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**INFLATION AND UNEMPLOYMENT RELATIONSHIP:
A DYNAMIC REPORT OF NIGERIA AND MEXICO IN THE
PERSPECTIVE OF PHILLIPS CURVE FROM 1991-2016**

**INFLACJA I JEJ RELACJE Z BEZROBOCIEM:
RAPORT DYNAMICZNY DLA NIGERII I MEKSYKU W
PERSPEKTYWIE KRZYWEJ PHILLIPSA OD 1991-2016**

Abstract

This research study investigated the relationship between unemployment and inflation in Nigeria and Mexico from 1991-2016. Secondary data were used to gather data from the World Bank database, Central Bank of Nigeria and Bank of Mexico. In order to determine the set objective, OLS and simple regression analysis of the econometric model were used. The models specified inflation as function unemployment, money supply % GDP, total Gross Formation Products. Based on the above test carried out, the study finds out that: Inflation significantly has little impact on unemployment in Nigeria both in the long – run and short – run within the period under review. In Mexico, there is actually no significant relationship between unemployment and inflation because when inflation is high, unemployment in Mexico is also high. The study shows that investors have an inverse relationship with unemployment in Mexico. There is also an inverse relationship between inflation and GDP in Mexico and Nigeria. And in regard to the findings above the study recommends that the government should use discretionary policy that would reduce unemployment by boosting the level of investment and maintaining stability in the money supply as it had a positive impact on Inflation in the long run. Friedman is of the view that the increase in government spending and the rate at which economy borrows, the higher the inflation.

Keywords: *Inflation, Unemployment, Philips Curve, Nigeria and Mexico*

Streszczenie

W artykule zbadano związek między bezrobociem a inflacją w Nigerii i Meksyku w latach 1991–2016. Dane wtórne wykorzystano do zebrania danych z bazy danych Banku Światowego, Banku Centralnego Nigerii i Banku Meksyku. W celu określenia ustalonego celu zastosowano OLS i analizę regresji prostej modelu ekonometrycznego. Modele określały

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inflację jako funkcję bezrobocia, podaż pieniądza % PKB, całkowite produkty formacji brutto. W oparciu o powyższy test przeprowadzony w badaniu okazuje się, że: inflacja w niewielkim stopniu wpływa na bezrobocie w Nigerii zarówno w perspektywie długoterminowej, jak i krótkoterminowej w badanym okresie. W Meksyku nie ma istotnego związku między bezrobociem a inflacją, ponieważ gdy inflacja jest wysoka, bezrobocie w Meksyku jest również wysokie. Z badania wynika, że inwestycje mają odwrotny związek z bezrobociem w Meksyku. Istnieje również odwrotna zależność między inflacją a PKB w Meksyku i Nigerii. W odniesieniu do powyższych ustaleń badanie zaleca, aby rząd wykorzystał politykę uznaniową, która zmniejszyłaby bezrobocie, zwiększając poziom inwestycji i utrzymując stabilność podaży pieniądza, ponieważ wywarła ona pozytywny wpływ na inflację w perspektywie długoterminowej. Friedman jest zdania, że im większy wzrost wydatków rządowych i tempo, w jakim gospodarka pożyczka, tym wyższa inflacja.

Słowa kluczowe: Inflacja, Bezrobocie, Philips Curve, Nigeria i Meksyk

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Statement of the problem in general outlook and its connection with important scientific and practical tasks.

Over the last decade, there have been arguments among economists, government officials and businessmen on inflation, unemployment and economic growth. This has triggered them to conduct a lot of research on the relationship that exists between inflation and unemployment. They argued on the effect of inflation and unemployment on the economic growth of a given area or country. According to Nwaobi (2009), the Marxist theory believes unemployment is caused by the fluctuating capitalist system. Unemployment and rising inflation are some of the major problems currently being faced in the 21st century and Nigerian/Mexico governments are not an exemption. Unemployment is a situation whereby people who are physically fit, capable, qualified and ready to work at any time are without jobs. The issue of unemployment is one of the macroeconomic problems of a nation. Currently, in developing countries, the problem of unemployment has been increasing as a result of different economic problems facing most

countries. The issue of unemployment in Nigeria and Mexico is highly different compared to other nations. This is due to the high level of corruption, mismanagement of public funds, among others over the years. Interestingly, every government regime comes with its own economic growth increase strategy, but none has been able to achieve the desired goal. Since the continuous increase in population begun, developing nations have been characterized by unemployment. The issue of unemployment brought about some vital social and economic consequences such as; increase in crime rate, loss of respect and identity, reduction in purchasing power, psychological injuries, corruption among others (Anning, Tuama & Darko 2017).

The issue of unemployment in most countries has come with so many issues of insecurity like disloyalty and lack of integrity among people, an increase in the crime rate (kidnapping, robbery and killing). Unemployment in most developing countries is one of the most life threatens issues that

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need urgent attention. When a new government authority in most developing countries comes into leadership, they promise the people about a different strategy to increase economic growth and reduce the rate of unemployment until now where is a little achievement in most of these countries.

Tomety (2011) defined Inflation as the increase in the general level of prices for goods and services in a country and is measured as an annual percentage change. Under conditions of inflation, the prices of things rise over time. Policymaker/government is faced with the challenges of reducing unemployment and the rate of inflation. In a simple explanation, when there is a rise in inflation every dollar purchase less, rise in price and fall in the value of money. In 1958 Phillips found the relationship between unemployment and inflation. He stated that there is an inverse relationship between unemployment and inflation in the UK. The Phillips curve came into existence from the research of the economist Williams Phillips (Phillips 1958). Finally, the recent global financial crisis which brought about a high rate of unemployment in the world was due to the high costs of operation that many organizations are facing. This led to a reduction of labor costs resulting in high rate of unemployment. Since the introduction of the Phillips curve, it has remained a vital guideline for the formulation of macroeconomic policy and researchers have been carrying out a different study on inflation and unemployment in relation to the Phillips curve. The major issue the government is facing is how to reduce the unemployment rate and at the same time reduce inflation. Some research has been carried out on the relationship between these two key macroeconomic variables.

Research Question. In order to find a solution to the problem which this research

work identified, the following research question is raised:

What is the relationship between inflation and unemployment in Nigeria and Mexico from the perspective of the Phillips curve from 1991-2016?

Objective. Currently, the rate of inflation in Nigeria moves up by 1.2% monthly and on a yearly basis it moves up by 13.3% and the rate of unemployment in Nigeria has increased drastically from 3.5% to 10%, presently it is on 7%. In the case of Mexico, the Inflation rate in Mexico, raise to 4.8% yearly, the rate of inflation move to 6.6% because of the higher cost of energy and fuels and also the fear of the unknown of the NAFTA. In the years 2000 and 2008, Mexico experienced a drastically rise in inflation 9% and 6.6% respectively, and presently the inflation is at 4.65% (World Bank, 2018). This research study looks into the relationship between the unemployment rate and inflation rate in Nigeria and Mexico from the perspective of Phillips and this will be examined under the test of correlation coefficient and simple regression analysis with the period of 1961 to 2016.

Hypothesis

H1: Gross Domestic Product negative significantly influences on the unemployment rate of Nigeria and Mexico

H2: Inflation positively significantly influences on the unemployment rate of Nigeria and Mexico

H3: Gross Formation of Capital positive significantly influences on the unemployment rate of Nigeria and Mexico.

Inflation Concept. The devaluation of currency leads to a rise in the prices of goods and services which result in inflation. One of the major goals of a country's economic system is to keep the prices of goods and services stable at rates that would not cause problems to the economic system. For this

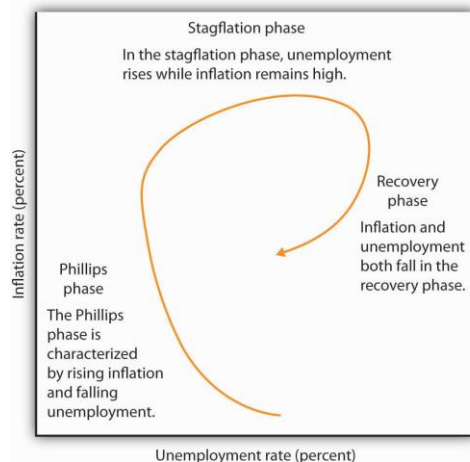
goal to be achieved, countries must ensure that the price level is stable. This goal also has dire micro and macroeconomic consequences. Inflation move in two ways the upward and downward inflationary, the upward movement of Inflation causes a disparity in the distribution of wealth and it put the export of goods and services in the international market less competitive (Haug&King 2011).

Unemployment Concept. Unemployment is a macroeconomic factor that shows the rate of unemployment in a country. In a simple explanation, unemployment means when the labor demand is higher than the supply of labor. When there is a high unemployment rate, organizations hire without having to pay high salaries, since the labor force is abundant. The Phillips curve analyses short-term movements of unemployment and inflation in macroeconomics. It shows that the higher the unemployment rate, the lower the rate of inflation and the low unemployment rate can be achieved by high inflation. It is a different issue in the long run because in the long run, most research studies stated that there is a little positive significant relationship between inflation and unemployment. Alfred A. Haugland Ian P. King (2011) examined the Empirical Evidence on Inflation and Unemployment, in the Long Run, provides evidence in accordance with the predictions of Friedman (1977) they found a positive relationship between inflation and unemployment in the medium to long run. There is also the Friedman-Phelps version of the Phillips curve; it is the accelerations Phillips curve. Using the adaptive expectations method, it indicates that in order to keep the

unemployment rate below the natural rate of unemployment, what matters is not the inflation rate but its variation.

The Phase of Inflation and Unemployment. Figure 1 shows the way an economy may move from a Phillips phase to a stagflation phase and then to a recovery phase. In the late 1970s the cycle of inflation and unemployment started from the stagnation phase, because of recession, most countries even the United States of America was faced with the Great Depression which leads to an increase in of unemployment and higher inflation. As the cycle passed through the stagflation phase, the economy suffered its highest rate of unemployment since the Great Depression. In the early 2000s, following the brief recession in 2001, the inflation- unemployment is a clockwise movement, as the economy moved back quickly into the Phillips phase of falling unemployment and rising inflation but at higher levels of both compared to what prevailed in the 1990s. During this recent period, oil and other commodity prices were rising, due primarily to the short-run aggregate supply curve was moving to the left while aggregate demand was shifting to the right. The Phillips curve relates the rate of inflation with the rate of unemployment. The Phillips curve argues that unemployment and inflation are inversely related: as levels of unemployment decrease, inflation increases. The relationship, however, is not linear. Graphically, the short-run Phillips curve traces an L-shape when the unemployment rate is on the x-axis and the inflation rate is on the y-axis.

Figure 1. Relationship between Unemployment and Inflation (Phase of Unemployment and Inflation cycle)



Source: Elaboration from Massachusetts Institute of Technology Economist and Nobel Paul Samuelson (1970)

Brief History of Inflation and Unemployment in Nigeria

Inflation in Nigeria has been a major problem since the 1980s, in early 1980 the inflation rate in Nigeria was 21.4%, around 1984 it move up to 41%, at this the government came up with the structural adjustment program, that year the inflation was 31.5% from 1986-1983. From 1995 to 2007, it averaged 12.3 percent (a period characterized by a democratic experiment and the bold effort at better management of the economy). It is believed that a single-digit rate of inflation and less than a 5% rate of unemployment is healthy for a country but anything apart from this is dangerous for the development and stability of a country (Umaru & Zubairu 2012).

Brief History of inflation and Unemployment in Mexico

In 1980, Mexico was faced with a high inflation rate as high as 179% from 2000 - 2009 the average inflation rate was 5.2%. In 1999 the Central Bank of Mexico adopted "Inflation Targeting Policy" which targets

3.0%. The application of this program started in 2003. Till now inflation has not been stable in Mexico. Inflation determines the continuous increase in the price of goods and services. In Mexico, there has been much difficult regarding unemployment. At the closure of 2014, 59.86% (participation rate) of the population in working age (not of 14 years but above 15 years, given the recent constitutional reform that added a year to the minimum working age) was economically active (EAP, people employed or looking for employment), a lower percentage than the one of the previous year (61.08%), 96.24% of the EAP was identified as Working population (WP), which means that the unemployment rate (UR) was off 3.76% in December(against the 4.53% in November, the 4.27% a year before and the 4,20% expected), decreasing for the fifth month in a row and situating itself at its lowest level in at least two years. Thus, the average UR of 2014 was of 4.83% lower to the 4.91% of 2012 (Garcias, Hernandez & Bolivar, 2017)

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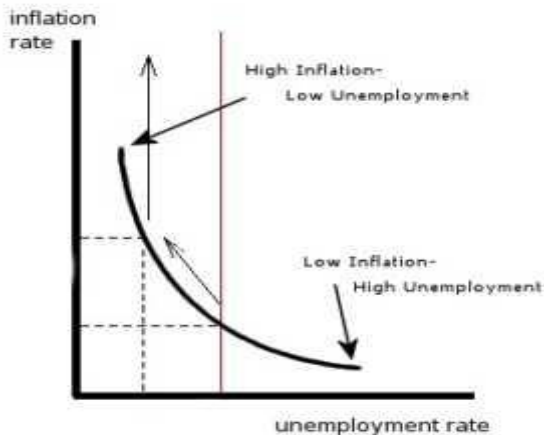
The Perspective of Phillips Curve

The Phillips Curve

The concept of Phillips Curve is an economic tool that shows the relationship between the change of inflation and unemployment. It was founded in 1958 when an English economist, A. W. Phillips shows the relationship that exists between the change of nominal wages and unemployment in his research works (Phillips, 1958). In 1960 the Phillips curve was seen as a tool to reduce unemployment and stabilize inflation (Samuelson and Solow, 1960). However, there was a lot of criticism

against the Phillips curve especially by Friedman and Phelps. The Phillips curve is believed to have an effect on unemployment and inflation in the short run, any further adjustment to reduce the rate of unemployment lead to an increase in the level of inflation and vice versa. The first version of the Phillips curve had a natural rate of unemployment. Phillips Curve is a negative relationship between inflation and unemployment. It is stated that when there is an increase in the price of goods and services, there will be a reduction in unemployment and vice versa.

Figure 2. Phillips curve.



Source: www.economicshelp.org, 2018

Analysis of latest research where the solution of the problem was initiated.

The Natural Rate of Unemployment

The contemplation among economists on choosing high inflation with low unemployment or low inflation and high unemployment led to the introduction of the Natural Rate of Unemployment. There was the introduction of the natural rate of unemployment after some deliberation on

the Phillips curve. There was a lot of contemplation among economists between choosing high inflation with low unemployment or low inflation with high unemployment. This led to the introduction of the natural rate of unemployment. When there is an increase in Aggregate Demand, most business organizations pay higher

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salaries/wages to workers, this also brings about an increase in the total spending of the individual. However, the increase in AD also causes inflation to increase and therefore real wages do not actually increase but remain the same. Later workers realize that the increase in wages was only nominal and not a real increase. Therefore they no longer work overtime. Therefore the supply of labor falls, and unemployment returns to its original or natural rate of unemployment. It is only possible to reduce unemployment by causing an increase in the rate of inflation. Therefore the natural rate is also known as the NAIRU (nonaccelerating rate of unemployment). This model assumes workers do not correctly predict the rate of inflation but have adaptive expectations. Some economists argue workers will correctly predict higher AD causes higher inflation and therefore there will not be even a short term fall in unemployment; this is known as rational expectations.

The Fiscal and monetary policies are in the view of how to reduce inflation and at the same time reduce unemployment. The fiscal policy is being controlled by the government it helps by the increase in government expenditure or reducing the tax level on the citizen. Where the monetary policy is control by the central bank, who decide to increase the interest rate or increase the interest rate (Johannes 2011). When there is a reduction in the interest rate, more people want to go into investment by getting a loan from the bank. It has shown that an excessive increase in government spending leads to inflation. In an interview in 1960 where Friedman was asked how can inflation be reduced, he said when the government spends so much money at first the people will be happy but suffering is coming because of inflation due to too much government spending. The

NAIRU is the level where inflation is constant.

The Central Bank of Nigeria/Mexico has to target low inflation. However, the stabilization of inflation is appropriate because the fiscal policy is only granted a short-run effect. An increase in government expenditure or cutting of taxes causes short-run positive effects on employment, with this exact effect influenced by two factors: first, the fiscal policy is affected by the degree of rigidities; and second, it is influenced by the preferences of the central bank (Patrick, Karison & Dominique 2013). A high degree of rigidities provides persistent positive effects of fiscal policy and only a slow increase in inflation. Given that inflation only starts with delay, the central bank will raise its interest rate late and mitigate the effect of fiscal policy. If there is a low degree of rigidities, an increase in inflation occurs after a short time, which will tempt the central bank to increase the interest rate early to achieve the inflation target. Due to this interaction between monetary and fiscal policy, the effect of fiscal policy results in an economic downturn, given that inflation will only increase slightly following an increase in government spending, and the central bank will not raise their interest (Marika, Hector & Dennis, 2008). By contrast, there is the possibility of an interest rate cut, because inflation also decreases in a downturn, and the central bank strives to counter this.

Empirical Review

Manuel Garcia-Ramos and Gerardo Fujii-Gambero (2008) measured the impacts of unemployment on Mexico's output gap from 1993Q to 2016Q4, from an econometric modeling point of view, the models allow symmetric interactions between output and unemployment. They concluded that Okun's law has a stable relationship in

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Mexico. When actual Gross Domestic Products is less than potential output, the unemployment gap rises by 0.17% points. It implies that an increment of the unemployment gap of one percent is associated with an output loss of -5.88 of potential output.

Karanassou, Sala and Snower (2008) analyzed the context of the new Phillips curve (NPC), there is frictional growth which generates an inflation-unemployment tradeoff in the long run. They argued that a holistic framework, like the chain reaction theory (CRT), should be used to jointly explain the evolution of inflation and unemployment. A further attraction of the CRT approach is that it provides a synthesis of the traditional structural macro-econometric models and the (structural) vector autoregressions (VARs).

Eduardo Lorial, Jorge Ramirez (2011) examined inflation, monetary policy and economic growth in Mexico: An inverse causation, 1970-2009. It is demonstrated through a structural vector autoregression (SVAR) model which distinguishes short and long term effects, that the monetary policy implemented in Mexico (1970-2008) has been successful in reducing inflation at the cost of stagnation, especially after 2002. They mention in their research that inflation targeting is contradictory in itself because, while it is efficient in improving transparency and credibility of the monetary policy, it doesn't solve structural causes of inflation and conversely, increases the financial costs of economic agents.

Katria, Bhutto, Butt, Domki, Khawaja, Khalid (2012) identified the relationship between inflation and unemployment in SAARC countries from the perspective of the Phillips curve. Unbalanced annual panel data of 8 SAARC members (Afghanistan,

Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka) and 6 expected member of SAARC (Republic of China, Russia, Indonesia, Iran, Myanmar and South Africa) have been used for the period 1980-2010. The study found significant results; there is a negative relationship between inflation and the unemployment rate in the SAARC Countries. The concept of the Phillips curve holds true.

Patrick Nüß (2013) explored the relationship between inflation and unemployment in Germany during the period from 1970 to 2012. This paper highlights that there is no short-run negative relationship between inflation and unemployment, and consequently the short-run Phillips curve is an unsuitable instrument for making political decisions. It also explained that there is a long-run relationship between inflation and unemployment, which can be explained with asymmetric nominal wage rigidities and resulting frictional growth. Since the beginning of the European Monetary Union, Germany has been on average 0.5% under the permanent inflation target of the central bank. Therefore, by using fiscal policy, Germany can reduce permanent unemployment without missing the inflation target of the central bank.

Vijayakumar (2013) scrutinized the nexus among poverty, economic growth, employment and dependency ratio in developing countries. The research makes use of the OLS method, correlation and econometric tools. Two models employed in the analysis are the goodness of fit because both p-value and F-statistics in the models are less than 5%. The results bring to light the fact that the age dependency ratio has had a tremendous impact on poverty and poverty has had a relatively very high impact on the age dependency

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ratio. Even though Industrial employment has a negative association with poverty incidence, it does not have a significant impact on poverty. The finding that economic growth, poverty and industrial employment significantly affect the age dependency ratio in model two is practicable and consistent with economic theories.

Furuoka and Munir (2014) examined Unemployment and Inflation in Malaysia: Evidence from Error Correction Model. The main finding of the current inquiry is that there existed an equilibrium relationship between the unemployment rate and the inflation rate in Malaysia. In other words, the results of this study support the validity of the Phillips Curve hypothesis.

Nindi and Odhiambo (2015) examined the causal relationship between poverty reduction and economic growths in Swaziland during the period 1980–2011. The study used the newly developed ardl-bounds testing approach to co-integration and the ecmbased Granger causality method to examine this linkage. The study also incorporates financial development as a third variable affecting both poverty reduction and economic growth – thereby leading to a trivariate model.

Orji, Antony-Orji and Okafor (2015) examined the inflation and unemployment nexus in Nigeria by testing if the original Phillips curve proposition holds for Nigeria. The study adopted a distributed lag model with data covering the period 1970-2011. The consumer's price index (a measure of inflation rate), was regressed on the unemployment rate, the growth rate of money supply, budget deficit, real gross domestic product, interest rate and the lag of current interest rate. The result reveals that unemployment is a significant determinant of inflation and that there is a

positive relationship between inflation and unemployment rate in Nigeria.

Hernández,Pérez-Sotoy and Godínez-Montoya (2016) analyzed some macro-economic variables that affect inflation and unemployment, 1980-2015 in Mexico, a model of multiple linear regression was developed. They were a highly significant statistically exchange rate and the interest rate. Unemployment elasticity with respect to GDP and FDI was: 3.44×10^{-6} , 1.24×10^{-4} , respectively, which indicated that the 10.0% increase in each of these, the unemployment rate varies very little. For inflation with interest rate was 1.4%, compared to an increase of 10.0% of this, the inflation rate increased by 14.0%.

OdoElom-Obed, Nwachukwu and Okoro (2017) investigated the relationship between unemployment and inflation in Nigeria from 1980-2015. The model specified unemployment as a function of inflation, the money supply is a % GDP, total government expenditure % of GDP. The statistical tests used were the causality test, VECM test, cointegration test. Based on the above tests carried out, the study found out that: Inflation significantly impacted unemployment in Nigeria both in the long run and short run within the period under review. This implies that an increase in government expenditure reduces unemployment, it can also be inferred from the result that government spending creates employment to the extent that inflation remains within the single-digit limit. Based on the results, the study recommended that government should use discretionary policy that would reduce unemployment by boosting government expenditure and maintain stability in money supply by using the traditional monetary instruments (such as open market operation, discount rate and special directive) to reduce the quantity of money in circulation).

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Omitogun and Longe (2017) investigated the impact of unemployment on economic growth in Nigerian the 21st century using the VAR model. Their research revealed that the impact of unemployment, inflation rate, exchange rate, and government expenditure varies over the periods. Unemployment and inflation, among other variables, were found to have contributed mostly to the variations in the growth of the economy over the period. This is because the price and sustainability means of the economy is a factor which needs full attention to avoid a downturn growth.

Anning, Tuama & Darko (2017) asserted in their research that the nature of inflation in the country was cost-push attributed to the method of technology adopted and the level of unemployment in the country. This

will make it possible for inflation rates if regressed along to behave abnormally to growth rates of output in Iraq. A historical analysis of monetary policy in Iraq within this framework suggests that monetary conditions might have been less accommodative and, hence, inflation in Iraq might have been lower and less volatile than what was observed in recent past had Iraq followed prescriptions based on a rule consistent with price stability.

Nigeria has a high GDP per capita medium unemployment rate. This country has been seen to have a fluctuating economy growth and the level of unemployment is not stable. There is a drastic increase in the level of unemployment from 2016 to 2017 even with high GDP.

Aims of paper. Methods

Methodology

For this research a range of data selection was used, time series, cross-sectional data, and panel data were used to gather information on the relationship between inflation and unemployment in Nigeria and Mexico. Simple Regression Analysis and Correlation model was used in order to understand its advantages in terms of an analysis of the Phillips curve. The research worked with both Phillip's long run and the short run. The study used correlation to find the relationship between inflation and unemployment in Mexico and also view the level of unemployment and inflation respectively.

Sources of Data Collection

This research study uses the secondary sources of data and these data were sourced principally from the Central Bank of Nigeria (CBN) annual reports, Central Bank of Mexico annual reports, statistical bulletin, and the World Bank databank. The

data Ordinary least squares (OLS) and simple regression analysis were used in which inflation was regressed against the unemployment rate, GDP and investment. The method is useful in developing a quantitative relationship between variables, which can be used for prediction. This is the most appropriate technique in view of the test for fitness and simplicity in understanding.

Model for the Research Study

Original data for Nigeria and Mexico was obtained from the World Bank Databank, which provides time series of various lengths for the variables involved in the study: GDP, inflation, unemployment, and Gross Formation Products.

The functional form of the model is as: $UN = f(GDP, INFL, UNE, GFP)$ Where $UNE =$ Unemployment rate in percent $GDP =$ Gross Domestic Product in percent $INFL =$ Inflation in percent $GFP =$ Gross Formation Product

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Simple Regression Analysis

To find the relationship between inflation and unemployment in Nigeria and Mexico, a linear regression analysis including model-building techniques and assumption verifications were conducted. Linear regression models the relationship between two or more variables by fitting the line (plane) that best explains the dependent variable from the explanatory variables. Linear regression does this by finding the line (plane) that minimizes the sum of the squares of the vertical distances between the actual. According to Reanna Collins (2009) Simple linear regression is a statistical method that allows us to summarize and study relationships between two continuous (quantitative) variables. One variable denoted x , is regarded as the **predictor, explanatory, or independent** variable.

The other variable denoted y is regarded as the response, outcome or dependent variable. The mean of the response, $E(Y_i)$ $E(Y_i)$, at each value of the predictor, x_i , is a linear function of the x_i ,

X = Inflation (INFL)

Y =Unemployment (UNE)

- The errors, ε_i , are Independent.
- The errors, ε_i , at each value of the predictor, x_i , are normally distributed.
- The errors, ε_i , at each value of the predictor, x_i , have equal variances (denoted σ^2).

In order to examine which of the two lines is a better fit, we first need to introduce some common notation:

- Y_i denotes the observed response for experimental unit i
- X_i denotes the predictor value for experimental unit i
- \hat{Y}_i is the predicted response (or fitted value) for experimental unit i

Then, the equation for the best fitting line is:

$$\hat{Y}_i = b_0 + b_1 X_i$$

If the relationship between Y and X is believed to be linear, then the equation for a line may be appropriate:

$$Y = \beta_1 + \beta_2 X,$$

Where β_1 is an intercept term and β_2 is a slope coefficient.

Exposition of main material of research with complete substantiation of obtained scientific results. Discussion.

Results analysis

Hypothesis result (inflation, unemployment gross formation products and gross domestic products) from 1991-2016.

There is an inverse relationship between GDP and Unemployment in Nigeria, it is shown below that when there is an increase in GDP there is a reduction in unemployment but in 2015 when there is an increase in GDP, there was also an increase in the rate of unemployment. The rate of inflation in Nigeria, Mexico and the world

was compared. It was seen that in 1991 the inflation rate was at 11% and there was a dramatic rise to 70% in 1995 due to change in government in Nigeria, the inflation rate in Mexico can be divided into three phases 1991 when the inflation rate was 22%, in 1995 it moved to 33%, and since then it has been fluctuating within 9% - 7%. It can be viewed that the rate of unemployment in Nigeria can be divided into five (5) phases. In 1991, the rate of unemployment was 3% and it moves tremendously to 7% in 1996. In 1999 it moved back to 2.5%. In 2008 it

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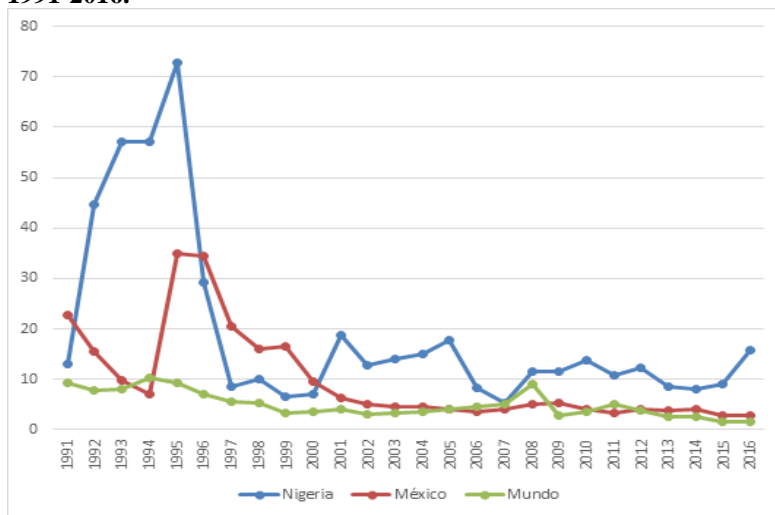
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moves upward to 5% and in 2015 it moves back to 3% and at the end of the year 2016 it has moved to 7% compared to the rate of unemployment in the world, Nigeria is still at the peak. In Mexico there are four phases in 1991 the rate of unemployment in Mexico was 5.2% it drops to 4.5% in 1993. In 2013 it moves downward to 3.55 and in 2014 it moves back to 4.8% and downward to 3.8% in 2016. Mexico compared to the world has been on a reasonable level but there is a crisis in 2008 due to a recession in most countries of the world. It can be seen the level of investment in Nigeria is very low compared to the world. The Gross Formation of Capital of the world is higher than Mexico. There was a drastically movement of Mexico's investment in 2009. It can be viewed that

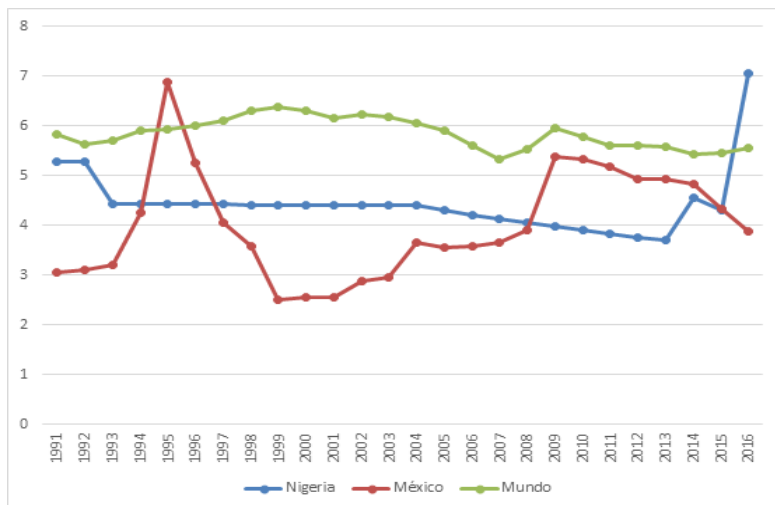
Nigeria GDP is very low from 1991 to 2004; from 2005 there was a little improvement because the GDP move from 7.2% to 7.9% in 2016, Mexico GDP movement has been fluctuating, from 8.7% to 9% back to 8.8% in 2016, and the world has been experiencing little changes 8.9% to 9.1%. it is shown on the befitting line the rate of investment in the world is far more than the rate of investment in Nigeria and Mexico. The rate of investment in Nigeria is relatively low compared to Mexico and the world. In 1991, the investment rate was 23.8%, it moved down to 23.2% in 1995, since 2005, there has been a continuous increase in the rate of investment in Nigeria. In Mexico, there is hardly any development in the rate of investment since 1992 which the rate has been 26%.

Graphic 1. Inflation (Consumer Prices, % Annual) Nigeria, Mexico and the World, 1991-2016.



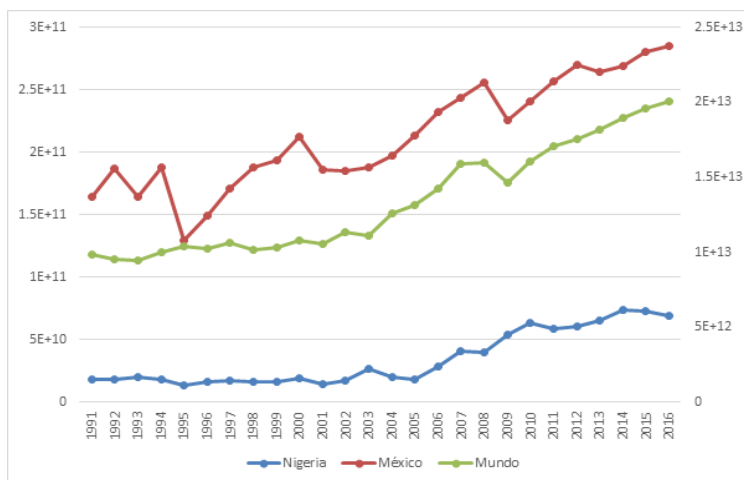
Source: World Bank 2018.

Graphic 2. Unemployment (% of Active Population), Nigeria, Mexico and the World, 1991-2016.



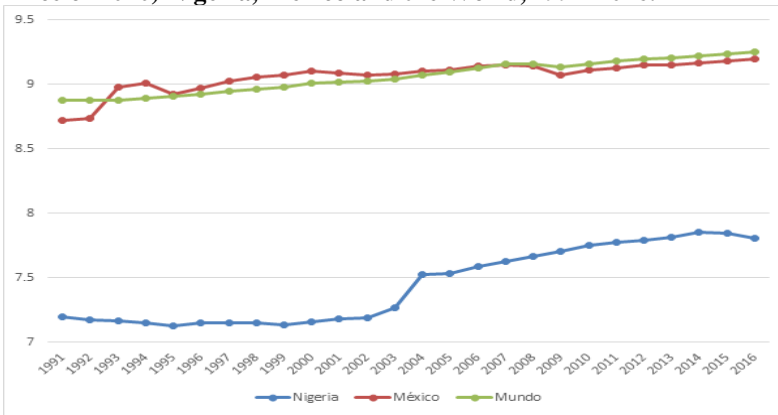
Source: World Bank 2018.

Graphic 3. Gross Formation of Capital (US\$, Prices of 2010), Nigeria, Mexico and the World, 1991-2016.



Source: World Bank 2018.

Graphic 4. Natural Logarithm (ln of Gross Domestic Product (Dollar Constant Price of 2010) Nigeria, Mexico and the World, 1991-2016.



Source: World Bank 2018.

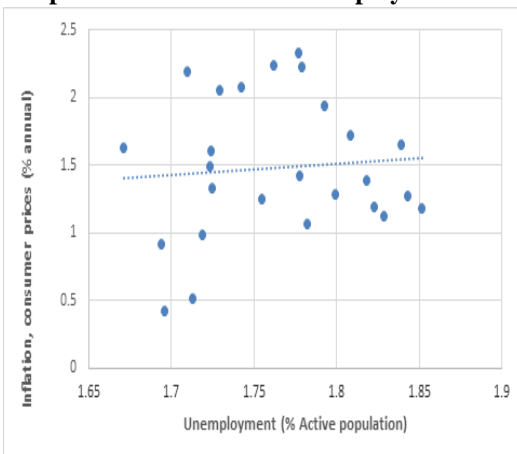
The result on Phillips Curve

It was observed that the natural logarithm of Gross Domestic Product and unemployment tend line in Nigeria, it can be seen that the increase in GDP corresponds to a decrease in unemployment for the period 1991-2016. An inverse situation occurs with the relationships observed of Natural logarithm of inflation and gross domestic product in the same

country where an increase of inflation has a correspondence with a decrease of the gross domestic product for 1991-2016.

In observing the Phillips curve in Nigeria, Mexico, and the world, the Phillips curve doesn't apply to the world and Mexico; there is a little tradeoff between inflation and unemployment in Nigeria. The Phillips curve in both countries has a weak trade-off

Graphic 5. Inflation and Unemployment in the World, 1991-2016.



Source: World Bank 2018.

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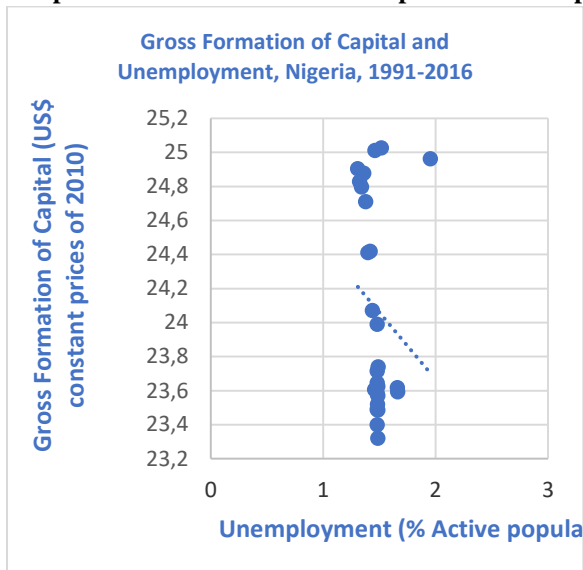
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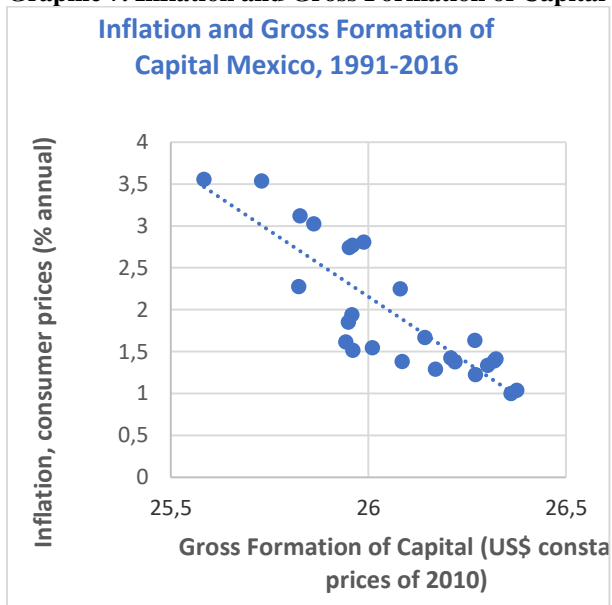
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Graphic 6. Gross Formation of Capital and Unemployment, Nigeria, 1991-2016.



Source: World Bank 2018.

Graphic 7. Inflation and Gross Formation of Capital Mexico, 1991-2016.



Source: World Bank 2018.

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Regression, Coefficient and Correlation Result

Tables 1 & 2 below showed the coefficient analysis and regression summary of the relationship between inflation, unemployment, GDP and investment in Nigeria. The unemployment rate is 0.871, F-value is 2.013 ($P > 0.05$). The adjusted R2 is 0.108, which shows that inflation is responsible for a 10.8% reduction of unemployment. This implies holding other variables constant if inflation goes by 1%, the rate of unemployment reduced by 10.8%. It can be

seen that the result does go in line with the idea of the Phillips curve Negative or inverse relationship that exists between inflation and the rate of unemployment. This result shows that the Phillips curve is very weak in Nigeria. It can be seen as the problem of stagflation is the major problem of Nigeria.

The t-value is 0.815 ($p > 0.05$), $R^2 = 0.215$ and Durbin-Watson = 0.714

Table 1. The coefficient for the relationship between Inflation and three other macro-economic variables (Unemployment, GDP and Investment).

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	9.873	6.893		1.432	.166
Nigeria: Unemployment, total (% of active population)	.871	1.069	.158	.815	.424
Nigeria: Gross Domestic Product per capita (US\$ constant prices of 2010)	-.707	1.330	-.293	-.532	.600
Nigeria: Gross Formation of Capital (US\$ constant prices of 2010)	-.134	.622	-.118	-.216	.831

Source: Researcher Survey Analysis, 2018.

Table 2. Nigeria Regression Analysis using Inflation, prices of consumer (% annual) Constant, Unemployment, GDP and Investment.

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.464 ^a	.215	.108	.66031	.215	2.013	3	22	.142	.714

a. Predictors: (Constant), Nigeria: Unemployment, total (% of active population), Nigeria: Gross Formation of Capital (US\$ constant prices of 2010), Nigeria: Gross Domestic Product per capita (US\$ constant prices of 2010)
 b. Dependent Variable: Nigeria: Inflation, prices of consumer (% annual)

Source: Researcher Survey Analysis, 2018.

Tables 3 & 4 below showed the coefficient analysis and regression summary of the relationship between inflation, unemployment, GDP and investment in Mexico. The unemployment rate t-value is 0.970, F-value is 24.750(P>0.05). Investment t-value is -4.493 (P<0.05), GDP t-value is 1.998(P< 0.05)The adjusted R² is 0.740, which shows that inflation is responsible for 77.1% investment and GDP improvement. This implies holding other variables constant, if

inflation goes by 1%, the level of investment and GPD improved by 77.1% . It can be seen that the result does go in line with the idea of the Phillips curve Negative or inverse relationship that exists between inflation and the rate of unemployment. This result shows that the Phillips curve is very weak in Mexico. It can be seen there is an inverse relationship between inflation and investment in Mexico.

The t -value is 8.234 (p <0.05), R² = 0.771 and Durbin-Watson = 0.592

Table 3. Mexico Regression Analysis using Inflation, prices of consumer (% annual) Constant, Unemployment, GDP and Investment.

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	82.266	9.992		8.234	.000
Mexico: Gross Domestic Product per capita (US\$ constant prices of 2010)	-1.913	.958	-.292	-1.998	.058
Mexico: Gross Formation of Capital (US\$ constant prices of 2010)	-2.431	.541	-.656	-4.493	.000
Mexico: Unemployment, total (% of active population)	.291	.300	.100	.970	.343

Source: Researcher Survey Analysis, 2018.

Table 4. Nigeria Regression Analysis using Inflation, prices of consumer (% annual) Constant, Unemployment, GDP and Investment.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
	.878 ^a	.771	.740	.39617	.771	24.750	3	22	.000	.592

a. Predictors: (Constant), Mexico: Unemployment, total (% of active population), Mexico: Gross Domestic Product per capita (US\$ constant prices of 2010), Mexico: Gross Formation of Capital (US\$ constant prices of 2010)

b. Dependent Variable: Mexico: Inflation, prices of consumer (% annual)

Source: Researcher Survey Analysis, 2018.

Conclusions.

Unemployment and inflation are two major macroeconomic variables facing Nigeria and Mexico's economy and social development. These problems have affected the political and economic development of these two most important countries in Africa and

Latin America. This prompts this research study to find out if the Phillips curve is also achievable in Nigeria and Mexico, but the result found out that the Phillips curve is not applicable in Nigeria and Mexico.

Recommendation

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a. This study revealed that when there is an increase in inflation, unemployment also increases in Nigeria and Mexico, the Phillips curve assertion is of the view that when there is an increase in inflation, there is a reduction in the rate of unemployment. The government of these two countries has to look for a way to reduce the rate of inflation and unemployment by focusing on how to create jobs and strategizing on how to capitalize on their production strength.

b. Monetary policy has been on a check, both Central Bank of Nigeria and Bank of Mexico work on their current monetary policy by reducing the rate of the interest rate.

In Nigeria it is time to move agricultural products (operation feed the nation), instead of relying on Natural gas, it time to move to small scale businesses to generate employment for the youth. Mexico should look for a way to secure another reliable importer for their products.

c. Another way to reduce the inflation rate is to provide more job opportunities. This can be done by investing in agricultural sectors and the industrial sector to provide vital services for the people who are capable and willing to work.

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