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Analysis of the impact of inflation rates on the Iraqi economy's unemployment rate for the period (2005-2022) using the model of different time frequencies (MIDAS)

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Abstract
Inflation rates with a monthly frequency on the unemployment rate with a quarterly frequency in the economy of Iraq for the period (2005-2022) using regression models with different time frequencies MIDAS in order should use the whole information of the variable with a high frequency in order to get more accurate results while researching the influence and forecasting, The study came to several results, the most significant of which was that it reached to prove the hypothesis on which the research was based, which indicated that there is a positive response in the unemployment rates with quarterly frequency resulting from the monthly inflation rates as well as the presence of an inverse over the long run equilibrium link between, economic inflation and unemployment in Iraq over the years (2005–2022). Therefore, the research recommends the need to accelerate the completion of the course of economic reforms (white paper), giving priority to the industrial sector through the privatization of Public production enterprises and improving the investment climate for the industrial sector.

Keywords: Inflation rates, unemployment, model of different time frequencies (MIDAS)

Introduction
In many nations, the two biggest issues are unemployment and inflation. These factors affect a number of economic activities, including poverty, economic growth, exporting, investing, and saving. For instance, the degree of social well-being might decline as a result of high inflation rates. Conversely, low inflation would cause economic growth rates to decline, poverty rates to rise, job possibilities to decline, and eventually stagnation to set in. He pointed out that GDP is positively impacted by inflation. While a number of socioeconomic factors, including slow economic growth and a high crime rate, can illustrate the effects of unemployment rates (WULANDARI *et al*, 2019) [10]. Perhaps no other variable has received as much attention in the economic literature as inflation and unemployment; unfortunately, it is not an exaggeration to emphasize that the world economy does not pose such a threat as these two variables. Especially for weak economies, hyperinflation and the growth of unemployment can lead to a severe loss of well-being. In turn, the unpleasant economic base on which this variable is based usually challenges the process of creating jobs despite excessive demand. A dramatic drop in productivity drives up commodity prices, while discouraging private investment exacerbates the economic Curse of high unemployment (Niken *et al*, 2023) [9].
However, the possible negative effects Ignorance about low inflation is not acceptable. Specifically, customers may postpone purchases due to the fear of deflation, which has a detrimental impact on employment and economic growth. (Olusola *et al*, 2022) [8]. Furthermore, central banks may find it more difficult to maintain economic equilibrium during times of low inflation, which lessens the efficacy of economic policy tools.
A persistent rise in the cost of goods and services is a sign that inflation is occurring. The decline in society's purchasing power is undoubtedly impacted by this situation. In essence, the state also benefits greatly from inflation at a particular level. But in practice, it has an impact on the economy when improperly managed. To cope with the problems, government policies in the country are aimed at achieving low unemployment, price stability and higher

economic growth. In this case, the government can implement both fiscal and monetary policy. However, since there is a trade-off between inflation and unemployment in theory, it is difficult to guarantee that both goals will be achieved together. As a result, authorities ought to start by addressing unemployment or inflation. In other words, price stability is impacted when the government seeks to increase employment. On the other hand, when authorities promote price stability, they should not think about wider job creation (WULANDARI *et al*, 2019) [10].

The main focus of the study challenge is the effects of inflation rates on the Iraqi economy's unemployment rate during the time (2005-2022) using the model of different time frequencies (MIDAS). Specifically, we dealt with the following question: (how big is the impact that inflation rates have generated on the Iraqi economy's unemployment rate for the period 2005-2022), and to answer this question, we will rely on the following hypothesis: there is a positive response in the unemployment rates with quarterly frequency resulting from monthly inflation rates in the Iraqi economy.

