

The impact of Inflation on the Unemployment Rate in Algeria within the Framework of the Phillips Curve during the period (1990-2023):

An Econometric Study using the ARDL Model

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Received: 20/08/2025

Accepted: 2026-03-31

Published: 2026-03-31

Abstract: This paper explores the relationship between unemployment and inflation in Algeria within the Phillips Curve theoretical framework over the 1990–2023 period. The Autoregressive Distributed Lag (ARDL) method is employed in this paper to estimate the dynamic relation between main macroeconomic indicators. Unemployment is modeled as the dependent variable, and inflation, the real effective exchange rate, and international oil prices are introduced as explanatory variables. On the basis of time series data, the research seeks to confirm the validity of the Phillips Curve both in the short and the long run. The empirical findings reveal the absence of a statistically significant long-run relation between inflation and unemployment, suggesting that the Phillips Curve is not valid in the Algerian context in the long run. These results underscore the insufficiencies of conventional macroeconomic assumptions for the Algerian economy and demand more context-specific policy models that pay attention to structural characteristics and external shocks.

Keywords: Unemployment ; Inflation ; Phillips Curve ; ARDL Model ; Algeria.

Jel Classification Codes : E24 ; E31 ; C32 ; E60.

1. Introduction :

Unemployment and inflation are the biggest issues facing the economies of the developing and developed world. In light of prevailing economic changes and events, the study of inflation and unemployment causality has become pertinent considering the adverse effects these cases have on individuals, society, and national economies and policy. Algeria, in particular, has suffered extremely high rates of unemployment and inflation, and it has led to extremely large economic issues. The Algerian government has not been able to offer sufficient opportunities for employment, adversely impacting the structural reforms adopted by the Algerian state. Since achieving independence, Algeria's strategy of development has required vast financial resources to achieve its investment objectives, and therefore the government has necessarily been forced to count on borrowing and monetary expansion with no subsequent rising output or foreign exchange reservoirs. All this has put on the inflationary pressure observed in rising levels of unemployment, continued rises in prices, and hence declined standards of living.

In this respect, a large number of studies have already resolved the issue of inflation and unemployment and their nexus. The aim of this study is to examine the nexus between inflation and unemployment in the Algerian economy in the context of the theory of Phillips Curve which has been introduced by the British economist Alban William Phillips in 1958 to explain the relationship between aggregate wage changes and the rate of unemployment.

Research Problem:

Algeria is faced with serious economic issues reflected in the sustained rise of both the inflation rate and unemployment, despite the adoption of various economic policies. Thus, the basic question lies in the extent to which inflation affects the unemployment rate in the Algerian economy, and whether the relationship between the two follows the traditional model proposed by the Phillips Curve between 1990 and 2023?

Research Hypothesis:

- The Phillips Curve holds in the Algerian economy.
- There is no long-run relationship between unemployment and inflation in the Algerian economy.

Research Objectives:

This study seeks to achieve the following objectives:

- To discuss the theoretical underpinnings of unemployment and inflation.
- To shed light on the conceptual framework of the Phillips Curve and assess the applicability of the same to the Algerian economy.
- To contrast the pattern and changes in the development of unemployment and inflation rates in Algeria from the perspective of identifying periods of disequilibrium and expansion and their cause.

- To investigate the inflation-unemployment relationship in the Algerian economy

Research Methodology:

This study uses the descriptive and analytical approach to explain and define the key terms related to inflation and unemployment. For investigating the relationship among the variables and the estimation of the Phillips Curve in Algeria from 1990–2023, this study utilizes an econometric approach with the help of the ARDL test method, based on time series data that were analyzed using Eviews 9 software.

2. Theoretical Framework of the Study

2.1. General Concepts of Unemployment and Inflation

Unemployment is seen by most as being among the most serious economic problems in various countries in the world, both developed and less developed ones. Its seriousness lies in that it represents an idle part of a society's productive capacity. The problem is further aggravated by its growing size in that it involves increasingly various parts of people.

In general, unemployment refers to the disruption of a portion of the labor force that is both willing and able to work within a given society. It is also defined as the existence of a labor force that is capable of working, willing to do so at the prevailing wage rate, but unable to find employment. Addressing this issue requires state intervention through the implementation of appropriate and effective policies and measures (Mahmoud Hussein Al-Wadi, 2013, p191).

Unemployment exists in various forms, depending on the causes of unemployment. The most prevalent are:

- **Involuntary Unemployment:** Occurs where individuals are willing and capable of working at the prevailing rate of wages but cannot find jobs. This means that structural issues exist in the economy and must be rectified by the government (Mahmoud Hussein Al-Wadi K. D.-A., 2007, p164).
- **Frictional Unemployment:** A short-term form of unemployment which is a result of job transitions such as moving around, seeking better opportunities, or finding employment after graduation.
- **Structural Unemployment:** Occurs due to skill mismatches between employees and the changing roles of the economy, typically due to technological advancements or industry shifts. Requires retraining and readjustment in regions over the long run.
- **Cyclical Unemployment:** Created by business cycles' downturns when decreased demand leads employers to retrench employees. It is a focal point of macroeconomic policy (Nadja, 2005, p25).
- **Seasonal Unemployment:** Occurred in sectors like agriculture or tourism, where labor demand is seasonal. Workers are dismissed during off-seasons (Khaled Wassif Al-wazni, 2008, p268).

