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The Correlation Between Inflation and Unemployment in Algeria The period from 1991 To 2022

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Abstract:

This study examines the link between inflation and unemployment in Algeria over the period from 1991 to 2022, employing the Autoregressive Distributed Lag (ARDL) Model to uncover their relationship over both short and long-time horizons. The findings from the model estimation reveal a notable and positive impact of inflation on unemployment in both the short and long terms.

In addition, the study pointed out that rising imported inflation has multiple negative effects on the economy, as it contributes to higher prices of domestic goods and services. This increase in prices can lead to a decline in consumers' purchasing power, negatively affecting consumption and economic growth.

Keywords: Macroeconomics; Inflation; Unemployment; Phillips Curve; Algeria Economy

JEL Codes: B22;E24;E31

Introduction

Unemployment stands as one of the most urgent problems plaguing both developed and developing nations. Its social, economic, and political consequences can be devastating. The recent COVID-19 crisis, with its catastrophic impact, has thrown the global economy into recession, driving unemployment rates sky-high.

On the other hand, erratic inflation can significantly hamper economic growth. Consequently, most countries prioritize maintaining low inflation rates as a key objective of their monetary policy.

Ever since Bill Phillips' groundbreaking work in 1958, the complex dance between inflation and unemployment has held center stage for macroeconomists and policymakers. The initial focus revolved around pinning down a potential short- run negative relationship and its policy implications. Milton Friedman, in his 1968 speech to the American Economic Association,

presented the notion of the "natural" rate of unemployment. This concept sparked the idea of a perfectly vertical Phillips curve in the long term, suggesting that inflation and monetary policy may have no influence on unemployment. Naturally, the nature of this short-term relationship and its applicability as a policy tool (explored by Lucas (1972)) became the central focus. However, Friedman's Nobel lecture in 1977 introduced a twist. He challenged this paradigm by proposing a potential positive long-term association between inflation and unemployment, driven by the distorting effects of the "inflation tax." Intriguingly, he supported this hypothesis with evidence from US data, analyzing average values over consecutive five-year periods. While this long- term relationship has since received less attention, its significance arguably warrants equal consideration.

Although empirical studies have demonstrated a strong correlation between the inflation rate and unemployment, the oil shocks of the 1970s, along with the research by Phillips (1968), Friedman (1968), and Lucas (1973), have cast doubt on the validity of the Phillips curve.

Therefore, skepticism and criticism of the Phillips curve emerged in the early 1970s amidst the onset of stagflation—a condition marked by simultaneous unemployment and inflation. One of the most prominent critiques was the neglect of expectations in the Phillips curve model. Subsequently, Phillips curve analysis evolved through new studies that incorporated these criticisms, distinguishing between short-run and long-run concepts of the curve by incorporating expectations.

In Algeria, inflation has been a major concern in recent years. The inflation rate has been rising steadily, and it reached a high of 9.26 % in 2022. This has led to a decline in the purchasing power of Algerians, and it has also made it more difficult for businesses to operate.

Unemployment is also a major problem in Algeria. The unemployment rate has been hovering around 12% for several years, and it is even higher among young people. This has led to social unrest and political instability.

The relationship between inflation and unemployment can be intricate. In certain scenarios, inflation can indeed contribute to unemployment. For instance, high inflation rates may deter businesses from hiring new workers due to concerns about escalating labor costs.

However, unemployment can also contribute to inflation. For instance, when there is a significant number of unemployed individuals, they tend to have less money to spend, resulting in decreased demand for goods and services. This decline in demand can cause prices to drop, subsequently leading to lower inflation.

In the case of Algeria, it is difficult to say definitively whether inflation is causing unemployment or vice versa. However, it is clear that both factors are having a negative impact on the economy.

In economic studies, several questions arise regarding the relationship between inflation and unemployment: Is there a causal link between the two variables? If so, what is the direction of this relationship? Is it unidirectional, where changes in inflation cause changes in unemployment, or bidirectional, suggesting a reciprocal influence between inflation and unemployment over time? These questions are central to understanding the dynamics and policy implications of these economic indicators.

The aim of this article is to enhance the understanding of the relationship between inflation and unemployment in Algeria. By understanding this relationship, we can better understand the challenges facing the Algerian economy, and we can develop more effective policies to address these challenges.

