical analysis of the Phillips Curve. A time series exploration of Germany. Published BSc Project, Linnaew University School of Business and Economics, Springfield.

Phelan, J.(2012). "Miltion Friedman and the rise and fall of the Phillips Curve" (http://www.thecommentator.com/article/1895/milton_friedman_and_the_rise_and_fall_of_the_phillips_curve). Thecommentator.com. Retrieved September 29, 2018.

Phillips, A.W.(1958). The Relationship between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom1861-1957. 25 Economica 283(https//www.jstor.org/stable/2550759)

Reichel, R. (2004) On the Death of the Phillips curve: Further evidence. Cato Journal, 24, 341-348.

Roberts, J.M. (1995) "New Keynesian Economics and the Phillips Curve". Journal of Money, CreditandBanking.27 (4):975-984JSTOR20777783 (https://www.jstor.org/stable/2077783)

Schreiber,S. and Wolter, J.(2002). What's wrong with the German NAIRU? Diskussionsbeitrage des Fachbereichs Wirts Chaft der Freien Universita Berlin 2002/08

APPENDIX
A: UNIT ROOT (STATIONARITY) TEST

Null Hypothesis: INFL has a unit root
Exogenous: None
Lag Length: 6 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.217134	0.0280
Test critical values:	1% level	-2.650145	
	5% level	-1.953381	
	10% level	-1.609798	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFL)
Method: Least Squares
Date: 02/01/20 Time: 22:47
Sample (adjusted): 1992 2019
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFL(-1)	-0.144344	0.065104	-2.217134	0.0378
D(INFL(-1))	0.259136	0.146364	1.770486	0.0912
D(INFL(-2))	0.118619	0.133803	0.886520	0.3854
D(INFL(-3))	-0.132439	0.112321	-1.179117	0.2515
D(INFL(-4))	-0.100541	0.097844	-1.027559	0.3158
D(INFL(-5))	-0.179920	0.098403	-1.828390	0.0817
D(INFL(-6))	0.360093	0.095982	3.751656	0.0012

International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: 2545-5893(Print) 2545-5877 (Online)
Volume 4, Number 4, December 2019
http://www.casirmediapublishing.com

R-squared	0.621139	Mean dependent var	-1.166071
Adjusted R-squared	0.512893	S.D. dependent var	10.84220
S.E. of regression	7.567104	Akaike info criterion	7.097816
Sum squared resid	1202.482	Schwarz criterion	7.430867
Log likelihood	-92.36942	Hannan-Quinn criter.	7.199633
Durbin-Watson stat	2.013102		

B: UNIT ROOT (STATIONARITY TEST)

Null Hypothesis: UNEMP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.960366	0.0211
Test critical values:	1% level	-4.284580	
	5% level	-3.562882	
	10% level	-3.215267	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UNEMP)
Method: Least Squares
Date: 02/01/20 Time: 22:51
Sample (adjusted): 1989 2019
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEMP(-1)	-0.563641	0.142320	-3.960366	0.0005
D(UNEMP(-1))	0.512303	0.165569	3.094187	0.0048
D(UNEMP(-2))	0.227678	0.181489	1.254495	0.2213
D(UNEMP(-3))	0.389435	0.188817	2.062499	0.0497
C	-1.372489	1.015354	-1.351735	0.1886
@TREND("1985")	0.442323	0.116103	3.809737	0.0008

R-squared	0.446645	Mean dependent var	0.574194
Adjusted R-squared	0.335974	S.D. dependent var	2.718176
S.E. of regression	2.214981	Akaike info criterion	4.600350
Sum squared resid	122.6535	Schwarz criterion	4.877896
Log likelihood	-65.30542	Hannan-Quinn criter.	4.690823
F-statistic	4.035795	Durbin-Watson stat	1.798810
Prob(F-statistic)	0.008022		

C: OBTAINED OLS RESULTS

Dependent Variable: INFL
Method: Least Squares
Date: 02/01/20 Time: 22:55
Sample: 1985 2019
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEMP	-0.990621	0.342801	-2.889785	0.0068
C	29.87284	4.859007	6.147930	0.0000

R-squared	0.201951	Mean dependent var	18.07171
Adjusted R-squared	0.177768	S.D. dependent var	17.17904
S.E. of regression	15.57744	Akaike info criterion	8.384970
Sum squared resid	8007.673	Schwarz criterion	8.473847
Log likelihood	-144.7370	Hannan-Quinn criter.	8.415650
F-statistic	8.350860	Durbin-Watson stat	1.057279
Prob(F-statistic)	0.006764		

International Journal of Management Studies, Business & Entrepreneurship Research
ISSN: 2545-5893(Print) 2545-5877 (Online)
Volume 4, Number 4, December 2019
http://www.casirmediapublishing.com

D: AUTOCORELATION TEST

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.520815	Prob. F(2,31)	0.0189
Obs*R-squared	7.903201	Prob. Chi-Square(2)	0.0192

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 02/01/20 Time: 22:56
Sample: 1985 2019
Included observations: 35
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNEMP	0.050391	0.313828	0.160567	0.8735
C	-0.553454	4.434354	-0.124810	0.9015
RESID(-1)	0.526052	0.177710	2.960172	0.0058
RESID(-2)	-0.152616	0.178488	-0.855049	0.3991

R-squared	0.225806	Mean dependent var	1.29E-15
Adjusted R-squared	0.150884	S.D. dependent var	15.34665
S.E. of regression	14.14156	Akaike info criterion	8.243323
Sum squared resid	6199.494	Schwarz criterion	8.421077
Log likelihood	-140.2582	Hannan-Quinn criter.	8.304684
F-statistic	3.013877	Durbin-Watson stat	1.964968
Prob(F-statistic)	0.044839		

E: HETEROSCEDASTICITY TEST

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	14.92768	Prob. F(1,33)	0.5005
Obs*R-squared	10.90119	Prob. Chi-Square(1)	0.0010
Scaled explained SS	14.76210	Prob. Chi-Square(1)	0.0001

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/01/20 Time: 23:10
Sample: 1985 2019
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	574.4457	106.4478	5.396503	0.0000
UNEMP	-29.01529	7.509842	-3.863636	0.0005

R-squared	0.311463	Mean dependent var	228.7906
Adjusted R-squared	0.290598	S.D. dependent var	405.1716
S.E. of regression	341.2599	Akaike info criterion	14.55861
Sum squared resid	3843124.	Schwarz criterion	14.64749
Log likelihood	-252.7757	Hannan-Quinn criter.	14.58929
F-statistic	14.92768	Durbin-Watson stat	1.820675
Prob(F-statistic)	0.000495		

F: MULTICOLINEARITY TEST

Variance Inflation Factors
Date: 02/01/20 Time: 23:18
Sample: 1985 2019
Included observations: 35

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
UNEMP	0.117512	3.405421	1.000000
C	23.60995	3.405421	NA