- Disguised Unemployment: Suggests having excess workers more than required in a profession, especially in public or unorganized work, where the loss of some workers will have no effect on total output (Mahmoud Hussein Al-Wadi K. D.-A., 2007, p166).
- Voluntary Unemployment: Denotes individuals who refuse to work at current wage levels despite the existence of employment opportunities. Such individuals are not included in the active labor force.

Unemployment stems from several social and economic reasons. The population's high growth rate enhances the labor force's size at a rate that usually exceeds the establishment of new job opportunities, thus requiring a never-ending increase in employment. Moreover, economic downturns in advanced nations adversely affect developing nations since the latter significantly rely on selling raw materials to the former, resulting in reduced national incomes during recessions. Moreover, capitalist investors will not invest if production is incapable of making sufficient profits to gratify them, therefore limiting the establishment of employment. Improvements in technology also contribute to unemployment since they improve automation and productivity, which can reduce working time and results in the cutting of workforce (Al-Rubaie, 2013, p31).

Inflation is one of the most significant prevailing economic trends as it has a negative effect on economic structures, institutions, and individuals—both as investors and consumers. It is now an endemic feature of most emerging economies, and as such, it has become a point of focus for most economists. There have thus been numerous studies and analyses that have been conducted in efforts to determine means through which its impact can be curbed and causes eradicated. Keynes distinguishes between two types of inflation based on the state of the economy. The first is sub-full employment level, at which price increase stimulates economic activity, reduces unemployment, and leads to full use of resources. That is Keynes's reflation, a desirable kind of inflation. The second undesirable form—inflation—arises if money keeps on printing even after the economy is already at full employment. It is here that the increase in money supply leads to only higher prices and reducing money purchasing power (Boufassa, 2018, p207).

In accordance with its cause and its nature, inflation can be classified into various types: (Tala Zaghba, 2020, p155)

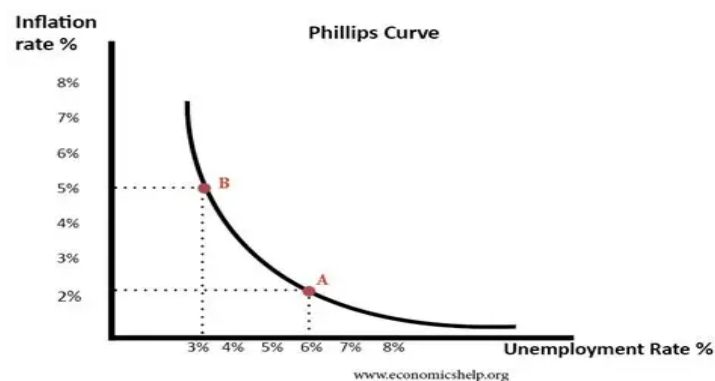
- Demand-Pull Inflation: Occurs when aggregate demand exceeds aggregate supply in the economy, leading to upward pressure upon prices. It typically occurs as a result of increased spending by consumers, the government, or investment.
- Cost-Push Inflation: As a result of higher production costs, e.g., higher wages or raw material costs. These additional costs are passed on to customers in the form of higher prices.
- Built-In Inflation: Arises as a result of a wage-price spiral, in which workers demand higher wages to keep up with higher living costs and firms raise prices to cover higher labor costs.
- Monetary Inflation: When there is an increase in money supply not paralleled by economic output, and it leads to the overall rise in prices.

- Imported Inflation: Created by high costs in imported goods and services, especially in foreign commodity price-dependent economies like energy or food.
- Hyperinflation: A full-blown inflation, in which prices increase at a very fast and uncontrollable rate, normally as a consequence of monetary collapse or political instability.

Inflation is typically the result of disequilibrium between aggregate demand and aggregate supply. From the side of demand, some of the principal causes are consumers' and investors' excess spending above the full-employment level, easy credit policies by commercial banks, chronic budget deficits financed by central banks, war-expense expenditures, and rising wage levels—particularly in those economies that accord greater influence to labor unions. Psychological factors such as inflationary expectations also enter the picture since expectation of future price increases will tend to induce current consumption and investment. On the supply side, inflation may arise from rigidities in the productive system such as achieving full employment, low levels of production capability, shortages of skilled manpower or raw materials, and absence of real capital availability (Samuel Ugochukwu Daniel, 2021, p1013). These forces limit the economy's ability to provide for increased demand, and that means upward pressure on prices.

2.2. The Phillips Curve: Theoretical Background and Developments:

Figure (1): Phillips Curve



The source : www.economicshelp.org

In 1958, the British economist A.W. Phillips demonstrated in an empirical study of the British economy for the period from 1861 to 1957 that there is an inverse relationship between the rate of change in nominal wages and the unemployment rate. During the boom periods of the economy, aggregate demand for goods and services increases, and therefore labor demand increases more, employment rises, and unemployment rates fall. As employment rises, income and wages rise as well, which encourages further demand and raises prices. Conversely, in times of depression or recession, aggregate demand drops, employment drops as well, and wage rises slow down, resulting in lower inflation or deflation (Gnoui Habib, 2014, p118).

Later, the relationship was defined to show the inverse relationship between the inflation rate and unemployment rather than wage movements. The new definition was the typical form of

the Phillips Curve. During a recession, reduced demand for goods and services reduces prices and inflation and, through a decrease in labor demand and employment, increases unemployment. Conversely, during an economic boom, demand, prices, and inflation rise but unemployment declines. Thus, the Phillips Curve is a negatively sloped curve and represents the negative relationship between inflation and unemployment.

