International Journal of
Biological Engineering and Agriculture

ISSN: 2833-5376
Volume 2 | No 12 | Dec -2023

# An Empirical Study On Phillips Curve, New Evidence From Iraq

**Zaman S. Al-Khazraji[1], Saad A. Al-Badawi[2]**

[1]Dep. of Soil Sci. and Water Resources, Coll. of Agri., Uni. of Sumer, Iraq
[2]Crop Protection Dep., Ministry of Agriculture, Iraq
Emails: drzamansalhm@gmail.com , saadizeddin@gmail.com

**Abstract:** The research aimed to analyze the relationship between unemployment and inflation, what are their effects on the Iraqi economy and the extent to which general economic policy contributes to reducing inflation and unemployment rates. The research used time series data from 2000 - 2022, as well as conducting Unit root analysis to detect the general trend phenomenon in the data and the regression relationship according to the Dynamic Ordinary Least Square - DOLS method to estimate Phillips relationship, in addition to cointegration analysis according to the Engel-Granger methodology. The research concluded that the aforementioned relationship is absent in the Iraqi economy, as the result the unemployment coefficient is insignificant and the t* value is -0.7. While the results of the cointegration analysis proved that the relationship was exist according to the Engle-Granger and Phillips-Ouliaris tests, at the level of 10% and 5%, respectively, the research recommended reassessment of the government's economic policy and giving the private sector an opportunity to take its role in employment and growth with respect of prices level, as well as understanding the reciprocal relationship gives the opportunity to maneuver and make comprehensive political decisions.

**Keywords:** Inflation, Unemployment, DOLS, Engle-Granger cointegration.

## Introduction

The relationship between unemployment and inflation is an important topic in economics and economic policy, and the theories and models used to understand this relationship have evolved over time. In classical economic theory, the relationship between unemployment and inflation is directly inverse. According to this theory, when the unemployment rate decreases, the demand for labor increases and wages increase, which ultimately leads to increased costs for companies and increased prices. In neoclassical theory, it is believed that there can be inflation or sustained inflation when there is pressure on resources and their full use, including the labor force. Thus, unemployment is a key factor in determining economic indicators and inflation rates. With the development of economic theories, new ideas have emerged about the relationship between unemployment and inflation. For example, the idea of the Inverse Phillips Curve was introduced, suggesting that there can be a positive relationship between unemployment and inflation in some cases, when there is weak economic growth and structural changes in the labor market, as occurred in the early seventies in what is known as stagflation. Some economists believe that monetary and fiscal policies can affect the relationship between unemployment and inflation. For example, tight monetary policies and interest rate climbs can lead to an increase in unemployment and reduce inflation, while monetary policies that encourage growth and lower interest rates can do the opposite. In particular, the relationship between

unemployment and inflation may be affected by structural and institutional factors in the economy. For example, changes in industry structure, productive technology, level of education and skills, labour market policies, and developments in the entry and exit of firms may all affect the relationship between unemployment and inflation. However, there are exceptional cases that can affect the relationship between unemployment and inflation. In deep recessions and high unemployment, there is low pressure on wages and prices, leading to lower inflation. On the other hand, in cases of strong economic growth and low unemployment, an increase in wages and prices can occur and thus increase inflation.

The phenomena of inflation and unemployment are one of the most important problems facing various economies of developed and developing countries, including the Iraqi economy. As it has witnessed successive waves of inflation and unemployment as a result of economic, political, social and even security conditions for the past four centuries, the research tries to determine how these two phenomena were associated in the Iraqi economy during the period 2000-2022, as it suffered and still from a structural imbalance and a clear distortion in its production base since the beginning of the millennium, and since the Iraqi economy is characterized by two basic features, which are dependence on oil and linking the exchange rate to the US dollar, the announced economic policies work to diversify sources of income through strengthening the role of the private sector, supporting non-oil sectors, and providing job opportunities, but this has not been achieved in any way. As for inflation, the prudential monetary policy over the years has ensured the ability of the banking sector to resist financial and economic shocks, so there is a correlation between inflation through high prices of goods and services, and unemployment in various sectors, whether explicit or convincing. The problem of the research is to try to explain the changes in inflation rates in Iraq based on the changes in the unemployment index within the framework of what is known as the Phillips Curve, in order to analyze the relationship and identify its economic effects on the economy and the extent to which the general economic policy contributes to reducing inflation and unemployment rates.

In this context, there are several researches on the subject, for example, here are some of them:

(Eita and Johannes 2010) investigated 'Determinants of unemployment in Namibia in the period 1971-2007'. The researchers estimated a model linking unemployment with macroeconomic variables using the two-step Angel-Granger cointegration method. The results showed that there is a negative relationship between unemployment and inflation in Namibia, and unemployment responds positively if actual output is less than potential output as well as when wages rise.