Literature Review

Theoretical review

A.W. Phillips, who initially examined the connection between unemployment and the rate of change in money wages from 1861 to 1957, put forward the concept of a negative correlation between unemployment and inflation rates. His analysis, utilizing data from the United Kingdom, revealed an empirical observation: when unemployment is high, the rate of wage increases tends to be low. This phenomenon occurs because workers are less willing to accept lower wages when labor demand is low and unemployment is high, resulting in slower wage declines. Conversely, when unemployment is low, wages tend to rise faster due to higher labor demand and fewer unemployed workers. Phillips argued that during economic downturns when labor demand decreases and unemployment rises, employers are reluctant to increase wages and may even reduce them, leading to higher unemployment rates as workers resist wage cuts, potentially leading to layoffs (Odo et al., 2017).

Empirical review

Inflation can be defined as a continuous increase in the overall prices of goods and services within a country, usually observed over a prolonged period. This phenomenon is closely linked to the concept of money, as encapsulated by the saying: "Inflation is too much money chasing too few goods." Think of it this way: when there's more money floating around in the economy than there are new products and services being produced, the natural consequence is a rise in prices, just like when there are more buyers than available items in a marketplace.

However, it's crucial to differentiate inflation from a mere one-time spike in prices or an increase confined to a specific category of goods and services. Economists distinguish true inflation by its sustained and widespread nature, affecting the overall price level across the economy (Mohammed, et al,2015).

Al-Zeaud (2014) examined the possible trade-off between unemployment and inflation in the Jordanian economy from 1984 to 2011. The study utilized Granger- causality tests to investigate the causal relationships and their directions between these variables. Additionally, unit root tests and co-integration techniques were utilized to evaluate the stationary nature and co-integration of the variables. The findings revealed no causal relationship between unemployment and inflation in Jordan during the study period, indicating the absence of a trade-off between these variables. The study recommended that policymakers consider these insights when addressing unemployment. Specifically, it advocated for programs that create productive, labor-intensive projects and prioritize the employment of local labor over foreign labor. Additionally, the study emphasized the importance of managing inflation to achieve desired rates of both unemployment and inflation, thereby promoting economic growth.

Numerous investigations have explored the link between inflation and unemployment across diverse nations and historical contexts. For example, Kogid et al. employed a Toda-Yamamoto causality test on Malaysian data spanning from 1975 to 2007. Their results demonstrated a one-way causal relationship from inflation to unemployment and identified a sustained cointegration between these variables over the study period, suggesting a trade-off effect. In Greece, Dritsaki & Dritsaki analyzed annual data from 1980 to 2010, finding a long-term causal link between inflation

and unemployment. Conversely, Al-Zeaud's Granger causality test for Jordan from 1984 to 2011 showed no causal relationship between unemployment and inflation, indicating no trade-off effect. Furuoka & Munir's study on Malaysia from 1975 to 2004 using an error correction model demonstrated that unemployment impacts inflation in both the short and long terms. Additionally, Thayaparan's Granger causality test for Sri Lanka spanning from 1990 to 2012 revealed a bidirectional causal relationship between unemployment and inflation (Suna, Muzhgan, 2020).

Examination of US data from 1952Q1 to 2010Q1 uncovered a positive association between inflation and unemployment over medium to long-term periods. This relationship exhibits a delayed effect and its intensity varies with assumed economic cycle durations. The most pronounced correlation is noted in cycles spanning 8 to 50 years, where unemployment responds to inflation roughly 13 quarters (approximately 3.25 years) following its onset. Significant correlations are found when inflation precedes unemployment by 1 to 6 years at the 10% significance level, by 11.2 to 51.4 years at the 5% level, and by 21.4 to 41.2 years at the 1% level. Notably, all significant correlations exhibit a positive association (Alfred, Ian, 2011).

We also discovered that these findings are highly robust. Similar outcomes persist across shorter cycle lengths, various time spans, different filters, and diverse measures of inflation. Lastly, we determined that this long-term relationship remains stable and is unaffected by changes in fiscal and monetary policy regimes (Doyle et al., 2008).

The study on The Gambia explores the inflation-unemployment relationship using the New Keynesian Phillips Curve model. It finds a negative correlation, with the output gap as a measure of unemployment. The coefficient of the output gap is statistically significant at the 1% level, suggesting that changes in unemployment affect inflation in the opposite direction. This trade-off relationship between inflation and unemployment presents a challenge for policymakers, as reducing unemployment tends to increase inflation rates in the economy. Therefore, the study emphasizes the importance of well-defined and effective policy recommendations regarding the optimal policy mix for managing inflation and unemployment levels in an economy (Pa Alieu, 2018).