During the late 1960s, stagflation, or increasing inflation accompanied by unemployment, invalidated the Phillips Curve. Economists Edmund Phelps and Milton Friedman challenged the use of the Phillips Curve in the long run and established the "Natural Rate of Unemployment" theory. They contended that the initial Phillips Curve did not distinguish between nominal and real wages. According to Friedman, the expansionary policies can temporarily reduce employment by reducing real wages, but in the long run since the laborers would adjust wage claims in terms of higher prices, unemployment will revert to its natural level. So the long-run Phillips Curve will be vertical, implying zero trade-off between employment and inflation in a long-run time frame (Rahma, 2023, p21).

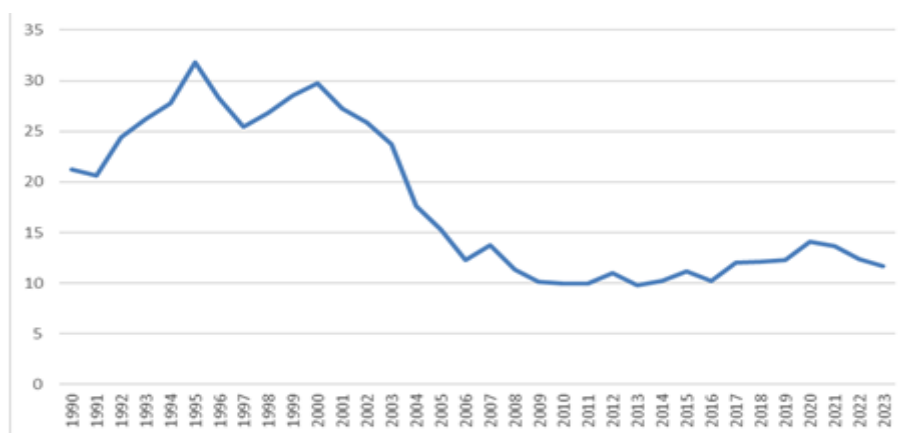
The Keynesian school differs from classical school fundamentally in its inability to specify the determinants of the aggregate level of prices (P) and the nominal wage rate (W) clearly. Classical theorists developed a model that forecasts all variables, including P and W. The Keynesian school, by contrast, assumes equilibrium in a state short of full employment and deals with W as a fixed and exogenous variable ($W = W^0$). Although Keynesians do acknowledge nominal wages in order to vary over time, it is beyond the general model.

A.W. Phillips tested in 1958 the relationship between UK unemployment and changes in nominal wages from the period 1868–1957. His empirical finding was a negative relationship between inflation and unemployment, which he showed using the Phillips Curve with economic cycle-adjusted data (Hani, 2018, p306).

2.3. An Overview of Unemployment and Inflation in Algeria (1990–2023)

2.3.1. Evolution of Unemployment Rates in Algeria During the Period (1990–2023)

Figure (2): Evolution Of Unemployment in Algeria (1990-2023)



The source: Based on Eviews9 Software

The history of Algerian unemployment rates can be divided into three general periods:

- ❖ Phase One (1990-2001): In this phase, mass hike in unemployment was witnessed, and it reached 31.84% in 1995. The major reason for the hike was primarily a fall in oil prices because this led to an economic crisis that led to the bankruptcy of many companies and large-scale retrenchments. In addition, devaluation of the Algerian dinar weakened public institutions, which led to their closure or privatization, thereby adding to unemployment.
- ❖ Phase Two (2002-2013): Gradually, unemployment rates decreased to a low of 9.82% in 2013. This was owing to reforms initiated by the government and expansionary fiscal policies for job creation, supplemented by increased public spending prompted by increased oil revenues. Five-year development plans and improved political and economic stability also contributed to reducing unemployment to a minimum.
- ❖ Phase Three (2014-2023): Unemployment rose again after 2014 due to falling oil prices, which necessitated government sector hiring freezes and layoffs after institutions were closed. The COVID-19 pandemic accelerated the situation in 2020, pushing unemployment to 14.06%. From 2021, however, unemployment has gradually decreased as the economy began to pick up.

2.3.2. Evolution of Inflation Rates in Algeria During the Period (1990–2023)

Figure (3): Evolution Of Inflation in Algeria (1990-2023)



The source: Based on Eviews9 Software

The inflation pattern in Algeria can be divided into four broad phases:

- ❖ Phase One (1990–1995):

Inflation gained momentum in this period, reaching a high of 31.67% in 1992 due to expansionary monetary policies, increased liquidity, and price liberalization. Although it eased in 1993, inflation resumed its upward movement due to continued structural reforms and the removal of price controls.

❖ Phase Two (1996–2000):

This was the time of a dramatic reduction in inflation, down to its historical low of 0.34% in the year 2000. The reduction was the result of successful monetary tightening, removal of public subsidies, liberalization of most prices, and reduced aggregate demand due to rising unemployment and higher interest rates.