Previous studies

There are very few previous studies that have applied the MIDAS model to investigate how inflation affects unemployment, and in accordance with to the researchers, we believe that this study is the first of its kind to use this model. As for the studies that tried to find out the impact of inflation on unemployment using different models, their results were different. A study (Vermeulen, 2015) [6] found that hyperinflation hinders job creation in South Africa. As for the study (Papanikolaou, 2020) [7], it was found that in the case of low unemployment and high unemployment, an increase in inflation by 1% will lead to an increase in unemployment by 0.202% in addition to a decrease in unemployment by 0.165%, respectively. The results of a study (Kristiyanto, 2021) [1] also showed that inflation affects the unemployment rate in East Java, as an increase in inflation by 1% leads to an increase in the unemployment rate by 1,544.96. As for the study (Omran and Bilan, 2021) [5], its results showed that inflation negatively affects the unemployment rate. The results of the study (Buthelezi, 2023) [2].

Did not differ from the previous results, only this study showed that an increase in inflation by 1% leads to an increase in unemployment by 2.61%.

On the other hand, studies have found that there is an adverse effect of inflation on unemployment, and these studies include a study (Thayaparan and Muhandiram, 2018) [3], which concluded that higher inflation rates lead to lower unemployment rates, and These findings align with a study's findings. (Mukherjee, 2019) [4], which concluded that an increase in the inflation rate by one percent leads to a decrease in the unemployment rate by 0.08 percent.

Description of MIDAS models: this model was proposed by (Ghysels *et al*., 2004) [11] Midas models are a mathematical tool that allows analyzing the regression between data published at different frequencies (Li *et al*., 2015) [12], by interpreting a variable measured at a frequency (quarterly – annual) (low frequency) as a function of the current and previous values of a variable measured at a higher frequency (monthly - daily) (high frequency) a dependent variable (3 months or annual) with an independent variable at a rate (monthly or daily) and a regression model (Midas) were formulated. Before (35: & Ghysels, Pedro Rossen, 2004) [11]

$$y_t = \beta X_T + \mathbf{f}\left(\lambda_1, \lambda_2 X^H_{t/_s}\right) + \varepsilon_t$$

Since the:

YT: is the dependent variable that is measured at a low frequency during the period.

Xt: is an independent variable that is measured at a high frequency and its effect on the dependent variable is studied during the period. *

f: function that shows the effect of high frequency data at low frequency.

$\frac{X_t^H}{S}$ The set of weighting functions showing the effect of high-frequency data during the period, on low-frequency data during the period t.

H. The number of variables.

ß. The parameter of the total effect of the high-frequency variable in the low-frequency variable. The parameters of the partial effect of each frequency Interval S in the period t.

Random error limit.

Estimation of MIDAS models

The previous estimate requires a large number of coefficients in the model, as studying the effect of a variable measured at monthly frequencies in a variable measured at annual frequencies requires adding parameters, showing the effect of each monthly change in the annual period, where the Midas estimate provides many weighting functions that reduce the number of parameters in the model by setting restrictions on the effects of high-frequency variables in different delay periods, in accordance with the limitations imposed on the data and its development, functions include.

It is used in the case when the data follows a linear trend and restrictions are imposed on the parameters by specifying the number of staging weights (ARMESTO, M. KRISTIE, 2010)

$$\boldsymbol{Y_t = \beta X_t + \left(\sum_{l=0}^{k-1} X^H\ (t-l)/s\right) \varphi_L + \varepsilon_t}$$

2. Almon weighting function: this weighting function is used if the data to be studied are related while taking the direction of a polynomial function (quadratic - cubic). Restrictions on the parameters are imposed by specifying the degree of the polynomial. According to this function, each degree of delay in high-frequency data reaches (K), the regression coefficients are modeled as (P) polynomial delay dimensions in the parameters of the (MIDAS) model, and therefore the constraints of the regression model are written.

$$Y_t = \beta X_t + \left(\sum_{l=0}^{k-1} X^H\ (t-l)/s\right) + \varepsilon_t$$

Where (P) the rank of the Almon polynomial model, and the chosen number of delays (K), it is important here to pay attention that the number of coefficients to be estimated

depends on the degree of the polynomial and not the number of delays for high-frequency data.

First, the economic variables used in the research. In order to evaluate the study theories and accomplish its goals, the independent variable inflation (INF) was determined with a monthly frequency in the Iraqi economy and unemployment (UN) with a quarterly frequency, using the model of different time frequencies (MIDAS) and the Mon weighting function (PDL/ALMON) according to the usual program's outputs (12, Eviews) for the duration (MIDAS)and the PDL / ALMON 2005 - 2022).

Table 1: The variables and data utilised in the estimated standard model are displayed

Profile	Variable	Icon	name Variables	Profile	Variable	Icon	name Variables
Adherent	**Y**	**UN**	**Unemployment**	**Independent**	**X1**	**INF**	**rate Inflation**
17.9				37.088			
17.5				53.106			
11.7				30.89			
15.3				12.7			
14.00				8.34			
12.00				2.457			
11.00				5.596			
11.9				6.056			
12.1				1.856			
10.6				2.242			
13.1				1.439			
10.8				0.068			
13.8				0.203			
13.5				0.404			
13.6				0.201			
18.00				1.009			
18.4				2.8			
17.2				2.6			

Source: from the work of the researcher

$$Y_t = \beta X_t + f\left(\lambda_1, \lambda_2 \frac{X_t^H}{S}\right) + \varepsilon_t$$

Yt The dependent variable that is measured at low frequency during the period expressed in this paper as unemployment.

XT: The independent variable expressed in this research as inflation that is measured at high frequency and its effect on the dependent variable at low frequency during the period t is studied.

f A function that shows the effect of high frequency data on low frequency.

$:X_{t/s}^{H}$ The set of weighting functions showing the influence of high frequency data during the period, on low frequency data during the t-period.

H. The number of variables.

ß. Parameter of the total effect of the high frequency variable in the low frequency variable.

$:\lambda 1, \lambda 2$ Partial effect parameters for each frequency interval S in the period t.

Random error limit.

Second, what is the impact of monthly inflation on the Iraqi economy's quarterly unemployment rate for the period (2005-2022) using different time frequency models (MIDAS)

We propose to estimate the impact of inflation (INF) with a monthly frequency on unemployment (UN) at a quarterly frequency, using the different time frequency model (MIDAS) and the mortar weighting function (PDL/ALMON) based on the outputs of the standard program (12, Eviews) and the data were taken in logarithm to reduce the severity of the series variation difference, where the results were as in Table (2):

Table 2: Midas model estimation results

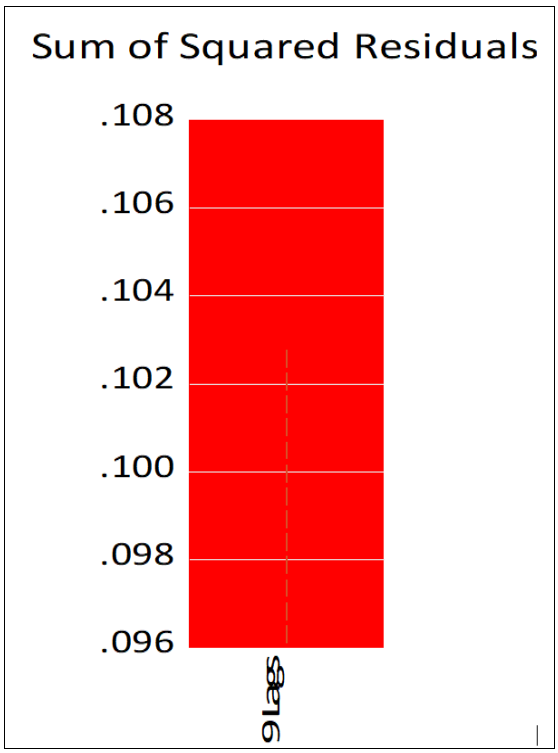
Dependent Variable: LOGUN				
Method: MIDAS				
Date: 01/29/24 Time: 16:39				
Sample (adjusted): 2005Q1 2022Q4				
Included observations: 64 after adjustments				
Method: PDL/Almon (polynomial degree: 3)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.050620	0.089245	0.567199	0.5727
LOGUN(-1)	0.982739	0.034438	28.53667	0.0000
Page: INFMO Series: INF(-5) Lags: 9				
PDL01	0.006600	0.007636	0.864383	0.3909
PDL02	-0.004257	0.004020	-1.058814	0.2940
PDL03	0.000460	0.000396	1.161571	0.2501
R-squared	0.933920	Mean dependent var		2.595277

Adjusted R-squared	0.929440	S.D. dependent var	0.157129
S.E. of regression	0.041738	Akaike info criterion	-3.439888
Sum squared resid	0.102783	Schwarz criterion	-3.271226
Log likelihood	115.0764	Hannan-Quinn criter.	-3.373444
Durbin-Watson stat	1.882155		

Source: Program Outputs Eviews Tenth Edition

Variable (INFM0INF(-5))	Lag	Coefficient
	0	0.002803
	1	-0.0000753
	2	-0.002035
	3	-0.003075
	4	-0.003196
	5	-0.002398
	6	-0.000681
	7	0.001955
	8	0.005510

We note from the table that the Almoon coefficient was selected for weighting of the third degree according to our results, and we find that (9) delay periods were selected to explain the effect of the high frequency variable (inflation) on the low frequency variable unemployment rate using the criteria of (Akaike Schwarz, Hannan Quinn), which leads to estimating the model in which the random error values are as low as possible according to the following figure:



***Source*:** Program Outputs Eviews Tenth Edition

Fig 1: Normal distribution of residues

Where the delays in inflation data are compensated by (9) months, and therefore according to the information standards, we here need inflation data for (9) months to be able to explain the changes in unemployment during each quarter.

Third, analysis of the impact of the previous values of the series on unemployment rates:

The first part of Table No. 01 of the results of the estimate shows the coefficients and statistics (t) for the low frequency variable (unemployment), where we get the following model:

LOGUN= 0.05 + 0.98 LOGUN (-1) + nt

We note that there is an impact of the previous period of unemployment on the current period, with a positive and statistically significant effect, which is in line with economic theory, which highlights how the unemployment rate is influenced by rates of unemployment in prior eras and at a pace that of (0.98%) whenever the previous series changes by (1%), because it is a reason for increasing the economic crisis, which is the cause of an increase in unemployment rates during the current period.

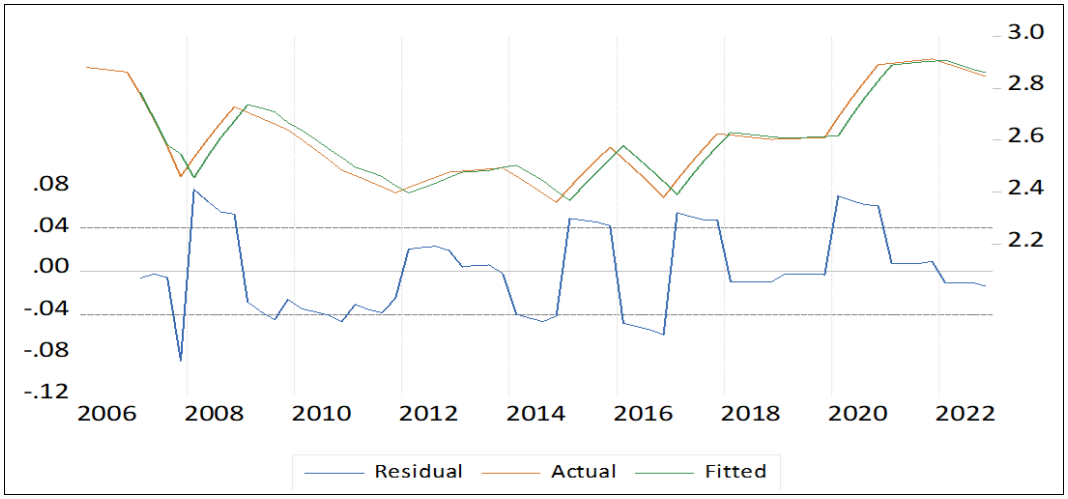
Estimation of the parameters of the MIDAS model

The second part of Table 01 shows the results of the estimate of the coefficients and the model statistics for the estimator

Almon (PDL) Weighting, where the weighting coefficient was significant (0.5%), i.e. there is a significant impact of inflation on unemployment, and from it we reach an estimate of the following MIDAS model:

LOGUN=0.0066
LOGIMF-0.004257+LOGIM

We note that unemployment responds directly to changes in the inflation rate, which is consistent with economic theory, where in theory the inflation index can have a positive or negative relationship with the unemployment index, depending on the results and effects of the economic policy followed in Iraq, we note that the higher the inflation rate by one unit, the higher the unemployment rate, and there is often a direct relationship between inflation and the unemployment rate at the beginning of inflation due to the fear of increasing inflation by producers and thus They try to reduce production, and this leads to the dismissal of some workers, and then the relationship is inverse, meaning that the inflation rate leads to a reduction in the unemployment rate due to the stability of the economic situation and the practice of producers to work better than the beginning of inflation, and this leads to a reduction in the unemployment rate.



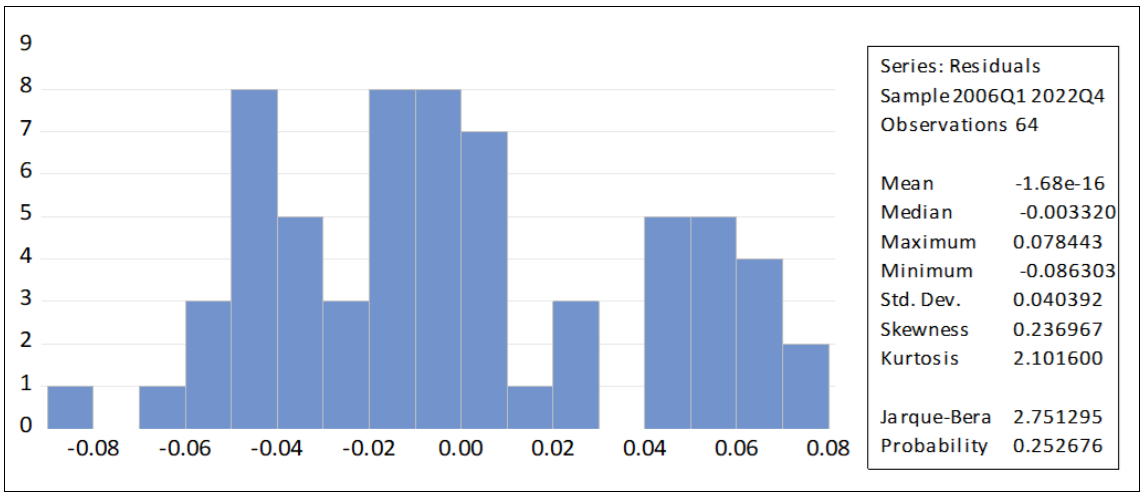
Source: Program Outputs Eviews Tenth Edition

Fig 2: Real, Estimated and Residual Values (Model Quality)

Sixth: Test of the normal distribution of the residues

Jarque Bera JB

The quantity of the probability value of the (JB) statistic serves as the foundation for this test. The null hypothesis is accepted if () or if the probability value is less than, indicating that the remaining model components are distributed appropriately. Since the model's remnants are not distributed properly, we adopt the alternative hypothesis. The criterion P-value>0.050.05 of kurtosis) indicates Whether the form is extended or flattened, The distribution is moderately shaped and has an extended form if the value of (3 = ku). In the event that (3< ku), the distribution's shape will be flattened; if (3> ku), the value of (ku) must be close to (3) or equal to (3) for the distribution's shape to be considered moderate, and the distribution's form is flattened if the value of (3> ku) is (2.10). The shape can be found symmetrical or twisted based on the Skewness criterion; if the value of (0 = sk), the distribution's shape is symmetrical; if the value of (0< Sk), the distribution's shape is twisted to the right., but if the value of (0> Sk) indicates that the shape of the distribution is twisted left, and the image shows that the value of (0< Sk) is (0.23), which suggests that the distribution's form is twisted right, as seen in the figure., and Figure (4) shows the results of the rest of the research model, which indicates that the data follow the normal distribution, because the p-value of the test (JB) is equal to (0.252) which is greater than (0.05) and thus the JB test proved that the data follows the normal distribution.

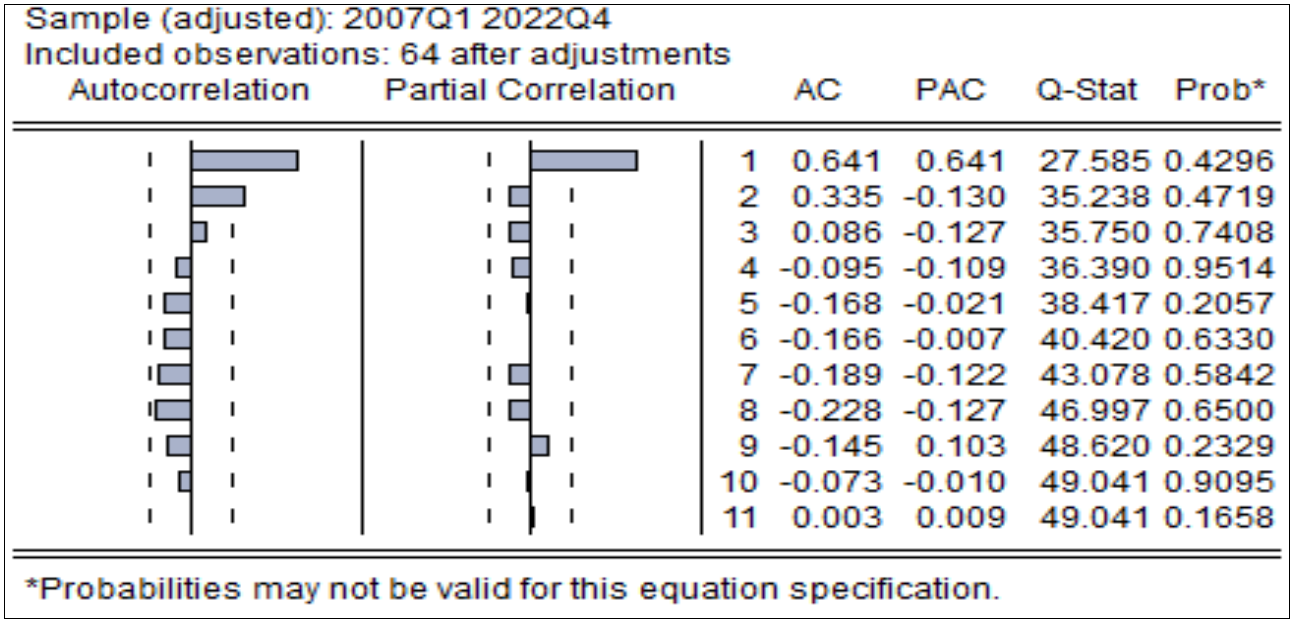


Source: Program Outputs Eviews Tenth Edition

Fig 3: Normal distribution of residues

Seventh: Autocorrelation Test for Errors:

To ensure that there is no autocorrelation, we resort to autocorrelation tests, as shown in the following table.



Source: Program Outputs Eviews Tenth Edition

Table 4: Results of the autocorrelation test for errors.

From the above table we note that all the columns in the field of confidence and test statistics (autocorrelation) are important, therefore we accept the null hypothesis that there is no autocorrelation.

We will test the stability of the search variables using the statistical program (2 observations 1) in order to find out whether the search variables are (stable or unstable), and by this we mean whether they contain the root of unity or not, identifying the stability by calculating the rank of integration of the search variables under study has become very important in estimating standard models, in order to get rid of the problem of erroneous regression of time series to check the time series stability, after performing these tests, we obtained the following results from the standard program (2 viewing 1):

Eighth, stability test results for the variables under investigation.

In order to determine the rank of integration, where the detection of the stability of the research variables under study has become very important in estimating standard models, we will use the statistical program (2Eviews1) to test the stability of the search variables. By this, we mean whether the search variables contain the root of the unit or not, Additionally, Stable time series can eventually regain equilibrium after removing the shocks they encounter. in order to eliminate the pseudo-regression issue that arises during estimation. In order to confirm the stability of time series, we will employ Time series graphics and unit root testing. Following the completion of these tests, we were able to the following results from the standard program (2, Eviews 1):

Table 4: Findings from the Phelps-Peron-PP test, or unit root test, for search variables at the first data level and the first difference

Unit root test results table (pp)			
Null Hypothesis: the variable has a unit root			
At Level			
		LOGUN	**LOGUN(-1)**
With Constant	t-Statistic	-1.7266	-1.6951
	Prob.	*0.4135*	*0.4291*
		n0	n0
With Constant & Trend	t-Statistic	-1.9342	-1.8336
	Prob.	*0.6258*	*0.6773*
		n0	n0
Without Constant & Trend	t-Statistic	-0.1829	-0.1479
	Prob.	*0.6167*	*0.6289*
		n0	n0
	At First Difference		
		d(LOGUN)	d(LOGUN(-1))
With Constant	t-Statistic	-4.0208	-3.9953
	Prob.	*0.0024*	*0.0026*
		***	***
With Constant & Trend	t-Statistic	-4.0310	-4.0321
	Prob.	*0.0121*	*0.0122*
		**	**
Without Constant & Trend	t-Statistic	-4.0482	-4.0234
	Prob.	*0.0001*	*0.0001*
		***	***
Notes: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not Significant			

Source: Program Outputs Eviews Tenth Edition

Conclusions and Recommendations

First: Conclusions: There are a number of conclusions, perhaps the most important of which are the following:

The results indicate the proof of the hypothesis on which the research was based, which indicated that there is a positive response in the quarterly frequency unemployment rates in the Iraqi economy's monthly frequency inflation rates for the 2005–2022 timeframe.

1. During the investigation, there was a long-term inverse equilibrium relationship between Iraq's unemployment rate and economic inflation. period (2005-2022).
2. The existence of a weak adverse effect of Long-term unemployment and inflation in Iraq during the research period.

Second: Recommendations: There are a number of recommendations, perhaps the most important of which are the following:

1. Work to accelerate the completion of the path of economic reforms (White Paper) with priority given to the industrial sector through the privatization of public productive enterprises and improving the investment climate for the industrial sector.
2. Establishing a Council for Economic Affairs for the public and private sectors to activate the economic role of the competent authorities by approving the preparation and monitoring of the implementation of a development strategy aimed at achieving economic growth in the Iraqi economy by coordinating macroeconomic policy and applying the multiplier method.
3. The authorities should make it a priority to halt the upward trend in the money supply and direct it to productive sectors in areas that encourage productivity growth and enable better use of existing productive capacity, such as the industrial and agricultural sectors, rather than providing interest-free loans.

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