This study aimed to investigate the causal link between unemployment and inflation in Nigeria from 1980 to 2015. The research model included unemployment as dependent on inflation, money supply, and total government expenditure as a share of GDP. The study utilized causality tests, Vector Error Correction Model (VECM) tests, co-integration tests, and unit root tests. Results indicate that inflation has a significant impact on unemployment over both short and long terms in the Nigerian context. There is a notable causal relationship among these variables. Based on these results, the study recommends that the government implement discretionary policies aimed at reducing unemployment. This can be achieved through increased government expenditure and maintaining stability in the money supply, which are expected to positively affect unemployment in the long term (Ademola, Badiru, 2016). However, from an open economy perspective, the challenge of inflation remains pertinent even within the framework of Modern Monetary Theory (MMT), where the assumption includes the implementation of a Job Guarantee (JG) program supported by an active central bank (Şen et al., 2018). Empirical studies have produced varied findings on the correlation between inflation and unemployment across different time spans. Hussain and Saaed highlight significant variations in this relationship across diverse economies. Meanwhile, Ahiadorme's research indicates that inflation's effects on output and the unemployment rate generally conform to expectations from the Phillips curve and Okun's law in the short term. These insights underscore the critical impact of unemployment on development

planning and its broader implications for business environments and the quality of life for populations. However, in the long run, the New Keynesian Phillips curve and Okun's relationship show a positive correlation. Sasongko and Huruta's research indicates a one-way causality where unemployment affects inflation but not vice versa. These dynamics may be obscured by the substantial share of the informal economy, yet they still influence inflation and overall living standards (Emad, Yuriy, 2021).

The relationship between inflation and unemployment in Algeria (1991-2022)

Between 1991 and 2003, Algeria experienced a higher average unemployment rate compared to the subsequent decades. The unemployment rate peaked in 1995 at 31.84% before gradually declining to 9.6% in both 2010 and 2011, marking nearly the lowest levels during the study period. This lower unemployment rate persisted relatively stable until 2022. Concurrently, inflation also declined significantly at the beginning of the study period and remained relatively stable at below 10% from 1997 onwards, as depicted in Table 1 and Figure 1. The trend of the curve representing the average annual rates of unemployment and inflation (Consumer Price Index, CPI) shows a continual decline followed by relative stability until the end of the study period.

Table1. Data on unemployment and inflation of Algeria for the period of (1991-2022)

Years	Unemployment(%)	Consumer Price Inflation (%)
1991	20.6	25.8863869
1992	24.38	31.6696619
1993	26.23	20.5403261
1994	27.74	29.0476561
1995	31.84	29.7796265
1996	28.515	18.6790759
1997	25.43	5.73352275
1998	26.64	4.95016164
1999	28.304	2.64551113
2000	29.77	0.33916319
2001	27.3	4.22598835
2002	25.9	1.41830192
2003	23.72	4.26895396
2004	17.65	3.9618003
2005	15.27	1.38244657
2006	12.27	2.31149919
2007	13.79	3.67899575

2008	11.33	4.85859063
2009	10.16	5.73706036
2010	9.96	3.91106196
2011	9.96	4.52421151
2012	10.97	8.89145091
2013	9.82	3.25423911
2014	10.21	2.91692692
2015	11.21	4.78444701
2016	10.2	6.3976948
2017	10.334	5.59111591
2018	10.416	4.2699902
2019	10.495	1.95176821
2020	12.248	2.41513094
2021	11.747	7.22606307
2022	11.55	9.26551552

Data used from: https://data.worldbank.org

Let's attempt to construct the Phillips Curve using statistical data from The World Bank and assess whether this curve is applicable to Algeria's economic situation.

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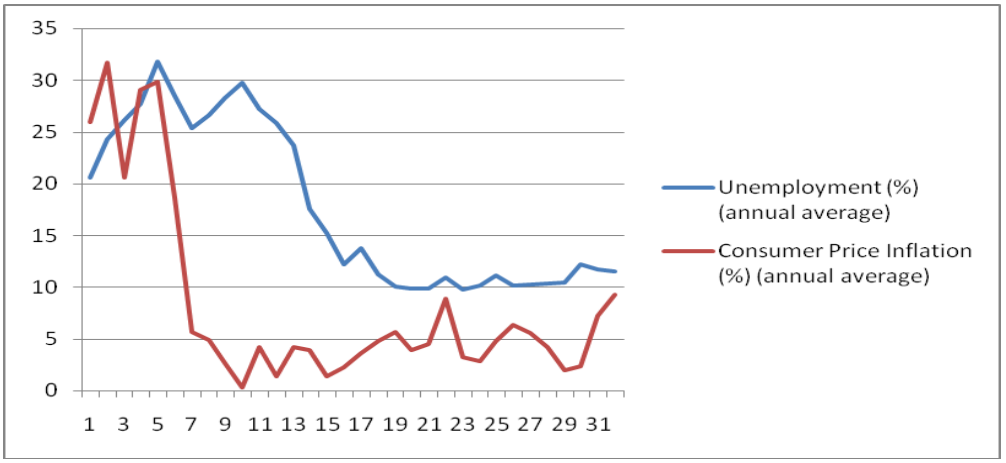
Figure1. Inflation and unemployment in Algeria (1991-2020)



Source: Author's computation with Excel Software

Results and Discussions Stationary

Tests

Table2. Stationary Statistics

Table 1: StationaryStatisticsVariable	ADF statistic	ADF first difference	ADF second difference	ADF thirddifference	Mackinon critical values at 5% significance level
Unemployment	-0.588560	-4.285433	Stationary	Stationary	-2.963972
Inflation rate	-2.193991	-5.841398	Stationary	Stationary	-2.963972

Table 2 provides stationary statistics for the variables examined in the study. The unemployment rate initially shows an ADF statistic of -0.5885 at the level, which is above the Mackinnon critical value of -2.9639 at a 5% significance level. This acceptance of the null hypothesis suggests that the unemployment rate is non- stationary at its level and requires further differencing. Conversely, for the inflation

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rate in Table 1, the ADF statistic at the level is -2.1939, surpassing the Mackinnon critical value of -2.9639, indicating non-stationarity and the need for first differencing. After first differencing, both variables exhibit ADF statistics of - 4.2854 for unemployment and -5.8413 for inflation, respectively, which are below the critical value of -1.96. This confirms that both unemployment and inflation rates achieve stationarity after the first difference, eliminating the need for additional differencing.

Lag selection

Figure2. Lags for Long Run and Short Run Model

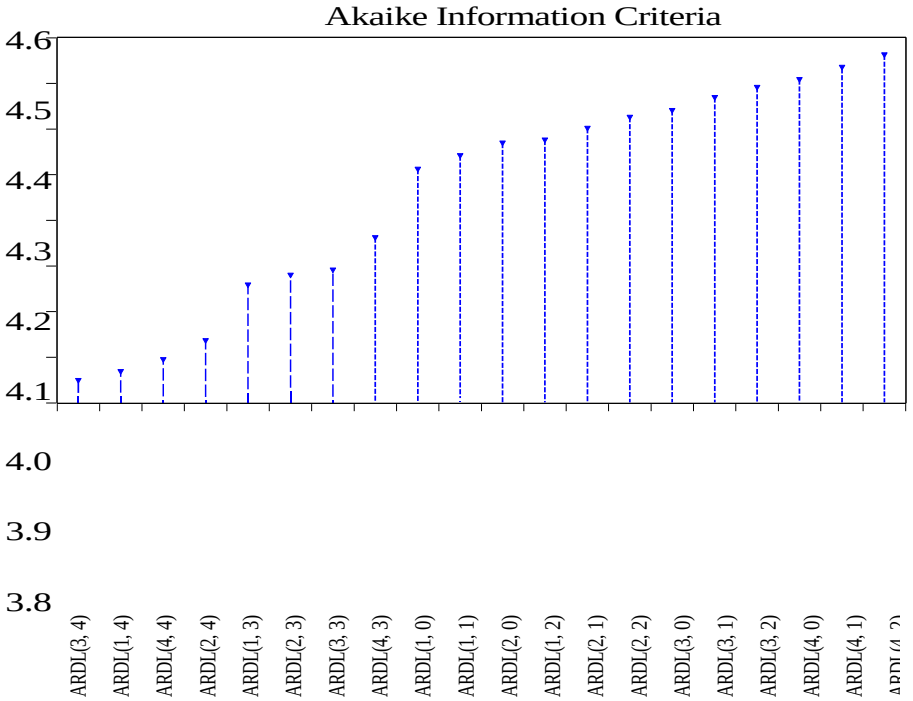

Figure 2 illustrates the process of selecting the appropriate lag for both the long- run and short-run models. The maximum number of lags considered ranges from lag 0 to lag 4. The study indicates that the ARDL (3,4) lag structure was chosen.

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Table 3: Test for Co-integration

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic : n=1000	
F-statistic	6.694353	10%	3.02	3.51
k	1	5%	3.62	4.16*
		2.5%	4.18	4.79
		1%	4.94	5.58
			FiniteSample: n=35	
ActualSample Size	28			
		10%	3.223	3.757
		5%	3.957	4.53
		1%	5.763	6.48
			FiniteSample: n=30	
		10%	3.303	3.797
		5%	4.09	4.663
		1%	6.027	6.76

Table 3 presents the outcomes from the co-integration analysis involving the explained and explanatory variables. The F-statistic, registering at 6.6943, exceeds the thresholds for both minimum I(0) and maximum I(1) values. This outcome leads to the rejection of the null hypothesis, affirming the existence of co-integration among the variables under investigation.

Table4. Long Run Regression Model

Variable	Coefficient	Std. Error	t-Statistic	t-Prob.
CPI	0.898496	0.350543	2.563155	0.0190
C	6.389291	3.104297	2.058209	0.0536
R^2	0.9758	F-statistic	6.694353	0.0000

UNEMP = 6.3893 +0.8985* CPI

In Table 4, the results from the long-term regression model are displayed. The intercept coefficient stands at 6.3893, accompanied by a standard error of 3.1042, a t-statistic of 2.0582, and a t-probability of 0.0536. The coefficient representing the relationship between inflation rate and unemployment rate is 0.8985, with a standard error of 0.3505, a t-value of 2.5631, and a t-probability of 0.0190. The model exhibits an R-squared value of 0.9758, indicating that 97.58% of the variation in unemployment is accounted for by the model. With an F-statistic of 6.6943 and a p-value of 0.000, the overall model's statistical significance is confirmed at the 0.05 significance level.

Table 5. Short Run Regression Model

ECM Regression Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UNEMP(-1))	-0.126449	0.163816	-0.771896	0.4497
D(UNEMP(-2))	0.278513	0.142174	1.958959	0.0650
D(CPI)	0.200121	0.076768	2.606825	0.0173
D(CPI(-1))	-0.150679	0.073141	-2.060112	0.0534
D(CPI(-2))	-0.317091	0.064571	-4.910704	0.0001
D(CPI(-3))	-0.218118	0.076834	-2.838834	0.0105
CointEq(-1)*	-0.189678	0.040259	-4.711376	0.0002
R-squared	0.652245	Mean dependent var		-0.578214
Adjusted R-squared	0.552886	S.D. dependent var		2.076373
S.E. of regression	1.388399	Akaike info criterion		3.706497
Sum squared resid	40.48068	Schwarz criterion		4.039548
Log likelihood	-44.89096	Hannan-Quinn criter.		3.808314
Durbin-Watson stat	2.192362			

Table 5 presents the results of the short-term regression model. The error correction term (CointEq(-1)*) is -0.189678, with a probability value of 0.0002, indicating its significance at the 0.05 level. This negative and significant error correction term validates the long-run equilibrium relationship, implying a mechanism for correcting deviations over time. Specifically, it suggests that 18.96% of short-term errors can be corrected within one year to restore long-term equilibrium.

Furthermore, the table highlights a positive relationship between inflation and the unemployment rate in the short term. A 1% increase in inflation corresponds to a 20.01% increase in the unemployment rate. This finding challenges the traditional Phillips Curve assumption, particularly in the context of Algeria where inflation is largely imported, reflecting prices set by exporting countries.

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Normality Test of Residuals

Figure 3. Normality Test

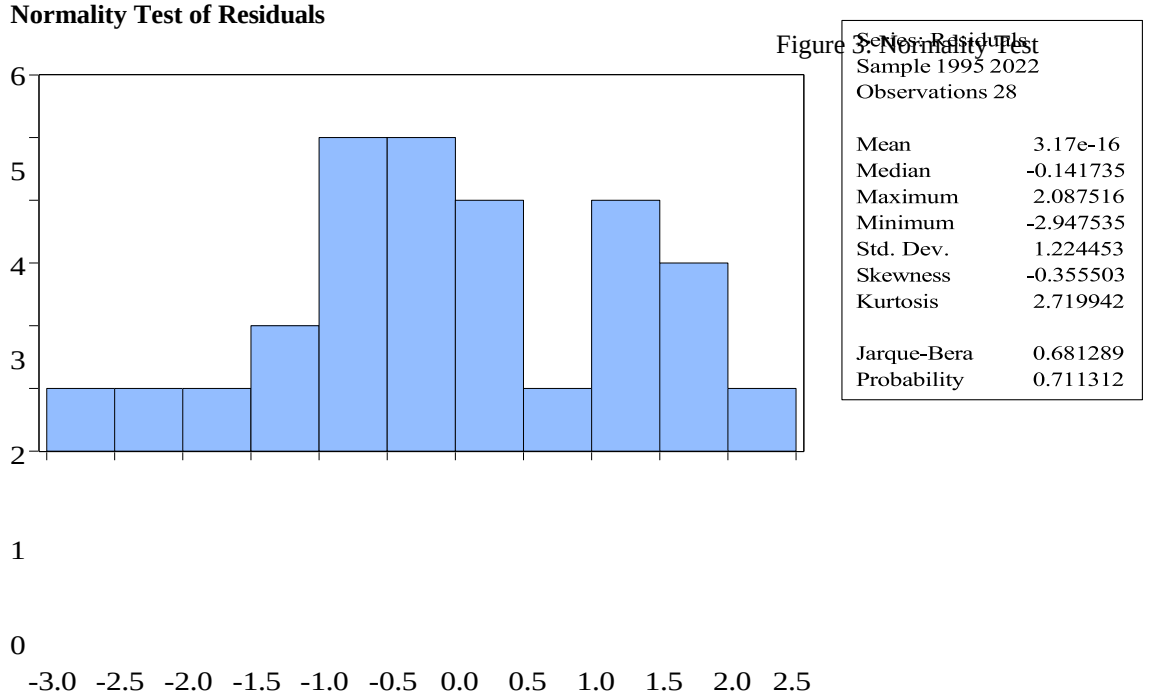

Figure 3 depicts the outcomes of the normality test. The chi-square value derived from the Jarque-Bera test is 0.6812, resulting in a probability of 0.7113. Since this probability value is greater than the significance level of 0.05, we do not reject the null hypothesis. Therefore, it indicates that the residuals conform to a normal distribution.

Lagrange Multiplier Test

Table 6: Lagrange Multiplier test

F-statistic	2.696735	Prob. F(2,17)	0.0961
Obs*R-squared	6.743803	Prob. Chi-Square(2)	0.0343

Table 6 shows that 2.6967 is greater than 0.05, indicating that the residuals of themodel do not suffer from the problem of autocorrelation of residuals.

CUSUMSQ and CUSUM Test results

In this section, we examined how stable the model parameters are by applying two statistical tests: the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ). The CUSUM test helps detect systematic changes in estimated coefficients over time, indicating whether there are significant shifts in how variables impact the model. On the other hand, the CUSUMSQ test identifies abrupt and unintended alterations in the stability of these coefficients, highlighting any unexpected changes that may affect the reliability of

the model predictions. Figures 2 and 3 present the results of these tests, revealing that the model parameters demonstrated stability, as indicated by the statistics remaining within the specified boundary lines for each test.

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Figure 4. Cumulative Sum of Recursive Residuals (CUSUM)

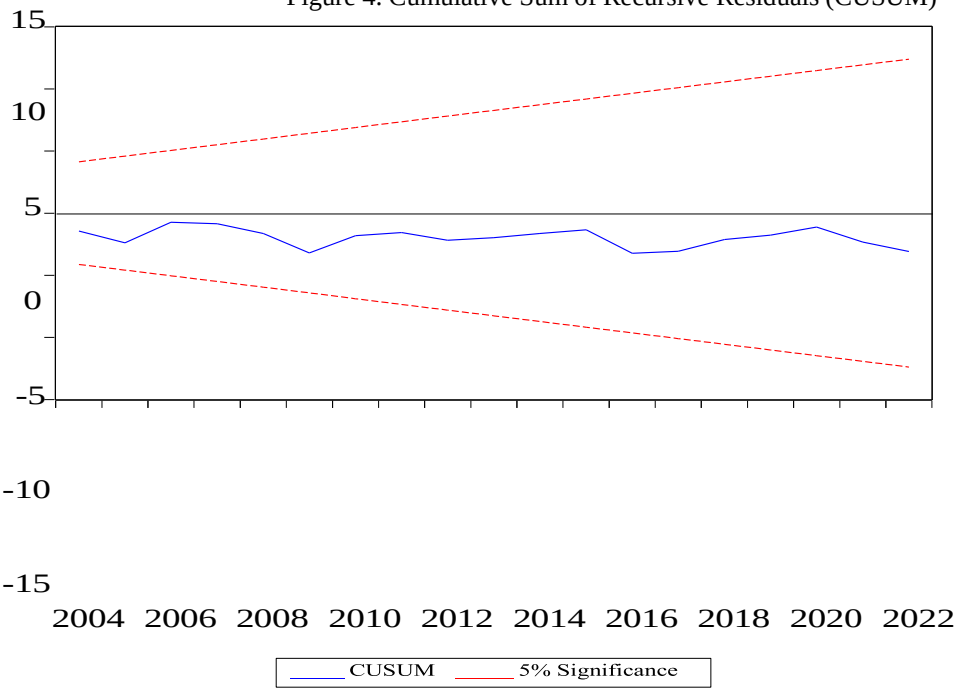
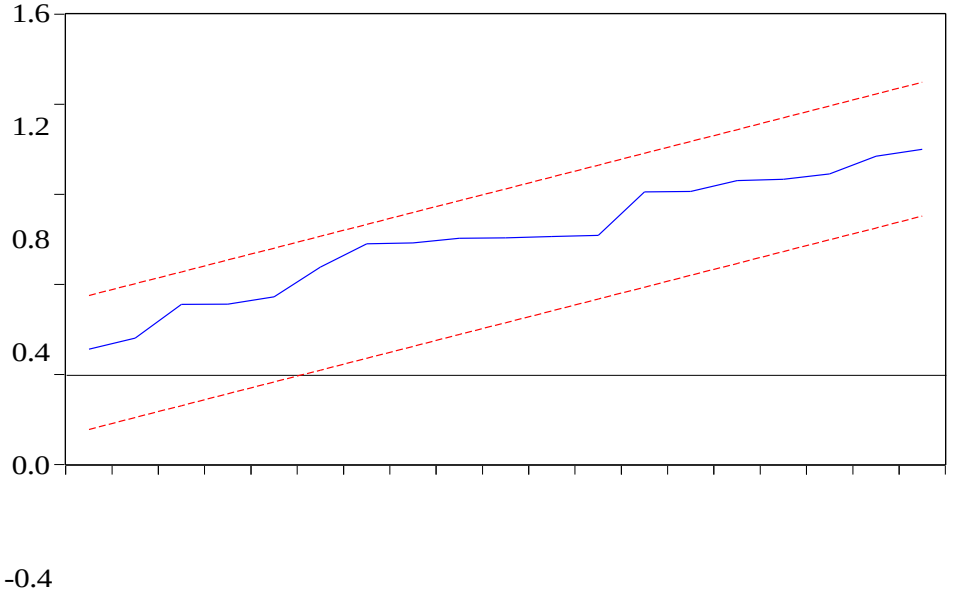
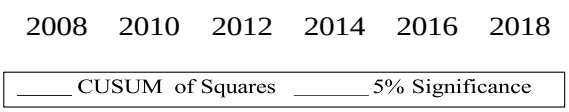


Figure 5. Cumulative Sum of Squares of Recursive Residuals and (CUSUMSQ)





Summary of the Findings

The study uncovered a significant positive correlation between the inflation rate and unemployment rate in Algeria, observable in both the short and long terms.

Conclusions

The study found that the inflation rate has a significant positive impact on the unemployment rate in Algeria, affecting both the short and long terms. A higher inflation rate corresponds to a notable increase in unemployment in the country. Consequently, the study concluded that the traditional Phillips curve concept does not apply to Algeria. These findings led to the rejection of the null hypothesis. The study further noted that the rise in imported inflation contributes to increased prices of goods and services. Additionally, higher imports can diminish gross domestic product, resulting in reduced employment and an elevated unemployment rate.

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