❖ Phase Three (2001–2012):

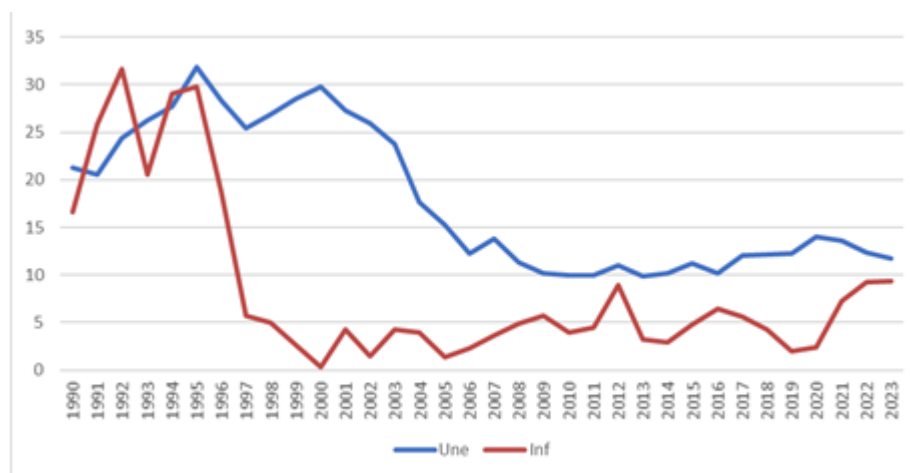
Inflation remained modest (below 5%) between 2001 and 2008. However, it increased in 2009 due to increased food prices and imported inflation linked to the global financial crisis. In 2012, inflation peaked at 8.89% as a result of the rising cost of fresh foods.

❖ Phase Four (2013–2023):

After a brief decline in 2013–2014 (as low as 2.92%), inflation resumed rising due to falling oil revenues and fiscal measures such as fuel price hikes. Though inflation fell to 1.95% in 2019 due to lower food prices, it rose again from 2020 onwards due to external economic shocks—particularly the COVID-19 pandemic and the Russia-Ukraine war—reaching 9.32% in 2023.

2.3.3. Analyzing the Relationship between Unemployment and Inflation in Algeria During the Period (1990–2023)

Figure (4): Evolution Of Unemployment and Inflation in Algeria (1990-2023)



The source: Based on Eviews9 Software

Algerian economic data from 1990 to 2023 indicate that the connection between unemployment and inflation was oscillating and not linear or stable. Instead, it depended upon structural and situational factors such as fluctuations in the price of oil, shifts in economic policy, and domestic and foreign crises.

❖ Phase One (1990–2001):

This was accompanied by simultaneous increases in inflation and unemployment, with inflation exceeding 30% during some years and 31.84% in 1995. This simultaneous movement is at variance

with the traditional Phillips Curve model and defines a situation of stagflation caused by economic contraction, institutional bankruptcies, and price opening.

❖ Phase Two (2002–2013):

Throughout this period, Algeria experienced relative economic calm driven by expanding oil revenues. Unemployment remained in decline slowly, even dipping below 10% in the year 2013, and inflation was kept in check (mostly below 5%). This resembles the Phillips Curve strategy better, where economic expansion accompanied falling unemployment and had controlled inflation.

❖ Phase Three (2014–2023):

This period saw a renewed rise in unemployment and inflation, particularly following the COVID-19 pandemic. The inflation rate reached 9.32% in 2023, and the unemployment also increased as a result of economic downturns and decreased state hiring. The double rise of both indicators once again foretells a stagflation period, driven by global shocks (pandemic, Russia–Ukraine war), inherent economic weaknesses, and Algeria's heavy dependence on oil exports and imports.

3. The Econometric Study to Estimate the Relationship Between Unemployment and Inflation in Algeria within the Framework of the Phillips Curve (1990–2023)

3.1 Definition of Study Variables

Study variables were selected based on both economic theory and empirical models used in earlier studies. The study variables are as follows:

- Unemployment rate (une): This is the dependent variable of this study.
- Inflation rate (inf): This is an independent variable.
- Price of oil (op): It is an independent variable.
- Real effective exchange rate index (rex): It is also an independent variable.

3.2 Econometric Model Used

This study adopts a quantitative econometric approach in examining the relationship between unemployment and inflation in Algeria for the period 1990–2023, using data gathered on a yearly basis from the World Bank. The estimation of the model is based on the Autoregressive Distributed Lag (ARDL) approach. The functional form of the model is as follows: $Une = f(inf, op, rex)$

3.2.1 Description of ARDL Model

The Autoregressive Distributed Lag (ARDL) model, which was developed by Pesaran et al. (1997–2001), takes into account lagged values of both the dependent and the independent variable(s). It spreads the explanatory variables over time lags of different orders and inserts them into a dynamic model, which estimates both short-run and long-run relationships simultaneously.

Key Conditions for Application of the ARDL Model:

- The error correction term (ECM) must be negative and statistically significant.
- The sample size must contain over 30 observations.

- All the variables must be stationary at level $I(0)$ or first difference $I(1)$, or both. However, the dependent variable must be $I(1)$.

The model has the benefit of modeling short-run and long-run dynamics within a single equation framework.

3.2.2 Steps for Estimating the ARDL Model

The ARDL estimation process has the following steps:

- Testing stationarity of time series variables at level or first difference using unit root tests (ADF test, e.g.)
- Estimation of ARDL model with appropriate lag structure based on information criteria (AIC, SBC).
- Conducting the Bounds Test to determine the presence of a long-run cointegration relationship among variables.
- Estimation of the long-run relation, the effect of inflation, oil prices, and the real effective exchange rate on unemployment, along with the error correction term (ECT) for the speed of adjustment.
- Testing the stability of the estimated model through CUSUM and CUSUMSQ tests.
- Testing for residual autocorrelation (e.g., Breusch-Godfrey LM test, e.g.)
- Testing for heteroskedasticity (ARCH test, e.g.)
- Testing the normality of the residuals (Jarque-Bera test, e.g.).