(Ahmed 2010) studied 'Unemployment in Iraq: Causes, Results and Treatments', aiming to identify the reasons behind the aggravation of the phenomenon of unemployment in Iraq, the economic and social consequences that resulted from the spread of this phenomenon, and the mechanism that can be used to address it with its accumulations, employing for this purpose the descriptive analysis approach, by analyzing data and information. He attributed unemployment to the decline in the role of the state and its withdrawal from the field of production.

(Islam 2011) presented an investigation into the existence and stability of Phillips curve for North Cyprus using time series data 1978 - 2007. ADF unit root test was used to check the stationarity, and ARDL and DOLS cointegration methodology to reveal the long-run relationship and understand the short-run dynamics. Estimates indicated the presence of a Phillips curve in the short and long term.

(Muto and Shintani 2014) studied the New Keynesian Wage Phillips Curve: Japan and the US, they found that the empirical fit of the NKWPC is generally superior for Japan. We also find that the slope of the NKWPC is much steeper in Japan than in the US. These results suggest that wages are less sticky in Japan than in the US. Inflation indexation plays a key role in the US, but is less important in Japan.

(Furuoka 2007) studied the existing of Phillips curve in Malaysia, the finding of the paper is the existence of a long-run and trade-off relationship and also causal relationship between the unemployment rate and the inflation rate in Malaysia.

(Orji et al 2015) also visited the nexus between inflation and unemployment in 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 unemployment rate, 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. This finding invalidates the original proposition on the Phillips curve hypothesis in Nigeria.

MATERIALS AND METHODS

The research will address the concepts of inflation and unemployment and the economic relationship that links them in a simplified manner as follows:

1. Inflation

Inflation is the annual percentage change in the cost to a consumer of obtaining a basket of goods and services that can be fixed or changed over specific periods of time, for example each year. It represents economic imbalances in markets for goods, services and factors of production (Al-Badawi, 2022). In general, inflation is caused by imbalances between cash flows and flows of goods and services in the market, as the increase in cash flows is at a higher pace than the increase in commodity and service flows, which leads to the emergence of inflation in the economy concerned, and even turns it into a phenomenon that the economy suffers from by the persistence of high money supply compared to the supply of goods in the market (Samuelson and Nordhaus 2006).

Types of inflation

The main two types of inflation are (Pettinger, 2021)

- Demand-pull inflation – this occurs when the economy grows quickly and starts to 'overheat' – Aggregate demand (AD) will be increasing faster than aggregate supply (LRAS).

- Cost-push inflation – this occurs when there is a rise in the price of raw materials, higher taxes, e.t.c

The types of inflation differ in terms of the categories that can be viewed from them, there are those which address above it in terms of source, and in terms of severity or in terms of state intervention in prices, we review below inflation in terms of the opposite because what Iraq was exposed to falls under this concept, which is as follows:

1. Creeping inflation: This type of inflation is characterized by a slow rise in prices even during periods of moderate aggregate demand.

2. Suppressed inflation: Describes a situation in which, at existing wages and prices, the aggregate demand for current output and labour services exceeds the corresponding aggregate supply. Suppressed inflation is the opposite of suppressed deflation, in which aggregate supplies of output and labour exceed aggregated demands. Both suppressed inflation and suppressed inflation and suppressed deflation involve non-wage and non-price rationing. In suppressed inflation, purchases of goods and labour services are rationed. In suppressed deflation, sales are rationed (Barro and Grossman 1974).

3. Running inflation: Which is a condition in an economy where the prices of goods and services increase by 10 per cent to 20 percent every year. It requires monetary and fiscal measures; else, it can lead to the condition of Hyperinflation (Pettinger, 2021).

4. Hyperinflation: In which prices rise at very high rates Money circulation, and money stops acting as an importer of values. If this situation continues, it leads to the collapse of the monetary system and the collapse of the value of the monetary unit, as happened in Germany (1921 and 1923)

and as happened in Hungary in (1945) after World War II or what happened in Iraq in the early nineties (Al-Hayali, 2006). Coupled with wars, revolutions and conflicts.

As a definition, In the sense of Cagan (1956). In his seminal work, based on the European episodes that occurred between 1920-1946, Phillip Cagan defined hyperinflations as those that begin in the month in which monthly inflation exceeds 50 percent and that end in the month before the month in which monthly inflation is less than 50 percent for at least one year (Saboin-García 2018).

2. Unemployment

According to the International Labour Organization (ILO) and the Organization for Economic Co-operation and Development (OECD), unemployment "includes all persons over the specified age who, during the reference period, were not working, looking for work, and are available to work within the prevailing wage" (ILO, 1982) (OECD, 2004). Unemployment is the state in which a person is unable to get a job despite being willing to work and actively looking for work (McConnell et al 2010). Accordingly, economists found it difficult to reach a specific concept of unemployment, some of them believe that it is related to describing the situation of the unemployed who are able to do it and are looking for it, but they do not find it, and others believe that it represents the phenomenon of labor market imbalance, which is a group of individuals who do not They work and have the desire to work at the prevailing wage in the market (Ferjani, 1998):

Types of unemployment

There are three types of unemployment: frictional, structural, and cyclical, and can be illustrated as follows (Dodge, 2017):

a. Frictional Unemployment

It arises because of the constant movement of people, moving between regions and from one job to another or during different stages of the life of the economic cycle, even if employment in an economy is complete, transformations are bound to occur, when students who have finished their studies go out to look for work, or when women return to the workforce after the birth of children, and because frictionally unemployed workers often move from one job to another, or are looking for better work, their unemployment is often optional (Samuelson and Nordhaus 2006). Because frictional unemployment is usually a short-term phenomenon, it is the least damaging to the economy.

b. Structural Unemployment

This type of unemployment is the result of fundamental changes in the economy that can lead to job losses of skills that are no longer needed. The job skills of the worker must be changed to suit the new workplace. In some cases of structural recruitment, jobs are lost because the product is no longer in demand, it may be replaced by a better product.

c. Cyclical Unemployment

It occurs when aggregate demand for labor is low, when aggregate spending and output fall, unemployment rises practically everywhere, as jobs are gained and lost as the business cycle improves and worsens, the unemployment rate rises when the economy contracts, and the unemployment rate decreases as the economy expands.

Measuring of unemployment

1. Unemployment Rate

The unemployment rate aims to measure labour market inactivity, which is the inability of the labor market to employ all available workers (i.e., those who are able and willing). The calculation of the total number of unemployed provides an inaccurate indicator of the extent of the spread and expansion of this phenomenon, and therefore the unemployment rate is often used as a real indicator to evaluate and analyze this phenomenon, as it measures the ratio of the unemployed to the total labor

force, which is a relative indicator confined between zero and one hundred and allows comparison over time and space. It is expressed mathematically in the following form:

The UR unemployment rate, LF represents the total number of people of working age, working or looking for work, U the number of unemployed, E the number of employed.

There are several differences between countries in terms of methods of measuring the unemployment rate, and they are due to several factors, including changes in the limits of the working age and in the determination of forces, and this indicator acquires special importance because it is the integral part of the labor force, and is also one of the most important measures of labor market performance. Whatever the quality of the tool used to measure unemployment, the credibility of the data is primarily due to the definitions used for unemployment, and despite the problems that may arise in measuring and interpreting the unemployment rate, this indicator remains one of the best indicators to measure the performance of the labor market.

Phillips Curve

In 1958, the famous New Zealand economist Alban William Phillips published the results of a statistical study on the relationship between unemployment rates and rates of change in monetary wages in the United Kingdom between 1861 and 1957, and this relationship became known in the economic literature as the "Phillips curve". To fill the theoretical void suffered by the Keynesian model, especially what he added about the relationship between the level of employment and the level of inflation, which Samuelson promised. Nordhaus is the main macroeconomic tool used to understand inflation. This curve shows the relationship between the unemployment rate and inflation, the rapid growth of real output naturally means faster growth in the number of jobs, and then low unemployment, and on the contrary, the slowdown in real output growth means slower growth in the number of jobs, and then high unemployment rates, so we conclude that if business fluctuations arise from the demand side, unemployment and inflation are expected to move in opposite directions, that is, unemployment decreases when inflation rises high, and rises when inflation falls.

The basic idea is that when production is high and unemployment is low, wages and prices tend to rise more quickly. This happens because workers and unions can push harder to increase wages when jobs are plentiful, and companies can more easily raise prices when sales are fast. The opposite is also true, high unemployment tends to slow inflation (Samuelson and Nordhaus 2006). The unemployment rate appeared on the horizontal axis in Figure 1 on the left vertical axis is the annual rate of price inflation.

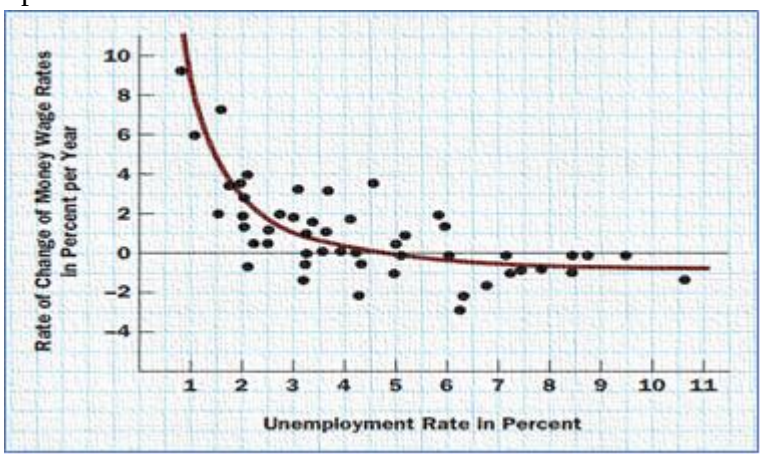


**Figure 1. Traditional Phillips curve.**
**Source: Phillips 1958.**

He formulated his famous relationship in the following mathematical formula (Phillips, 1958, 290):

$$y + a = bx^c \qquad or \qquad log(y + a) = logb + c\ log\ x$$

Whereas: y wage level change rate, x unemployment rate, constants b and c estimators of the regression relationship by the usual least squares method, and the fixed limit a was added by trial and error

Paul A. Samuelson and R. M. Solow published their work at the American Economic Association's seventy-second symposium in December 1959 published in Economica in 1960 and concluded that there is not only a relationship between unemployment and the rate of change in monetary wages, but also an inverse relationship between the rate of inflation and the unemployment rate (Samuelson and Solow, 1960). This relationship soon became widely known under the term Phillips Curve. It is, of course, "The Samuelson-Solow Phillips Curve" (Hall and Hart 2010).

**Inflation in Iraq for 2000-2022**

With the beginning of the third millennium, the Iraqi economy witnessed a major transformation after the military operations in March 2003 and the subsequent change of the political system, which led to a change in the economic system and the trend towards a market economy, the lifting of economic sanctions and openness to the outside world, as well as the impact of increasing total spending, which was a reflection of the expansion of the phenomenon of government current spending, due to the increase in salaries and wages, which led to an increase in aggregate demand pressures and a rise in the general level of prices and then an increase in inflation rates that increased from 12.17% during the period from (2002 - 2005) on average after the events of 2003 and the change of the political and economic system, inflation rates witnessed a gradual relative rise to reach its peak by about 53.2% in 2006, due to the high inflation in most commodity groups, and this is due to several factors, the most important of which is imported inflation as a result of trade openness, high food prices globally, as well as inflation due to the impact of increased demand for rents, increasing the money supply, and increasing government consumption, and relatively slow inflation growth rates are known as creeping inflation. Inflation decreased in the following year 2007 to about -10.07% as a result of the decrease in the index from 89.77% to 80.73% and the inflation rate in the consumer price index continued to decline starting from 2007 to reach low levels that were the lowest in 2017 as it reached 0.18 and about -0.2 in 2019, so that the inflation rate decreased to -15% in 2020 as a result of the decrease in the consumer price index to 101% from 119%, to rise again for the following two years. Unemployment reached its highest level in 2003 by approximately 27.3% to decline gradually over time to reach 18.1% in 2019, and we also note the most important disruption to this series of decline in 2015, as unemployment rates increased from 18.80% in 2014 to 19.36% in 2015 with an annual change rate of approximately 3%. As shown in Table 1 and Figure 2.

**Table 1. CPI, inflation rates and Unemployment in Iraq for the period 2000-2022 (2015=100)**

| Years | Consumer price index (CPI) (%) | Inflation rate (%)* | Unemployment rate (%) |
|---|---|---|---|
| 2000 | 18.16 | 4.98 | 8.75 |
| 2001 | 21.13 | 16.37 | 8.84 |
| 2002 | 25.21 | 19.32 | 8.89 |
| 2003 | 33.69 | 33.62 | 8.85 |
| 2004 | 42.77 | 26.96 | 8.61 |
| 2005 | 58.58 | 36.96 | 8.72 |
| 2006 | 89.77 | 53.23 | 8.65 |
| 2007 | 80.73 | -10.07 | 8.65 |
| 2008 | 90.95 | 12.66 | 8.48 |

| | | | |
|---|---|---|---|
| 2009 | 97.20 | 6.87 | 8.40 |
| 2010 | 100.00 | 2.88 | 8.25 |
| 2011 | 105.80 | 5.80 | 8.13 |
| 2012 | 112.24 | 6.09 | 7.96 |
| 2013 | 114.35 | 1.88 | 9.26 |
| 2014 | 116.91 | 2.24 | 10.59 |
| 2015 | 118.54 | 1.39 | 10.73 |
| 2016 | 119.20 | 0.56 | 10.82 |
| 2017 | 119.42 | 0.18 | 13.02 |
| 2018 | 119.86 | 0.37 | 14.07 |
| 2019 | 119.62 | -0.20 | 15.11 |
| 2020 | 101.50 | -15.15 | 16.23 |
| 2021 | 107.63 | 6.04 | 16.17 |
| 2022 | 113.00 | 4.99 | 15.55 |

*Source: CPI Index FAOSTAT data, unemployment rate from ILO website.*

**Inflation rate is calculated according to the following common formula:* $\boldsymbol{\pi_t = \frac{CPI_{t+1} - CPI_t}{CPI_t} * 100}$, *where π the inflation rate, t time.*

**Unemployment in Iraq**

Unemployment is one of the most complex problems facing the Iraqi economy because of its inability to find and generate suitable job opportunities for those entering the labor market annually, whether university graduates or others, which led to high unemployment rates continuously, one of the most important reasons leading to unemployment is a quantitative and qualitative imbalance between the available labor force and job opportunities in the labor market. The events of 2003 led to the emergence of unemployment largely for reasons related to the repercussions of the occupation and the accompanying dissolution of the Iraqi army, the demobilization of large numbers of volunteers in the army, police, internal security forces and military manufacturing facilities, and the dispensation of the services of their employees, in addition to the suspension of most of the industrial projects owned by the state, totaling 192 projects (Mahdi, 2021). They were all targeted, and they were out of the production process. Also, work in small factories and traditional industries was suspended due to power outages and poor security conditions, all of which led to the interruption of more than one and a half million workers and employees (Nasser et al 2008).

As for the pure economic aspect, the deterioration of production processes and the high inflation index in the Iraqi economy in its acute form had a direct impact on confusing investment operations, which led to the spread of the phenomenon of unemployment of all kinds and in varying proportions of the active population. So, we find the diversity of forms of unemployment in Iraq, but most of them were of the type (structural unemployment) It is more severe than other types and extends for a long period of time, and this type is mainly due to the lack of work for people who are able to work and willing to work, due to structural changes in the economy, and the imbalance between supply and demand, and also because of the failure of operational policies and irregular labor markets and weak absorptive capacity in economic activity and these reasons combined formed the reality of structural unemployment in Iraq, the data have shown that the unemployment rate in Iraq for the average period (2000-2009) amounted to about 8.85% While the average period (2010-2022) was rising to about 11.99% approximately, as in Table 2, and that these rates have been gradually rising since 2013 as a result of the difficult security conditions that the country went through as of 2014, as well as the oil price crisis and others.

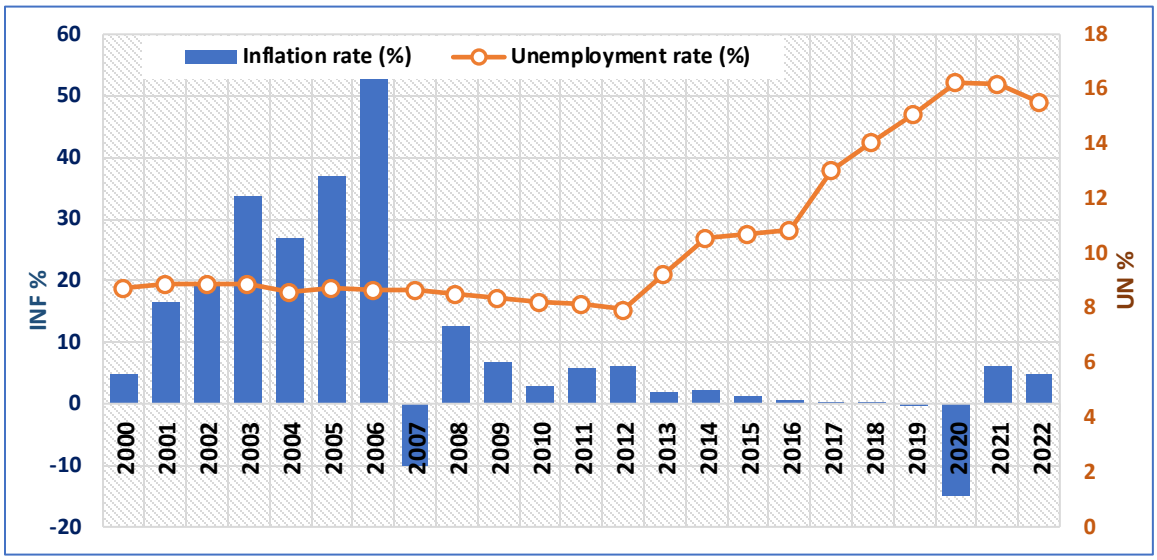


**Figure 2. Unemployment and inflation rates in Iraq for the period 2000-2022. Source: Prepared by the researcher based on Table 1.**

## RESULTS AND DISCUSSION

### Unit root test results for time series stationary (PP)

An estimate of this equation in the case of a non-stationary time series data would consequently lead to the problem of spurious regression, which means that the use of this data is not permitted (Nelson and Plosser, 1982).

The presence of unit root is due to the fact that the time series data often has a trend factor that reflects certain conditions that affect all variables and make them change in the same direction, although there is no real relationship between them, and this often happens in the waves of depression or recession that sweep societies (Attia, 2004).

The null hypothesis specifically means that the unit roots are in the string values, and the null hypothesis is accepted when the value of (*t*) calculated from the ADF test or PP test is less than the corresponding critical value that appears with the test results, in which case the string is non-static and not suitable for use in estimation.

As for the alternative hypothesis, it means specifically that the data is devoid of the roots of the unit, and in the case of rejecting the null hypothesis and accepting the alternative hypothesis, this means that the series is static in the plane and can be used in the estimate directly, and the PP test was used for its more consistent color in short time series .

A first detailed analysis of the time series shows that inflation as well as unemployment are non-stationary processes in both cases, which leads with high probability to the problem of spurious regression. After the form of the first difference of both these variables comprise at least stationary at the 5% significance level when using the PP test as showed in Table 2. Thus, both time series are integrated in the first order *I(1)*, giving us the possibility of a short-term analysis. For detection of the optimal lag length, the AIC and the SC were used. Moreover, a further analysis using the Engle-Granger and Phillips-Ouliaris methods also reveals that both variables cointegrated at the 10% level of significance and thus have a long run relationship. This is already a first indication of an absence of the natural rate of unemployment. Although both variables are cointegrated, this relationship can subsequently change over time (Islam et al 2011).

**Table 2. Unit root test results (PP)**

| Null Hypothesis: the variable has a unit root | | | | |
|---|---|---|---|---|
| | **At Level** | | **At First Difference** | |
| | ***INF*** | ***TU*** | ***d(INF)*** | ***d(TU)*** |

| | | | | | | |
|---|---|---|---|---|---|---|
| With Constant | t-Statistic | -2.4800 | -0.2976 | t-Statistic | -9.5213 | -3.7407 |
| | **Prob.** | **0.1335** | **0.9105** | **Prob.** | **0.0000** | **0.0111** |
| | | No | No | | *** | ** |
| With Constant & Trend | t-Statistic | -4.2989 | -1.6026 | t-Statistic | -9.0626 | -3.7252 |
| | **Prob.** | **0.0134** | **0.7587** | **Prob.** | **0.0000** | **0.0430** |
| | | ** | No | | *** | ** |
| Without Constant & Trend | t-Statistic | -2.0406 | 1.0937 | t-Statistic | -8.8916 | -3.6575 |
| | **Prob.** | **0.0420** | **0.9231** | **Prob.** | **0.0000** | **0.0009** |
| | | ** | No | | *** | *** |

*Source: Output of Eviews 10.*

**Estimating the model**

Since the time series used is less than 35 years, it is not possible to estimate using the ARDL method, which assumes the minimum of 35 observations in the length of the time series. The researchers used the Dynamic Ordinary Least Squared – DOLS methodology was conducted to estimate the model. The DOLS procedure requires partial knowledge of the series expected to cointegrate and the orders of integration. With DOLS the problems associated with simultaneity, endogeneity and serial correlation are resolved by including leads and lags in small sample. The DOLS procedure is helpful if the series has different orders of lags (Stock-Watson 1993). The research applied the DOLS using the following model:

$$INF = \beta_0 + \beta_1 UN + \sum_{i=\mp p}^{k} \beta_2 \Delta INF_{t-i} + \sum_{i=\mp p}^{k} \beta_3 \Delta UN_{t-j} + \varepsilon_t$$

Where: $\beta_0$ refers to a constant and $\beta_1$ to the long run parameter. The number of lags is denoted by *p; k* refers to lag length of the lead's terms. The $\varepsilon_t$ refers to the error term. The selection of lags and leads is based on SC and AIC, as in table 3.

**Table 3. VAR Lag Order Selection Criteria**

Endogenous variables: UN INF
Exogenous variables: C
Sample: 2000 2022
Included observations: 20

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -131.7614 | NA | 2209.561 | 13.37614 | 13.47571 | 13.39557 |
| 1 | -101.2010 | 51.95256* | 155.8527* | 10.72010* | 11.01882* | 10.77842* |
| 2 | -99.01270 | 3.282505 | 190.0272 | 10.90127 | 11.39914 | 10.99846 |
| 3 | -98.11771 | 1.163487 | 269.8299 | 11.21177 | 11.90878 | 11.34784 |

*Source: Output of Eviews 10.*

The model was estimated using the DOLS method as shown in Table 4, and the absence of a causal relationship is shown from the unemployment rate as an independent variable and the inflation rate as a dependent variable, as the results show that the unemployment estimate (UN) was not significant, this negates the short-term relationship between them.

**Table 4. Estimated model**

Dependent Variable: INF
Method: Dynamic Least Squares (DOLS)
Sample (adjusted): 2002 2021
Included observations: 20 after adjustments
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=1, lag=1)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| UN | -1.770817 | 2.520419 | -0.702588 | 0.4931 |
| C | 31.34602 | 23.56998 | 1.329913 | 0.2034 |
| R-squared | 0.272757 | Mean dependent var | | 9.581572 |
| Adjusted R-squared | 0.078826 | S.D. dependent var | | 16.63635 |
| S.E. of regression | 15.96720 | Sum squared resid | | 3824.274 |
| Long-run variance | 361.2977 | | | |

*Source: Output of Eviews 10.*

After the results shown in Table 4 that endorse the absence of a short-term relationship between the two variables, the researchers have no choice but to analyze the existence of the long-term relationship in this area. Instead of performing a unit root analysis for the residuals of the model and then comparing the results with critical values for regression-residual based co-integration tests to confirm the existing of co-integration, we used two tests:

### 1. Cointegration Test - Engle-Granger

It is a direct result of cointegration, and the null hypothesis states the absence of co-integration between the two variables. The results shown in Table 5 showed that there is a co-integration between the two variables in the long term based on the tau-statistic as well as z-statistic, which reached approximately -3.39 and -15.5 respectively, which both are significant at the level of 10%.

**Table 5. Cointegration Test - Engle-Granger**

| Specification: INF UN C<br>Cointegrating equation deterministics: C<br>Null hypothesis: Series are not cointegrated<br>Automatic lag specification (lag=0 based on Schwarz Info Criterion, max lag = 4) | | |
|---|---|---|
| | Value | Prob.* |
| Engle-Granger tau-statistic | -3.389168 | 0.0774 |
| Engle-Granger z-statistic | -15.49891 | 0.0582 |

*Source: Output of Eviews 10.*

### 2. Cointegration Test - Phillips-Ouliaris

The Phillips-Ouliaris tests consists four distinct tests. Two are similar to the Engle-Granger test, only using a Phillips & Perron-like approach replaces the lags in the ADF test with a long-run variance estimator. The other two use variance-ratio like approaches to test. In both cases the test stabilizes when there is no cointegration and diverges due to singularity of the covariance matrix of the I(1) time series when there is cointegration. The Z test should therefore have superior power properties in small samples and should be the test used to test for cointegration (Haug 1992). The results shown in Table 6 showed that there is a co-integration between the two variables in based on the tau-statistic as well as z-statistic, which reached (-3.49 and -15.97) approximately respectively, which are significant at the level of 10% and 5% respectively.

**Table 6. Cointegration Test - Phillips-Ouliaris**

| Specification: INF UN C<br>Cointegrating equation deterministics: C<br>Null hypothesis: Series are not cointegrated<br>Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)<br>No df. adjustment for variances | | |
|---|---|---|
| | Value | Prob.* |
| Phillips-Ouliaris tau-statistic | -3.492807 | 0.0642 |
| Phillips-Ouliaris z-statistic | -15.96850 | 0.0498 |

*Source: Output of Eviews 10.*

The absence of a relationship between the unemployment rate and the inflation rate in the Iraqi economy in the short term indicates that there are other factors at play that influence unemployment and inflation rates independently. There could be several possible explanations for this absence, such as:

1. Government interventions: The Iraqi government may intervene in the economy by implementing policies that independently control unemployment and inflation rates. The government adopted large-scale government employment programs and increased public spending on infrastructure projects, which can affect unemployment rates without having a significant impact on inflation.
2. Oil resource effects: The Iraqi economy relies heavily on oil exports. Fluctuations in oil prices can have a significant impact on the Iraqi economy in the short term, and this can contribute to the absence of a direct relationship between unemployment and inflation during this period. On the contrary, in the long term, the impact of inflation and unemployment rates on each other may become evident. For instance, if inflation rates continue to rise sustainably, it can lead to increased production costs and wage inflation, which can contribute to higher unemployment rates. Similarly, if the unemployment rate increases, it can put pressure on wages and spending, reducing demand and leading to inflationary slowdown.
3. Iraq's political and security turmoil could affect the relationship between unemployment and inflation. There may be a negative impact on economic growth and a gap in the labor market as a result of instability, and this can lead to the absence of a direct relationship between unemployment and inflation.
4. If local prices are affected by global price inflation, external factors may have a greater impact on the inflation rate in the Iraqi economy than local factors. Thus, imported inflation may have a greater impact on prices and inflation in general, while the unemployment rate remains constant.

If an increase in government spending on infrastructure turns out to lead to an increase in inflation without significantly affecting the unemployment rate, there may be a need for reassessment and adjustment of government policies. Analysis of this relationship can help predict the stages of growth and recession in the economic cycle, and understand the interaction between the inflation rate and the unemployment rate in the Iraqi economy. Iraq's inflation rate can be affected by factors such as changes in the prices of goods and services, monetary inflation, and monetary and fiscal policies. Unemployment rates in Iraq in turn affect economic and social factors, reflecting the level of employment and job opportunities available. Using the Phillips relationship, economic analysts and policymakers in Iraq can assess the effects of changes in the unemployment rate on the level of inflation, and vice versa. This analysis can be used to guide monetary and fiscal policies, and to make relevant economic decisions. However, we must note that the relationship between the inflation rate and the unemployment rate in Iraq may be influenced by local factors and the country's special circumstances, such as the security situation, political challenges, changes in oil prices and international trade. Therefore, the relationship between inflation and unemployment in Iraq should be used with caution, taking into account country-specific factors and a comprehensive analysis of local conditions.

**References**

1. Ahmed, M. A. (2010). Unemployment in Iraq: Causes, results and treatments, Journal of Administration and Economics - University of Karbala, 1 (3): 1-15.

2. Al-Badawi, S. A. (2022). An analytical economic study of the reality of agricultural employment in Iraq and the policies affecting it for the period 1980 – 2019. Ph.D. Dissertation. Baghdad Uni./ Coll. of Agri. Engi. Sci.- Dep. of Agri. Econ., p: 139.
3. Al-Hayali, A. D. (2006). Measuring and analyzing some of the factors affecting inflation in Iraq for the period 1992-2002. Iraqi Journal of Agricultural Sciences, 37 (4): 123-130.
4. Al-Ferjani, N. (1998). Unemployment in The Arab World Is Renewed, Organizing and Modeling the Labor Markets and The Dynamics of The Workforce in The Arab Countries, Part Two, Arab Planning Institute, Kuwait. pp:466.
5. Attia, A. M. (2004). The Modern in Econometrics. House of University. Alexandria Egypt, pp:643.
6. Awaidha, M. A., Moroccan, M. J., Shata, M. A. and Tarabia, A. I. (2017). Inflation in the Egyptian agricultural sector (its indicators and the measurement of the inflationary gap). J. Agric. Econom. And social sci, Mansoura univ., 8(9):575-582
7. Desai, M. (1975). The Phillips Curve: A Revisionist Interpretation. Economica, 42(165), 1–19. https://doi.org/10.2307/2552982.
8. Dodge, E. R. 2017. AP Macroeconomics. McGraw-Hill Education, pp:137.
9. Eita, J. H. and Ashipala, J. M. (2010). Determinants of Unemployment in Namibia, International Journal of Business and Management, Vol. 5, No. 10, October.
10. Hall, Thomas E. and Hartm William R. (2010). The Samuelson-Solow "Phillips Curve" and the Great Inflation. Miami University Former School of Business, Department of Economics/ Working Paper.
11. Haug, A. A. (1992). Critical Values for the Žα-Phillips-Ouliaris Test for Cointegration*. Oxford Bulletin of Economics and Statistics, 54(3): 473–480. doi:10.1111/j.1468-0084.1992.tb00014.x
12. ILO. (1982). The Thirteenth International Conference of Labour Statisticians, Conference Report, Geneva. pp:4.
13. Islam, F. and M. Shahbaz and M. Shabbir (2011), Phillips curve in a small open economy: A time series exploration of North Cyprus, Munich Personal Research Papers of Economists, 28397, pp:1-39.
14. Kunst, R. M. (2011). Vector autoregressions - Based on the book 'New Introduction to Multiple Time Series Analysis' by Helmut Lutkepohl. University of Vienna and Institute for Advanced Studies Vienna. Download: https://homepage.univie.ac.at/robert.kunst-/varpres2.pdf.
15. Mahdi, A. A. (2021). The problem of unemployment in Iraq after 2003: its reality, causes, effects, and public policy options. Al-Bayan Center for Studies and Planning, Baghdad, pp:4.
16. McConnell, C. R., Stanley, L B., Sean, M. F. and Randy, R G. (2010). Macroeconomics: Brief Edition, First Edition. McGraw-Hill/Irwin – New York.
17. Nasser, M. N., Abdel-Aziz, A. Z. and Atwi, A. N. (2008). The reality of employment and unemployment in Iraq for the period from 1977-2004. Technical Magazine 21(6):108-130.
18. Nelson, C. R., & Plosser, C. R. (1982). Trends and random walks in macroeconomic time series: Some evidence and implications. Journal of monetary economics, 10(2), 139-162.
19. Nub, P. (2013). An empirical analysis of the Phillips Curve: A time series exploration

of Germany. Linnaeus University-School of Business and Economics, diva-portal.org. p:1-39.

20. Oweida, Mohamed Abdel Salam, al-Maghribi, Muhammad Jabr, Shata, Muhammad Ali Muhammad and Tarabiya, Asma Ismail Aboul Fotouh. (2017). Inflation in the Egyptian agricultural sector (its indicators and measuring the inflationary gap). J. Agric. Econom. and Social Sci., Mansoura Univ., Vol. 8(9): 575 - 582
21. Phillips, A. W. (1958). The Relation between Unemployment and the Rate of Change of Money Wages in the United Kingdom, 1861–1957. Economica, New Series.
22. Samuelson, P. A., and Solow, R. M. (1960). Analytical Aspects of Anti-Inflation Policy. The American Economic Review, 50(2), 177–194. http://www.jstor.org/stable/1815021.
23. Samuelson, P. and Nordhaus, W. (2006). Economy, translation of the fifteenth edition, Al-Ahlia House for Publishing and Distribution, Jordan/ Amman, pp: 597, 620.
24. Stock, J. H. and Watson, M. (1993). A simple estimator of cointegrating vectors in higher order integrated system. Econometrica, 61:783-820.
25. OECD-Organization for Economic Co-operation and Development. (2004). OECD Glossary of Statistical Terms. Paris. pp: 735.
26. Pettinger, T. (2021). Different types of inflation. Article on "Economics Help" website. Accessed at: Sep 25, 2023. https://www.economicshelp.org/blog/2656/inflation/different-types-of-inflation/.
27. Barro, R. J., & Grossman, H. I. (1974). Suppressed Inflation and the Supply Multiplier. The Review of Economic Studies, 41(1), 87–104. https://doi.org/10.2307/2296401
28. Saboin-García, J. L. (2018). The Modern Hyperinflation Cycle: Some New Empirical Regularities. International Monetary Fund - IMF Working Papers, WP/18/266.