3.3 Estimation and Discussion Results

3.3.1 Testing the Stationarity of the Time Series at Level $I(0)$ or First Difference $I(1)$

We then test the stationarity of the time series used in this paper using unit root tests. We specifically use the Phillips-Perron (PP) test, said to be more powerful than the Augmented Dickey-Fuller (ADF) test, whereas their results often turn out to be similar in most instances.

We test for stationarity for each of the variables using three different specifications: (Intercept, Trend and Intercept, None (no trend and intercept)). The unit root test results can be summarized in the table below:

Table (1) : Unit Root Test Results –PP-

Variable	Difference	Intercept	Trend &	None
UNE	$I(0)$	0.6354	0.5210	0.2847
	$I(1)$	0.043	0.0197	0.0009
INF	$I(0)$	0.3771	0.6812	0.1983
	$I(1)$	0.0000	0.0003	0.0000
OP	$I(0)$	0.4876	0.4378	0.6025
	$I(1)$	0.0005	0.0026	0.0000

REX	I(0)	0.0002	0.0000	0.0498
	I(1)	0.0000	0.0000	0.0000

The source : Based on Eviews9 Software

Based on the results presented in the above table, it is possible to infer that the UNE, INF, and OP variables are unit-rooted at level, thus leading us to accept the null hypothesis for the presence of a unit root but to reject the alternative hypothesis for stationarity. However, at the first difference, we reject the null and accept the alternative hypothesis, indicating that these series are integrated of order one I(1).

In case of the REX variable, the null hypothesis is rejected at level and the alternative stationarity hypothesis is accepted. That is, the REX series is stationary at level zero integrated of order zero I(0).

3.3.2 Estimation of The ARDL Model

The ARDL model was estimated based on the selected optimal lag structure. The results of the estimation are presented in the following table:

Table (2) : Summary of ARDL Model Estimation

Interpretation	Result Level	Component
Based on AIC, Two lags for UNE and REX, zero for INF and OP	ARDL (2,0,0,2)	Selected ARDL Model
The chosen Model minimized the AIC	Models 54 tested	MModel selection criterion
Of Unemployment 96.89% variation is explained by INF, OP and REX	0.9689	R-Squared
Statistically significant, exceeds critical values, confirming model validity	106.96	F- Statistic

The source : Based on Eviews9 Software

The ARDL(2,0,0,2) model identified after examining 54 other alternatives using Akaike Information Criterion (AIC). There are two lags for both unemployment (UNE) and the real effective exchange rate (REX), while inflation (INF) and oil prices (OP) have zero lags. The model has a high degree of explanation as evidenced by the 0.9689 R-squared figure, which indicates that the explanatory variables, in total, explain about 96.89% of the variations in unemployment. Furthermore, the F-statistic calculated at 106.96 exceeded relevant critical values, indicating that the overall regression model could be statistically judged to be significant and well-specified, appropriate to capture dynamics among the variables of interest.

3.3.3 Estimation of the Long-Run Relationship of the Effects of Inflation, Real Effective Exchange Rate, and Oil Prices on Unemployment, and the Error Correction Term (ECT)

Table (3) : Summary of Cointegration Test, Long-Run & Short-Run Estimates, and Error Correction Term (ECT)

Interpretation	Statistical	Result	Component
Indicates a long-run cointegration relationship exists among UNE, INF, OP and REX	Above all upper critical bounds (1-10%)	5.572836	Bounds-test (F-Statistic)
Confirms long-run stability, approx. 37.47% of disequilibrium corrected annually	Significant and negative	-0.3747	Error Correction Term (ECT)
Inflation negatively affects unemployment, but significantly	Not significant	-0.1305	Long -Run Coefficient (INF)
Rising oil prices reduce unemployment in the long run	significant	-0.0852	Long -Run Coefficient (OP)
Exchange rate depreciation increases unemployment in the long run	significant	0.3506	Long- Run Coefficient (REX)
No significant short-run impact of the variables on unemployment	Not significant	Negative (all)	Short- Run Effects (INF, OP, REX)

The source : Based on Eviews9 Software

The bounds test for cointegration resulted in an F-statistic of 5.572836, which has been well above the upper critical values at all conventional significance levels (1% to 10%), and consequently the null hypothesis of no long-run relationship is rejected, thereby confirming the existence of cointegration among unemployment (UNE), inflation (INF), oil prices (OP), and the real effective exchange rate (REX). The coefficient of the error correction term (ECT) is negative and statistically significant (−0.3747), suggesting that approximately 37.47% of the short-run disequilibrium is corrected within a year, reflecting moderate adjustment speed toward long-run equilibrium. In the long run, the oil price negatively and significantly affects unemployment, implying that more oil revenues mean greater public spending and job creation. The real effective exchange rate, in turn, has a positive effect on unemployment, meaning that the depreciation of the currency increases unemployment because of Algeria's narrow scholarship in exports and increased costs of imports. Inflation is negatively associated with unemployment, but not statistically significant. In the short

run, none of the independent variables have significant effects, which is consistent with the view that structural rigidities and delayed transmission mechanism characterize the Algerian economy.

- Short-Run Impacts:

Short-run estimation results indicate a negative but statistically insignificant relationship between unemployment and inflation. This is possibly due to various reasons, specifically:

- Dependence of Algeria on government subsidy for food and energy prices means that consumers and producers do not experience inflation's impact despite an increase in global prices. Thus, labor demand is more or less unaffected in the short run. Besides, Algerian inflation is often driven by external factors, such as increasing import prices, and not by demand at home.

The Algerian labor market is plagued by rigidities, particularly in the government sector, where it is sluggish and reluctant to hire and fire. Thus, even if inflation rises, unemployment does not react quickly, and the impact on employment choice is slow to come.

- The relationship between the price of oil and unemployment is also negative but insignificant over the short run. This means that fluctuations in the price of oil do not impact unemployment in the short run due to:
 - Rearward transmission of oil revenues to the real economy.
 - Weak economic diversification since the Algerian economy remains very much subject to oil revenues.
 - The petroleum industry is capital- and technology-intensive as opposed to labor-intensive, so higher oil prices do not automatically mean more jobs.
- On the real effective exchange rate (REX) side, the relationship to unemployment is also negative but insignificant. This implies that exchange rate movements do not instantaneously affect the labor market. The effects of a depreciation of the Algerian dinar, say, are lagged: falling purchasing power reduces aggregate demand, which in turn absorbs economic activity and possibly raises unemployment.

The ECT coefficient is statistically significant and negative, and it shows that there is a long-run equilibrium relationship among the variables. The size of the ECT coefficient (0.3747) suggests a moderate adjustment speed: approximately 37.47% adjustment in short-run disequilibrium each year to reach long-run equilibrium.

- Long-Run Results :

After confirming the presence of a long-run relationship using the bounds test between unemployment (dependent variable) and explanatory variables (inflation, oil prices, and the real effective exchange rate), we proceed to estimate the long-run relationship.

Estimated Equation :

$$UNE_t = -15.7532 - 0.1305 INF_t - 0.0852 OP_t + 0.3506 REX_t + E_t$$

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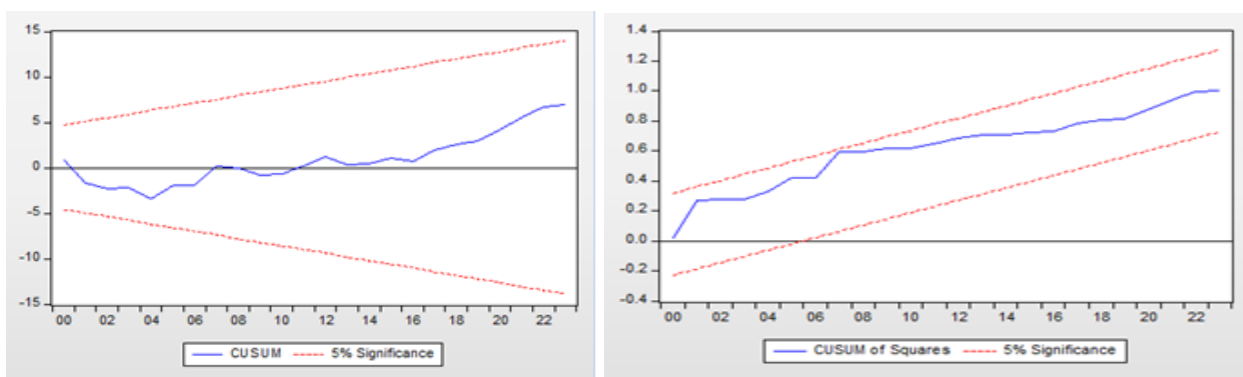
In the long run, the relationship between inflation and unemployment is said to be negative but statistically insignificant, and this suggests that there is no long-run relationship between the two variables. This finding can be accounted for by Algeria's widespread subsidy system on essential goods, energy, and public transport. These subsidies drive market prices out of equilibrium and reduce the real pass-through of inflation to the broader economy. In addition, Algeria's labor market suffers from labor rigidities, in particular due to bureaucratic hiring procedures in the public sector. Therefore, even during inflation, the labor market does not respond flexibly or quickly.

In the context of oil prices, the results show a strong and statistically significant negative relationship with unemployment in the long term. This means that an increase in oil prices leads to a decrease in unemployment. Higher oil prices raise foreign exchange revenues, reduce budget constraints, and allow the government to increase public spending on development projects and infrastructure. This in turn stimulates an employment creation, particularly within the government sector, and promotes support to small and medium enterprises (SMEs).

For the model of real effective exchange rate, the model finds a positive and statistically significant relationship with unemployment in the long run. That is, currency depreciation is linked with rising unemployment. This is partly due to the fact that Algeria has limited ability to fund the local economy in times of exchange rate volatility. Depreciation reduces the government's capacity to fund projects as well as create jobs, especially in the public sector. Moreover, Algeria lacks a competitive and diversified export base, hence the currency depreciation does not stimulate jobs or exports as it could in other countries. A depreciated dinar, on the other hand, increases the cost of imported goods, lowers purchasing power, reduces consumer demand, and eventually slows down economic activity, resulting in rising unemployment in the long term.

3.3.5 Model Stability Test

Figure (5): Model Stability Test



The source : Based on Eviews9 Software

From the graphs above, it is evident that the Cumulative Sum (CUSUM) of recursive residuals, indicated by the blue line, remains within the 5% critical limits throughout. This confirms the fit of the estimated model over the sample period.

Similarly, the Squares of CUSUM also stay within the limit of critical values, thereby providing further support to the claim that the model is structurally stable.

Therefore, we can infer that the estimated ARDL model is stable and internally reliable in both long-run and short-run relationships.

3.3.6 Diagnostic Tests Results for the Estimated ARDL Model

Table (4) :Diagnostic Tests Results for the Estimated ARDL Model

Interpretation	Decision (at 5%	Statistic p-	Diagnostic Test
Residuals are independently distributed, no autocorrelation	Fail to reject H0 (no serial correlation)	P=0.2858	Serial Correlation Test (Breusch-Godfrey)
Residuals have constant variance, no heteroskedasticity	Fail to reject H0 (homoscedasticity)	P=0.7939	Heteroskedasticity
Residual are normally distributed	Fail to reject H0 (normality)	P=0.7375	Normality Test (Jarque Bera)

The source : Based on Eviews9 Software

Diagnostic testing upon an ARDL model's residual confirms the robustness and validity of the estimation. The autocorrelation test produces a p-value of 0.2858, which exceeds the 5% significance value, signifying that residuals are free and can be distributed independently. The heteroskedasticity test produces a p-value of 0.7939, which verifies the presence of homoscedasticity, meaning that the variance of residuals is the same across observations. The Jarque-Bera normality test gives a p-value of 0.7375, which confirms that residuals are distributed normally. Thus, it is established that all these tests indicate that the residuals of the model satisfy the major classical linear regression assumptions, and this would generate greater confidence in the model's estimates and inferences.

4. Conclusion:

This study attempted to investigate the relationship between unemployment and inflation in Algeria in terms of the Phillips curve under the period (1990–2023) by integrating theoretical and empirical approaches through the application of econometric tools, namely the Autoregressive Distributed Lag (ARDL) model.

The theoretical framework examined concepts of inflation and unemployment, their determinants, and the shape of the Phillips curve in various economic environments. The study also canvassed dynamics of these phenomena in Algeria, which was structured into distinct identified periods of structural shifts in the macroeconomy, most notably within the context of fluctuations in oil prices and extensive state intervention.

Empirically, annual data covering 1990-2023 were used to fit the ARDL model with unemployment as the dependent variable and independent variables as inflation rate, oil prices, and real effective exchange rate. Following the stationarity tests, model selection, and cointegration test, the research came up with the following key findings:

The impact of Inflation on the Unemployment Rate in Algeria within the Framework of the Phillips Curve during the period (1990-2023): An Econometric Study using the ARDL Model

- The assumption of the Phillips curve is not valid for Algeria in the long run since there was no establishment of a long-run negative relationship between inflation and unemployment.
- There is a short-run negative relationship between inflation and unemployment, but the relationship is statistically irrelevant, reflecting minimal price change impact on the Algerian labor market due to enormous government subsidies and slow public sector adjustment.

The results show that:

- Relationship between unemployment and oil price is negatively very strong in the long run, but it emphasizes how important is the supporting role of oil rents in employment.
- The relationship between unemployment and real effective exchange rate is positively very strong in the long run, implying that currency depreciation is a hit to economic activity and raises unemployment.
- Relationships between unemployment and all independent variables in the short run were statistically insignificant.
- Model diagnostics (CUSUM, Jarque-Bera, Breusch-Pagan, Durbin-Watson tests) confirm that the model is stable, non-autocorrelated and non-heteroscedastic, and the residuals are normally distributed.

Based on the results above, the research recommends:

- Reviewing government subsidy policies and directing support to poor and vulnerable populations to reduce price distortions and enhance labor market efficiency.
- Reducing the reliance on oil and diversifying the economy by promoting productive industries and non-oil economic activities that provide sustainable jobs.
- Promoting the private sector and improving the investment climate by removing bureaucratic barriers and ensuring access to finance, as the private sector is a key driver of job creation.
- Enhancing the effectiveness of monetary and fiscal policies for curbing inflation and maintaining economic stability through elastic instruments that reflect exchange rate risks and international market developments.
- Refining the quality of official statistics, particularly on the shadow economy and informal unemployment, to provide a more realistic foundation for policy decision-making.
- Reforms in the labor market through making its recruitment ratio decline and firing more flexible, and organizing education and training in line with the labor market.

 Future Research Directions:

- Expanding the analysis to include other economic variables such as economic growth, public expenditure, and private foreign direct investment.

- Comparing the results with other similar countries in the Maghreb region or other rentier economies to achieve more universal conclusions.
- Employing advanced econometric models such as Vector Error Correction Models (VECM) or structural time series models for a better causal analysis.

5. Referrals and references:

1. Al-Rubaie Radjaa (2013), The role of fiscal and monetary policy in addressing stagflation, Amina Publishing and Distribution House, Jordan;
2. Boufassa Slimane (2018), Fundamentals of monetary and banking economics, University Publications Office, Algeria;
3. Khaled Wassif Al-wazni, Ahmed Hussein Al-Rifaai (2008), Principles of Macroeconomics, Wael Publishing House, 9th Edition, Amman;
4. Mahmoud Hussein Al-Wadi, Ahmed Aref Al-Assaf, Walid Ahmed Safi (2007), Macroeconomics, Al-massirah Publishing, Distribution and Printing House, 1st Edition, Amman;
5. Nadja, Ali Abdulwahab (2005), The problem of unemployment, University House, Egypt;
6. Gnouni Habib, Benadda Mohamed, Reghi Malika (2014), Unemployment and Inflation in Algeria –a study of the relationship between the two phenomena (1990-2023), Journal of Economic Management and Commercial Sciences, Vol 11;
7. Hani, Miloud Waail (2018), The relationship between Unemployment and Inflation: An econometric study of the Phillips-curve in Algeria for the period (2000-2015), Afak Journal of Research and Studies, Vol 2, N° 2;
8. Rahma Metioui (2023), Unemployment between the Phillips Curve and Okun's Law in Algeria During the period (1989-2020), Al-Bachaer Economic Journal, Vol 9, N°1;
9. Talal Zaghba, Abdulmutalib Bissar, Mohad Areiwa (2020), The relationship between inflation and unemployment in Algeria: A Phillips Curve Analysis, Afak Scientific Journal, Vol 12, N°5.
10. Samuel Ugochukwu Daniel , Victoria Chidinma Israel , Chibuzor Benjamin Chidubem , Joel Quansah(2021) , Relationship Between Inflation and Unemployment : Testing Philips curve Hypotheses and Investigating the Causes of inflation and Unemployment in Nigerai , Path of Sience , Vol 7 ,N° 9.

6. Appendices:

Appendix 01: Data on Unemployment, Inflation, and the Real Effective Exchange Rate during the period (1990-2023):

Time	une	Inf	Rex
1990	21,26	16,6525344	220,960851
1991	20,6	25,8863869	131,787525
1992	24,38	31,6696619	135,152002
1993	26,23	20,5403261	162,120577
1994	27,74	29,0476561	139,984287
1995	31,84	29,7796265	117,348038
1996	28,308	18,6790759	119,573658
1997	25,43	5,73352275	129,083375
1998	26,853	4,95016164	135,455997
1999	28,548	2,64551113	125,227347
2000	29,77	0,33916319	123,279188
2001	27,3	4,22598835	114,300899
2002	25,9	1,41830192	103,012065
2003	23,72	4,26895396	103,445822
2004	17,65	3,9618003	101,668766
2005	15,27	1,38244657	101,242535
2006	12,27	2,31149919	99,8671345
2007	13,79	3,67899575	102,230726
2008	11,33	4,85859063	100,261773
2009	10,16	5,73706036	100
2010	9,96	3,91106196	99,1232556
2011	9,96	4,52421151	103,91002
2012	10,97	8,89145091	101,798482
2013	9,82	3,25423911	102,924746
2014	10,207	2,91692692	96,5736752
2015	11,206	4,78444701	95,5860542
2016	10,202	6,3976948	97,8048648
2017	12	5,59111591	93,5171663
2018	12,137	4,2699902	95,449206
2019	12,259	1,95176821	91,2215043
2020	14,057	2,41513094	86,7999258
2021	13,63	7,22606307	92,3296144
2022	12,346	9,26551552	102,330481
2023	11,701	9,32217376	119,329629

Appendix 02: Estimation of the Autoregressive Distributed Lag (ARDL) Model:

Dependent Variable: UNE
Method: ARDL
Date: 04/22/25 Time: 15:57
Sample (adjusted): 1992 2023
Included observations: 32 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): INF OP REX
Fixed regressors: C
Number of models evaluated: 54
Selected Model: ARDL(2, 0, 0, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
UNE(-1)	0.842901	0.150159	5.613392	0.0000
UNE(-2)	-0.206366	0.141723	-1.456127	0.1583
INF	-0.047468	0.057818	-0.820982	0.4197
OP	-0.030998	0.015920	-1.947125	0.0633
REX	-0.006041	0.031405	-0.192359	0.8491
REX(-1)	0.096485	0.038559	2.502305	0.0196
REX(-2)	0.037003	0.019264	1.920854	0.0667
C	-5.725765	3.581117	-1.598877	0.1229
R-squared	0.968941	Mean dependent var		17.71700
Adjusted R-squared	0.959882	S.D. dependent var		7.726284
S.E. of regression	1.547535	Akaike info criterion		3.923521
Sum squared resid	57.47674	Schwarz criterion		4.289955
Log likelihood	-54.77634	Hannan-Quinn criter.		4.044984
F-statistic	106.9600	Durbin-Watson stat		2.372010
Prob(F-statistic)	0.000000			

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

Appendix 03: Bounds Test for the Existence of a Long-Run Cointegration Relationship:

ARDL Bounds Test		
Date: 04/23/25 Time: 10:29		
Sample: 1992 2023		
Included observations: 32		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	5.572836	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Appendix 04: Estimation of Long-Run and Short-Run Relationships and the Error Correction Term (ECT):

ARDL Cointegrating And Long Run Form				
Dependent Variable: UNE				
Selected Model: ARDL(2, 0, 0, 2)				
Date: 04/23/25 Time: 11:05				
Sample: 1990 2023				
Included observations: 32				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UNE(-1))	0.204042	0.120978	1.686601	0.1046
D(INF)	-0.036934	0.069212	-0.533635	0.5985
D(OP)	-0.022420	0.015620	-1.435343	0.1641
D(REX)	-0.003666	0.030941	-0.118489	0.9067
D(REX(-1))	-0.037215	0.014702	-2.531340	0.0183
CointEq(-1)	-0.374755	0.070948	-5.282095	0.0000
Cointeq = UNE - (-0.1306*INF -0.0853*OP + 0.3506*REX -15.7532)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	-0.130597	0.151666	-0.861083	0.3977
OP	-0.085286	0.035665	-2.391303	0.0250
REX	0.350646	0.086034	4.075686	0.0004
C	-15.753244	10.432951	-1.509951	0.1441

Appendix 05: Test for Serial Correlation of Residuals:

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.326453	Prob. F(2,22)	0.2858
Obs*R-squared	3.443529	Prob. Chi-Square(2)	0.1788

Appendix 06: Heteroskedasticity Test:

Heteroskedasticity Test: ARCH

F-statistic	0.232743	Prob. F(2,27)	0.7939
Obs*R-squared	0.508442	Prob. Chi-Square(2)	0.7755

Appendix 07: Normality Test of Residuals:

