Studying the relationship between economic growth and unemployment according to Okun's Law in Egypt during the period (1990-2023

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Abstract: The study critically investigates the influence of unemployment on Egypt's economic growth using time series data from 1990 to 2023. The relationship between unemployment and economic growth was found to be adverse, indicating that reducing unemployment would ensure Egyptian economic growth. The effects of Okun's law coefficient suggest a negative association between unemployment and GDP, since low economic growth is one of the reasons for the rise in unemployment. As the decrease in aggregate demand triggers a decline in aggregate supply, a decrease in production leads to a decrease in economic growth rates. Thus, companies cut staff, which raises unemployment, exacerbating long-run unemployment issues. In summary, the study's findings support Okun's law, as they prove that growing GDP decreases unemployment in Egypt. Based on the findings.

The results of the model tests showed that there is no direct relationship between GDP growth as an independent variable and the growth of the unemployment rate as a dependent variable, but there is a relationship between the difference at level and the influence factor by approximately (-0.386), with a significance level of 5%, meaning that an increase in the growth rate of output by 1% leads to a decrease in the unemployment rate by (-0.386%). In a later period, hold other factors constant. which is in line with Okun’s law, but this relationship is only in the short run, while the existence of a long-run integration relationship between the two variables has not been proven.

Keywords: economic growth, unemployment, Okun's Law, Egypt

1. Introduction

Economic growth and unemployment are among the most significant macroeconomic variables impacting any country's economy. Reducing unemployment rates and achieving high and stable economic growth rates are among the crucial issues faced by all economies, especially developing ones. They suffer from high unemployment rates, leading to numerous economic repercussions and problems that reflect on social and political aspects. These issues are primarily a result of slowing economic growth rates and an increase in population growth. Consequently, one of the main solutions to reducing unemployment rates is to achieve high and stable economic growth rates. This is because an increase in the economic growth rate leads to greater efficiency in utilizing the available labour force in society, resulting in increased employment levels and thus reducing unemployment. Consequently, this increases the welfare of society by improving the income of workers and providing employment opportunities for the unemployed (Elshamy, 2013). Several economic studies have examined the relationship between economic growth and unemployment by verifying the applicability of Okun's law (Arther M. Okun, 1962), which suggests an inverse relationship between the economic growth rate and changes in the unemployment rate.

Regardless of the availability of numerous studies that have addressed Okun's law to analyze the relationship between economic growth and unemployment, most have focused on advanced economies. There remain a somewhat limited number of studies concerning developing countries, including Egypt, in this context. Therefore, this study has focused on testing the applicability of Okun's law in the Egyptian economy. It aims to analyze the form and nature of the relationship between economic growth and unemployment. Achieving high and stable economic growth rates and reducing unemployment constitute some of the most significant challenges faced by the Egyptian economy over the past three decades. Consequently, the results of this study can help identify the type of unemployment prevalent in the Egyptian economy, thereby guiding the formulation of appropriate policies aimed at reducing unemployment rates and fostering future economic growth in Egypt.

1.1.The Statement of the problem

Throughout the previous thirty years, the Egyptian economy has experienced a number of changes. The economy went through structural imbalances and an economic slump in the 1980s. To address these inequalities, Egypt launched an economic reform program in the early 1990s with backing from the World Bank and IMF. The economic growth

rate declined during this time, and the unemployment rate significantly increased.

Despite the remarked stability and achieving an acceptable and high growth rates at the beginning of the new millennium, it failed to reduce the unemployment rates and accommodating the increasing numbers entering the labor market annually. The so-called 'growth without jobs' hypothesis was followed by the global financial crisis of 2008, followed by the events of the January 25th Revolution in 2011, leading to political and economic instability. As a result, the economic growth rate deteriorated unemployment rates rose. Following to the monetary reform program in 2016 backed by the IMF, gradual improvements in economic growth rates began. However, the growth rate declined again with the onset of the COVID-19 pandemic in 2020, followed by the Russian-Ukrainian war. Throughout this period, unemployment rates remained relatively high, particularly among youth and recent graduates. Given these challenges faced by the Egyptian economy and its labor market, the study's problem is defined as follows: To what extent does the change in the economic growth rate impact the unemployment rate in Egypt during the study period? Is the increase in unemployment in Egypt a result of the decrease in and instability in the economic growth rate? What is the impact of the achieved economic growth pattern on unemployment in the Egyptian economy? To what extent is Okun's law valid and applicable to the reality of the Egyptian economy?"

The study Objectives

The study aims to measure and analyze the relationship between economic growth and unemployment in Egypt by testing the applicability of Okun's law in the Egyptian economy during the period (1990-2023). It seeks to answer the questions posed in the research problem.

1.2.The Study's Significance

The significance of this study lies in addressing one of Egypt's most pressing chronic issues; unemployment. Understanding the relationship between economic growth and unemployment and assessing the mutual impact is crucial in formulating and guiding economic policies. The correlation between these variables can help identify the nature of unemployment in the Egyptian economy. It determines whether the unemployment is cyclical, managed through the demand side, suggesting the potential to reduce unemployment by boosting economic

growth. Alternatively, it could be structural unemployment, requiring different policies and interventions, it necessitates the development of appropriate strategies to address this issue.

1.3.Research hypotheses

Based on the research problem and its objectives, the research assumptions could be summarized as follows:

1. There is an indirect relation between the economic growth rate and the unemployment rate.
2. such relation suggests the potential applicability of Okun's law in the Egyptian economy.

Therefore, the study seeks to test the achievement of the following assumption: 'There is a negative impact of economic growth on the unemployment rate in Egypt during the period (1990-2023).

1.4.The study Methodology

Based on the descriptive-analytical approach, the study seeks to analyze and determine the directional relationship between the economic growth rate and the unemployment rate in Egypt. This is achieved through a standard analysis model, relying on the Auto-Regressive Distributed Lag (ARDL) model for cointegration and the Error Correction Model (ECM) to measure the relationship between them in both the short and long terms. The study mainly utilizes data from the World Bank spanning the period (1990-2023).

1.5.The structure

The study is divided into five sections. It begins with an introduction encompassing the research problem, its objectives, significance, assumptions, and the methodology used. It then delves into the relationship between economic growth and unemployment in economic literature. Additionally, it includes a review of the theoretical aspect related to Okun's law as a secondary part of the study. The third section analyzes trends in unemployment, economic growth, and their relationship within the Egyptian economy during the period (1990-2023). The fourth section involves measuring their relationship in Egypt during that period using the ARDL model to identify the required level of growth to address unemployment and diagnose the primary types of unemployment experienced by the Egyptian economy. Finally, the fifth section highlights the key findings obtained to assess the extent to which Okun's law applies to the Egyptian economy. This is aimed at formulating

and guiding appropriate economic policies toward achieving the desired objectives.

2. The Relationship Between Economic Growth and Unemployment in Economic Literature

2.1. The Conceptual Framework of Economic Growth and Unemployment

Economic growth and unemployment are among the most crucial economic variables that policymakers should prioritize, given their direct impact on the welfare of the society. The influence of the growth rate on unemployment lies in its potential to mitigate it. Essentially, growth stands as the foremost variable capable of aiding in solving the issue of unemployment. Increased economic growth corresponds to heightened resource utilization efficiency, it increases the employment levels, thereby reducing unemployment and poverty within society. Moreover, the rise in the economic growth rate is necessary to achieve economic development goals and enhancing the welfare of community members (Andrei, 2009).

Economic growth is defined as the process that elevates the real income of individuals within any given country over a specific period. It is determined by enhancing a society's capacity to produce a larger quantity of goods and services. Economic growth is considered as one of the most effective tools in reducing poverty, curbing unemployment, and enhancing the quality of life. Consequently, all countries aim for a continual increase in economic growth rates (Jhingan, 2003).

As it encompasses those who are able to seek work with the prevailing wage rates, yet unable to secure employment, this definition of unemployment applies to individuals entering the job market for the first time or those who have previously worked but left due to various reasons, reflecting their involuntary exclusion from the workforce. Consequently, unemployment represents a surplus in the labor market (Rami Zaki, 1998). Unemployment manifests across both advanced and developing nations for different reasons. In developing nations, it's typically due to inadequate capital, whereas in advanced countries, it's often due to technological advancements. Periodic fluctuations, seasonal events, and technological advancements are among the main causes of unemployment (Pata & Kalca, 2018).

Unemployment poses a serious dilemma for most developed and developing nations. Increased unemployment rates adversely affect the economy, resulting in decreased living standards and productivity. This,

in turn, leads to a reduction in overall demand and the emergence of numerous economic and social issues. Therefore, one of the primary solutions to curb unemployment is achieving a high and stable economic growth rate through the use of appropriate fiscal policies. This would subsequently enhance the efficiency of utilizing the available labor force in society, leading to increased employment levels and, consequently, a reduction in unemployment. This could be achieved by improving the income of existing workers and providing employment opportunities for the unemployed, thereby enhancing the welfare of the community (Seth & Dalhatu, 2018).

2.2.Theoretical Framework (Okun’s Law)

The theoretical economic framework has not significantly provided models that strongly connect the economic growth rate and the unemployment rate, despite the importance of stabilizing the relationship between these variables. This stability is essential for policymakers to reduce the unemployment rate. However, the economic literature is rich with numerous studies that have addressed the relationship between unemployment and economic growth. These studies aimed to test the validity of Okun's assertion regarding the inverse relationship between unemployment and economic growth in the United States in the early 1960s. This relationship became known as Okun's Law and has been a cornerstone in studies of this economic phenomenon for decades (Christopher, 2010).

Okun's Law stands as a significant Keynesian analysis both theoretically and in its application within macroeconomics. Theoretically, this law reflects the relationship between the aggregate supply curve and the Phillips curve. It highlights the vital connection between the goods and services market and the labor market. It describes the relationship between short-term changes in real GDP and changes in unemployment. From an applied perspective, Okun's coefficient aids in forecasting and developing appropriate economic policies. According to Okun's Law, a 3% increase in the real GDP corresponds to a 1% decrease in the unemployment rate, and vice versa. This law was derived through analytical studies of certain variables in the American economy between 1960 and 1974. To prevent losses stemming from unemployment, continuous economic expansion is necessary. Consequently, to mitigate unemployment, real GDP should grow at a faster pace than potential GDP (Tumanos, 2019).

Okun's law relied on several different formulas in interpreting the relationship between economic growth and unemployment. In 1970, Okun proposed two formulas for this relationship: the differences formula and the gap formula. However, many economists pointed out that the original versions of Okun's law overlook important dynamics that involve the impact of both past and present output on the current level of unemployment. Consequently, researchers leaned towards suggesting dynamic formulations and production function formulas. Yet, the first two formulas are the most commonly used in most applied studies. Below is a brief presentation of these formulas:

A. Formula (The Difference Version)

Okun began his study by observing that more labor is required to increase production, thus a slowdown in output growth leads to increased unemployment. The change in the unemployment rate is linked to the growth rate of output during the same time period. The two variables have an inverse relationship, expressed by the following regression equation, known as Okun's Difference Formula:

$$(\boldsymbol{U_t - U_{t-1}}) = \boldsymbol{\alpha + \beta(Y_t - Y_{t-1})} \qquad \boldsymbol{(1)}$$

Here, *(Ut)* represents the unemployment rate in time period *(t)*, **(** $\boldsymbol{U_{t-1}}$**)** represents the unemployment rate in the previous time period, *Yt* denotes the real growth rate of GDP in time period *t*, and (*Yt*−1) represents the real growth rate of GDP in the previous time period.

This function illustrates how the unemployment rate changes with the real growth rate of GDP according to the value of the Okun coefficient (*β*), which is negative. This means that an increase in the real growth rate of GDP leads to a decrease in the unemployment rate, and vice versa. Therefore, this formula demonstrates the relationship between movements in real GDP growth and movements in unemployment, correlating rapid GDP growth with a decrease in unemployment and slow GDP growth with an increase in unemployment (Bouaziz, 2015 & El Andari).

B. The Gap Formula (The Gap Version)

In his article, Okun introduced another formula that links the unemployment rate to the gap between actual Gross Domestic Product (GDP) and potential GDP. This assumes that potential GDP represents the maximum output achievable without inflationary full employment, where full employment is a condition where the unemployment rate does not

exceed 4%. Economists refer to this as the natural rate of unemployment. The gap formula can be formulated as follows:

$$(\boldsymbol{U_t - U^*}) = \boldsymbol{\beta}(\boldsymbol{Y_t - Y^*}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (\mathbf{2})$$

Where:

- *U** denotes the natural rate of unemployment.
- *Y** represents the potential Gross Domestic Product in period *t*.

According to this equation, the unemployment gap, measured by the difference between actual and natural rates of unemployment, is an inverse function of the output gap. Therefore, the output gap embodies the cyclical level of output, and similarly, the unemployment gap represents the cyclical unemployment rate. Usually, actual output is less than potential output, resulting in actual unemployment rates being higher than natural unemployment rates. Hence, the coefficient) *(β)* measuring the change between these gaps is negative. However, it's noted that both the natural rate of unemployment and therefore potential GDP cannot be directly determined through aggregate economic statistics but rather subject to the researcher's judgment (Knotek, 2007).

C. The Dynamic Version

Many economists have pointed out that the original versions of Okun's law overlook important dynamics, including the impact of both past and current output on the current level of unemployment. Consequently, researchers have turned to using the Autoregressive Distributed Lag (ARDL) model to model the short and long-term dynamic versions of Okun's law. Therefore, the dynamic regression model for Okun's law (the difference version) will take the following form:

$$\Delta \boldsymbol{U_t} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\Delta \boldsymbol{Y_t} + \boldsymbol{\beta_2}\Delta \boldsymbol{Y_{t-1}} + \boldsymbol{\beta_3}\Delta \boldsymbol{Y_{t-2}} + \boldsymbol{\beta_4}\Delta \boldsymbol{U_{t-1}} + \boldsymbol{\beta_5}\Delta \boldsymbol{U_{t-2}} \ldots\ldots\ldots (\mathbf{3})$$

Where:

- $\Delta \boldsymbol{U_{t-1}}$**(** represents the change in the unemployment rate in the previous time period.
- $\Delta \boldsymbol{U_{t-2}}$ **(** represents the change in the unemployment rate two periods back, indicating temporal slowdowns.
- $\Delta \boldsymbol{Y_{t-1}}$ **(** represents the change in Gross Domestic Product growth rate in the previous time period.

- ΔY_{t-2} (represents the change in Gross Domestic Product growth rate two periods back, indicating temporal slowdowns.

According to the equation, the current level of change in the unemployment rate is affected by changes in both the current period's achieved output and the output of the two previous periods, as well as the changes in the unemployment rate in those two previous periods. Hence, Okun's analysis, based on this formula, suggests that changes in both current and past output have a negative impact on changes in unemployment.

D. The Production-Function Version

$$Y_t = \alpha(k + c) + \beta(yn + \delta h) + T$$

In this equation, *(Y)* represents the real GDP growth rate in period ***t***, k stands for the amount of capital used, *(c)* denotes the rate of capital usage, *(n*) represents the number of workers, (α&β) signify the elasticity of output concerning labor and capital respectively, *(h)* is the number of working hours, *(y)* denotes the contribution of a work hour to output relative to total work hours, (δ) represents the worker's contribution to output concerning the quantity of labor used, and *(T)* accounts for technological advancement. This formula is based on the Cobb-Douglas production function, where the output volume is influenced by inputs of both labor and capital, as well as technological levels. Therefore, variations in labor constitute a portion of the impact on output, making labor one of the inputs influencing output levels (Rahman & Mustafa, 2015).

3. Literature review

3.1.Empirical studies of Okun's Law

Several empirical studies have attempted to test the validity or invalidity of Okun's Law in numerous countries using quarterly or yearly data and employing one or more formulas to express Okun's Law. Most of these studies have confirmed the relationship as postulated by Okun, especially in developed countries, where an inverse relationship between economic growth rate and unemployment has been established. However, the strength of Okun's coefficient estimates has significantly varied among different countries and over time (Adrados, 2013).

While the majority of empirical studies in developed nations support the validity of Okun's Law, there are many studies that haven't supported its accuracy. Some studies have even suggested a positive

relationship between economic growth and unemployment. Furthermore, a number of studies have highlighted the weakness or absence of this relationship. Such a substantial inconsistency in the results of empirical studies complicates the generalization of findings supporting the validity of Okun's Law. Due to this contradiction and ambiguity in the empirical results examining this relationship, the current study will present a number of empirical studies representing each of the aforementioned directions:

- (Onakoya A. B., & Victor S. A., 2020) aimed to assess the applicability of Okun's Law in both the United States and South Africa during the period from 1980 to 2018. It employed the difference equation and the dynamic version of Okun's Law using Ordinary Least Squares (OLS) regression method. The study confirmed the validity of Okun's Law in both South Africa and the United States. It found that the coefficient value of Okun's Law was higher in the dynamic formulation compared to the difference equation in both countries.
- (Bahat T. A., Lone T. A. & Din T. M., 2019) aimed to determine the applicability of Okun's Law in the Indian economy during the period from 1983 to 2013. It used the cointegration approach and the Vector Error Correction Model (VECM). The results indicated the presence of cointegration between the variables. The estimated coefficient value of Okun's Law was -0.47, suggesting that a 1% increase in Gross Domestic Product leads to a decrease in the unemployment rate by approximately 0.47%. Hence, Okun's Law holds in the Indian economy.
- (Al-Shanawi, 2018) examined the applicability of Okun's Law to the Egyptian economy during the period from 1990 to 2016 using the ARDL model. It applied both the difference and gap models and found evidence of long-term cointegration between the Gross Domestic Product growth rate and the unemployment rate in Egypt. The estimated Okun coefficient was 0.908, indicating that a 1% increase in Gross Domestic Product would lead to a reduction in the unemployment rate by approximately 0.908 in the long term. However, the Okun coefficient was not statistically significant in the gap model. Consequently, the gap model failed to explain the relationship between economic growth and unemployment in Egypt.

- (Nurudeen A., 2017) used the ARDL model to examine the applicability of Okun's Law to the Nigerian economy from 1970 to 2014. Additionally, this study explored the role of oil prices in the Nigerian economy. The empirical results demonstrated a long-term cointegration between the unemployment rate, economic growth, and oil prices. The estimated Okun coefficient in this study was 0.18, significantly lower than the results obtained by Okun and other studies focused on advanced countries. This indicates that the Okun coefficient is not only unstable but also varies from one country to another, remaining inconsistent. Hence, policymakers should consider alternative measures to reduce unemployment and enhance economic growth in Nigeria.
- (Hassam A. & Qusay A., 2016) aimed to verify the validity of Okun's Law in Jordan by measuring the impact of economic growth on unemployment during the period of 1980-2011, using the cointegration approach and two models (ECM and ARDL). It found a long-term cointegration relationship between the variables, suggesting that economic growth has a weak and short-term inverse effect on unemployment in Jordan. Consequently, the validity of Okun's Law in Jordan is confirmed, albeit with very weak Okun coefficients (-0.007 in the long term, -0.003 in the short term).
- (El Andari C. & Bouaziz R., 2015) aimed to verify Okun's Law in Tunisia using quarterly data spanning from 1990 to 2014, employing the cointegration approach, Error Correction Model (ECM), and Granger causality test. The study revealed unidirectional causal relationship from unemployment to Gross Domestic Product (GDP), indicating an inverse relationship between unemployment and GDP in the long term. The Okun coefficients ranged between 0.75 to 1.4, according to both the difference and gap formulations, thereby supporting the validity of Okun's Law in Tunisia.
- (Rahman M. & Mustafa M., 2015) aimed to verify Okun's Law in 13 advanced economies from 1970 to 2013, utilizing the cointegration approach and two models, ECM and DOLS. The empirical results indicated a co-integrating relationship between the unemployment rate and GDP growth rate, confirming the validity of Okun's Law in 12 out of the studied countries. The Okun coefficients closely resembled the values found in the United States and South Korea. However, these coefficients were weak in

Canada, Finland, New Zealand, Sweden, France, Italy, Japan, the Netherlands, the United Kingdom, and Australia.

- (Nikolli E. in 2014) examined the validity of Okun's Law in the Albanian economy from 1995 to 2010. It concluded that a decrease in the unemployment rate by approximately 1% would lead to an increase in the real GDP growth rate by about 1.54% annually, supporting the applicability of Okun's Law to the Albanian economy.
- (Hany E. in 2013) tested the validity and applicability of Okun's Law in Egypt from 1970 to 2010. Using the method of cointegration for the long term and error correction model (ECM) for the short term, the results indicated a co-integrating relationship between the output gap and the unemployment gap in the long term. It also confirmed an inverse relationship between the output gap and the unemployment gap. Hence, while Okun's Law was deemed applicable to the Egyptian economy, the coefficients of Okun were found to be very weak. For instance, a 1% increase in the unemployment gap led to a decrease in the output gap by approximately 0.022% in the long term and 0.021% in the short term.
- (Li, C. & Liu, Z., 2012) examined the relationship between unemployment rates, economic growth, and inflation in China from 1978 to 2010. The study found a stable and long-term mutual relationship between unemployment, economic growth, and inflation. It confirmed that economic growth has an inverse relationship with the unemployment rate in the absence of external factors. However, the study indicated that in the short term, economic growth has a push-pull relationship with the unemployment rate, contradicting Okun's Law. This suggests that rapid economic growth in China might not directly lead to an immediate decrease in unemployment rates, which diverges from the expected pattern outlined in Okun's Law.
- (Zeeshan A., 2010) investigated the relationship between Gross Domestic Product (GDP) and unemployment, examining the applicability of Okun's Law to the Swedish economy between 1993 and 2009. The study utilized the Output Gap model and the Hodrick-Prescott (HP) Filter technique to analyze this relationship in the short term, specifically to test the applicability of Okun's Law. Additionally, it employed the Cointegration Model and Error Correction Model to examine the relationship between

unemployment and GDP growth in both the short and long terms. The findings of the study indicate that Okun's Law was applicable to the Swedish economy during the study period. Furthermore, the study confirmed the existence of both long-term and short-term relationships between unemployment and Gross Domestic Product.

- (Javeid U in 2007)investigated the relationship between Gross Domestic Product (GDP) and the unemployment rate and to examine the applicability of Okun's Law in the Pakistani economy from 1981 to 2005. The study used the Okun's Law difference formula and employed the Common Integration Method, Error Correction Model (ECM), and Granger causality. It indicated an inverse relationship between the unemployment rate and GDP, as well as with all variables in both the short and long terms. This signifies the validity of Okun's Law in Pakistan over both short and long terms.

3.2.The empirical studies that support the failure of Okun's Law.

- (Ugyen, T., 2019) measured the correlation between the economic growth rate, inflation, and unemployment during the period of 1998-2016 in Bhutan to understand the unemployment dynamics at the macro level. The study employed the ARDL model to estimate the impact of economic growth rate and inflation on unemployment. The empirical results indicated that the economic growth rate had no significant effect on reducing unemployment in Bhutan in both the short and long terms. However, inflation showed a negative association with unemployment in the short term and a positive one in the long term. This implies that an increase in employment rates led to an inflation rise in the short term. Similarly, if inflation is not monitored or controlled, it might lead to a decrease in investment, subsequently reducing economic growth rates and resulting in higher unemployment rates in the long term.
- (Murad, Mustafa, 2016) tested the impact of economic growth on unemployment in some countries of the Maghreb region: Algeria, Tunisia, and Morocco during the period of 1991-2013. The study utilized panel models and found no significant effect of economic growth on unemployment in those countries.
- (Rahman M. & Mustafa M., 2015) sought to verify the Okun's law in 13 advanced countries, revealing that there was no long-term relationship between unemployment and output growth in

Germany. Consequently, Okun's law does not apply to Germany despite its application to the other countries in the study.

- (Mohammed, Mohsen, 2014) measured the relationship between economic growth and unemployment in the Iraqi economy and verify the applicability of Okun's law to the Iraqi economy. The study concluded that the relationship between economic growth and unemployment was weak and asynchronous, reflecting the lack of applicability of Okun's law in Iraq.
- (Moroke, N., 2014) assessed the applicability of Okun's law in South Africa using data from 1990 to 2013. It indicated the inability to apply Okun's law to South Africa. Additionally, the study recommended that the government and policymakers focus on implementing more structural changes and reforms in the labor market through economic policies.
- (Adrioush, 2013) examined the applicability of Okun's law to the Algerian economy. It attempted to estimate the required Gross Domestic Product (GDP) growth rate necessary to achieve full employment if Okun's law were to apply to the Algerian economy. The study utilized annual data covering the period from 1980 to 2011, employing time series analysis, the common integration method, and Error Correction Model (ECM). The study concluded that Okun's law does not apply to the Algerian economy.
- (Kreishan, F.M., 2011) explored the relationship between economic growth and unemployment while testing the validity of Okun's Law in Jordan using annual data from 1970 to 2013. It employed the Common Integration method and Ordinary Least Squares (OLS) regression and utilized the Augmented Dickey-Fuller (ADF) test for unit root. The empirical results revealed a long-term cointegration relationship between the variables. Although the Okun coefficient was negative, it was not statistically significant, indicating an inability to confirm Okun's Law in Jordan. Consequently, the study couldn't explain the rise in unemployment rates by the decrease in economic growth. The study recommended that economic policies related to demand management might not significantly reduce unemployment rates. Therefore, implementing policies targeting structural changes and labor market reforms would be more suitable for policymakers in Jordan.
- (Imad, M., 2008) measured the relationship between economic growth and unemployment, estimating the Okun coefficient for a

group of Arab countries, namely Morocco, Algeria, Tunisia, and Egypt. The study sought to understand the law's validity in these economies. It concluded that there was an absence of this relationship within the studied countries' sample, indicating a lack of alignment with Okun's Law. However, the absence of this relationship in the study's sample doesn't necessarily mean it doesn't exist. Rather, it suggests a specific type of unemployment prevalent in these Arab countries. The researcher attributed the lack of validity of this relationship in these countries to three main reasons:

- The unemployment in these countries is predominantly structural and frictional rather than cyclical. Structural unemployment appears in countries experiencing fundamental changes in their economic systems, leading to a mismatch between worker skills and job requirements. This type of unemployment doesn't stem from economic recession but rather from a lack of necessary skills among the unemployed. Frictional unemployment occurs when there's a lack of synchronization between available jobs and the workforce's skills. Thus, real GDP growth doesn't contribute to reducing these types of unemployment.
- The rigidity in these countries' labor markets, largely due to the dominant role played by their governments in labor markets, being the primary source of demand for the workforce.
- The nature of the economic structure in these countries. Many of these nations have dominant sectors (e.g., the oil sector in Algeria) primarily controlled by the government. If these dominant sectors don't employ a substantial workforce, growth within these sectors doesn't reduce unemployment. This explains the higher value of the Okun coefficient in advanced countries compared to its value in developing economies, as advanced economies are characterized by greater economic diversity compared to developing nations.

3.3."Studies supporting a positive relationship between economic growth and unemployment"

- (Al-Omari B.K., 2019) attempted to identify the type of unemployment in the Sultanate of Oman using yearly data from 2000 to 2017. The study aimed to test the applicability of Okun's Law to the Omani economy using Ordinary Least Squares (OLS) regression. The empirical results of the study indicate that the coefficient value of Okun's Law is positive, yet statistically

insignificant, therefore not substantiating Okun's Law in the Omani economy.

- (Seth A., John M. A. & Dalhatu A. Y., 2018) measured the impact of unemployment on economic growth in Nigeria from 1986 to 2015, utilizing the Engle-Granger cointegration approach and the Autoregressive Distributed Lag (ARDL) model. The empirical results of the study revealed no long-term cointegration between the variables, showing a positive relationship between unemployment and economic growth in the short term. Hence, Okun's Law did not apply to Nigeria in both the short and long terms.
- (Al-Shurbaji, 2005) measured the impact of economic growth on employment in the Egyptian economy from 1982 to 2005, employing the cointegration approach and the Unrestricted Error Correction Model (UECM) to estimate short- and long-term elasticities. The empirical findings indicated that economic growth had a statistically insignificant positive effect on employment in both the short and long terms. Additionally, the overall impact of real capital formation on employment in both the short and long terms was negative and significant.

4. An analysis of unemployment and economic growth trends and their relationship in the Egyptian economy during the period (1990-2023)

In this section of the study, an evolution of the Gross Domestic Product (GDP) growth rate and the unemployment rate in Egypt over the study period will be addressed, so it could be divided into three periods: the first from 1990 to 1999, the second from 2000 to 2010, and the third period from 2011 to 2023, as illustrated in Table (1)

Table (1): Average Gross Domestic Product (GDP) Growth Rate and Unemployment Rate in Egypt

The time period	(GDP) growth rate %	Unemployment rate %
1990-1999	4.5	9.5
2000-2010	5	9.8
2011-2023	3.9	11
1990-2023	4.4	10.1

Source: Compiled by the researcher based on Statistical Appendix Table (1)

The data presented in table number (1) in the statistical annex and the table above illustrate the volatility of the Gross Domestic Product

(GDP) growth rate, which experienced fluctuations during the study period. In the 1990s, which marked the initiation of the economic reform program and structural adjustment in 1991 supported by the International Monetary Fund and the World Bank, inclusive of contractionary fiscal and monetary policies aimed at addressing several short-term monetary imbalances that plagued the Egyptian economy in the 1980s. These policies contributed to a decline in the economic growth rate and an increase in the unemployment rate, exacerbating several other issues (Monem, 2011). Despite the success of these contractionary policies in alleviating some short-term monetary problems for a period, they did not have a positive impact on economic growth. The Gross Domestic Product growth rate declined from an average of 6.7% annually during the period (1980-1989) (https://data.albankaldawli.org/indicator) to an average growth rate of about 4.5% annually during the period (1990-1999). In the first decade of the new millennium, the GDP growth rate witnessed a significant decline to approximately 2.4% in 2002, then gradually rose to its peak value during the study period, reaching 7.2% in 2008. However, it subsequently declined again due to the global economic crisis at that time, dropping to 5.1% in 2010, with an average growth rate of around 5% annually during the period (2000-2010), indicating a gradual improvement in GDP growth during the first decade of the new millennium. Yet, at the beginning of the second decade of the new millennium, there was a sharp decline in GDP growth rate due to the events of the January 25 Revolution in 2011 and the subsequent political, security, and economic instability that lasted for almost three years. The GDP growth rate reached approximately 1.8% in 2011, but gradually started to rise again after the political and economic stability that began in 2014, especially following the monetary reform program implemented at the end of 2016 with the support of the International Monetary Fund. However, the state of instability and the internal and external crises experienced by the Egyptian economy during the period (2011-2023) prevented a significant improvement in the Gross Domestic Product growth rate, which decreased to an average of about 3.9% annually during that period.

Considering the evolution of the unemployment rate in Egypt during the period (1990-2023) as illustrated in table number (1) in the statistical annex and the table above, it's evident that the unemployment rate exhibited fluctuations, experiencing waves of both increase and decrease throughout the study period. However, it can be said that there is

a general increasing trend in the unemployment rate in Egypt during the study period. Several reasons contribute to this trend, including population growth rates exceeding the economy's capacity to create employment opportunities. Additionally, the educational system's failure to meet the demands of the labor market (Peeters, 2011) contributes to this trend. Furthermore, there's a lack of increased demand for labor due to a significant decline in investment rates. The public sector's reduced ability to provide more job opportunities resulted from the privatization program and the sale of public sector entities. This occurred simultaneously with a decline in the private sector's capacity to absorb more labor due to its limited role in economic activity and reliance on capital-intensive and technology-driven production methods.

During the 1990s, the Egyptian economy witnessed a significant rise in the unemployment rate due to the implementation of economic reform programs and the privatization program announced by the government in 1996, aiming to achieve high economic growth rates. This growth was expected to have a positive impact on employment rates within the Egyptian labor market. However, these policies did not have a positive effect on economic growth and therefore did not contribute to an increase in job opportunities aligned with the growth in the labor force (Touny, 2013). Data regarding unemployment rates in Egypt indicates an increase from 8.6% in 1990 to 11.1% in 1993, slightly decreasing to 8.1% in 1999. However, this led to a significant increase in the unemployment rate, estimated at about 9.4% on average annually during the period (1990-1999). During the first decade of the new millennium, unemployment rates increased from 10.2% in 2002 to around 11.2% in 2005, gradually decreasing to 8.7% in 2008 and then gradually rising again to 9% in 2010. This trend could be attributed to the government's continued implementation of economic reform programs, transitioning to a market economy, and the reduced role of the government in economic activity. This resulted in reduced private and public investments, subsequently reducing job opportunities. Unemployment reached approximately 9.8% annually, representing 2.3 million unemployed individuals on average during the period (2000-2010). Unemployment rates continued to rise due to political and economic instability, declining investment rates, and economic growth following the January 25, 2011, and June 2013 revolutions in Egypt. Unemployment reached 13.2% in 2013. However, with improved economic conditions, especially after the Egyptian government implemented a monetary reform program in

collaboration with the International Monetary Fund, unemployment rates gradually declined from 12.5% in 2016 to about 7.6% in 2023. The average unemployment rate during the period (2011-2023) was 11% annually.

By examining the trends in Gross Domestic Product (GDP) growth rate and unemployment rate during the study period, an inverse relationship between the two becomes apparent. While the impact of GDP growth rate on unemployment was limited during the study period, it is notable that despite periods of high local GDP growth rates, sustainability and stability were lacking, and consequently, there was no significant reduction in unemployment. For instance, when the local GDP growth rate declined at the beginning of the 1990s, there was an increase in unemployment, reaching around 11.1% in 1993, correlating with a significant decrease in the GDP growth rate in the same year, dropping to 2.9%. Subsequently, unemployment rates decreased as local GDP growth rates improved towards the end of that decade, reaching approximately 8.1% in 1999. However, unemployment rates rose again, coinciding with a modest local GDP growth rate of 3.2% in 2003, reaching around 11%. Subsequently, unemployment rates notably decreased in years that witnessed relative improvement in local GDP growth rates, particularly from 2006 to 2008.

Following the global financial crisis in 2008 and the events of the January 2011 revolution, a significant decline in local GDP growth rates was observed, coupled with a substantial increase in unemployment rates, reaching record levels from 2012 to 2015. Afterward, unemployment rates gradually declined with the progressive improvement in GDP growth rates due to the return of political and economic stability. Consequently, it becomes evident that unemployment rates increased during years of slowed economic growth, and vice versa, indicating an inverse relationship between local GDP growth rates and unemployment rates in Egypt during the study period. This confirms the potential existence of Okun's Law in the Egyptian economy.

5. Data, empirical model, and econometric methodology

5.1.Study Methodology:

The relationship between unemployment and economic growth has been a subject of considerable attention in economic literature, particularly in developing countries. Arthur M. Okun, an American economist, first demonstrated a negative empirical relationship between these two variables using data from the United States (1947-1960) in

1962. According to Okun, the elasticity of the unemployment rate to US economic growth is -0.3, meaning that when growth increases (declines) by 1%, the unemployment rate falls (increases) by 0.3 points. This relationship, known as Okun's Law, describes an empirical relationship between unemployment and real output growth and has proven to be one of the more durable correlations in current macroeconomic analysis.

Following Okun's pioneering work, numerous economists explored the link between changes in the unemployment rate and output growth, examining the sign and magnitude of Okun's coefficient in various specifications and for various nations. Several academics used modern econometric techniques and updated data to test the validity of Okun's Law throughout different periods and for different nations.

Okun's Law states that there exists an inverse and non-proportionate relationship between output and unemployment. Therefore, an increase in unemployment will lead to more than a proportionate decrease in output and vice versa. The theory has two versions: level and differenced.

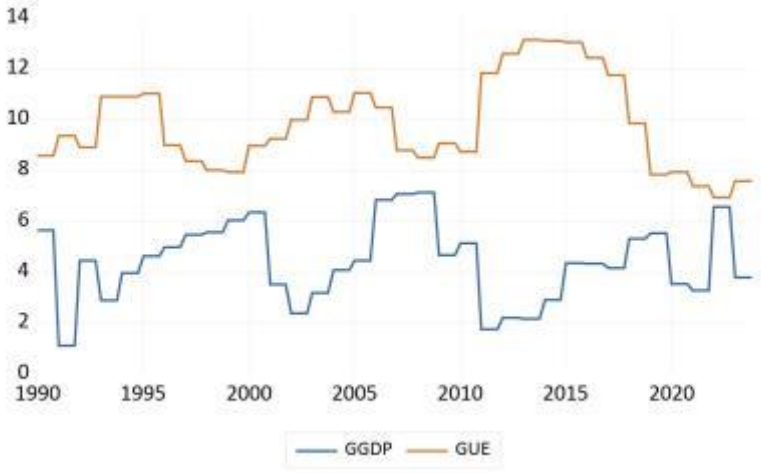
The study adopts a descriptive-analytical approach, focusing on analyzing and determining the directional relationship between the economic growth rate and the unemployment rate in Egypt. This is achieved through a standard analysis model, relying on the Auto Regressive Distributed Lag (ARDL) model for cointegration and the Error Correction Model (ECM) to measure the relationship between them in both the short and long terms. The study utilizes data from the World Bank spanning the period (1990-2023).

We have relied on the studies of both (Amor & Hassine, 2017) and (Conteh, 2021), This is to determine the equation of the standard model that will be tested.

5.2.Data

Between 2001 and 2019, the investigation relied on annual statistical data obtained from global development indicators, specifically World Bank data, to analyze Egypt's unemployment rate and economic growth rate. Consequently, our research measured economic growth using GDP growth (annually expressed in percentage) while unemployment was defined as the rate of jobless labor force in relation to the total labor force in the country. Therefore, the study focused on the interplay between two variables: unemployment and economic growth (GDP).

Figure No. (1) showing the study variables



Source: prepared by the researcher based on the outputs of the Eviews10.

5.3.Variables in descriptive statistics

Annual data was also converted to quarterly data, in order to obtain longer time series and thus a larger number of observations. This increases the accuracy of test results and increases confidence in them, and the views increased from 34 to 136 views.

The following table shows the raw data before converting to quarterly, while the statistical description of the quarterly data.

Table No. (2) Time series for the study variables

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
GGDP	5.7	1.1	4.5	2.9	4.0	4.6	5.0	5.5	5.6	6.1	6.4	3.5	2.4	3.2	4.1	4.5	6.8
GUE	8.6	9.4	8.9	10.9	10.9	11.0	9.0	8.4	8.0	8.0	9.0	9.3	10.0	10.9	10.3	11.0	10.5
Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
GGDP	7.1	7.2	4.7	5.1	1.8	2.2	2.2	2.9	4.4	4.3	4.2	5.3	5.6	3.6	3.3	6.6	3.8
GUE	8.8	8.5	9.1	8.8	11.8	12.6	13.2	13.1	13.1	12.5	11.8	9.9	7.9	7.9	7.4	7.0	7.6

Source: https://data.albankaldawli.org/indicator

Table No. (3): Statistical description of the study variables

	GUE	GGDP
Mean	9.85	4.41
Median	9.32	4.42
Maximum	13.15	7.16
Minimum	6.96	1.13
Std. Dev.	1.77	1.54
Skewness	0.39	-0.09
Kurtosis	2.05	2.33
Jarque-Bera	8.60	2.74
Probability	0.01	0.25
Sum	1339.59	599.83
Sum Sq. Dev.	424.01	320.99
Observations	136	136

Source: Eviews10 outputs.

5.4.Specifications for the Model and Estimation Technique

the research utilized the Okun's model with a modification, making unemployment the independent variable and GDP the dependent variable. The Okun's Law, which is an abbreviated version of the Philips curve, is based on the inverse relationship between GDP growth and unemployment.

GDP = f (Unemp.) is the model's formula (1)

Therefore, RGDP = $\beta 1 + \beta 2 Unemp + \mu$

Where GDP- denotes the rate of GDP growth (Economic Growth), Unemp- denotes the unemployment rate; $\beta 1$, $\beta 2$ - are the parameters, μ- is the error term

To approximate equation 1, the researchers first examined the stability characteristics of the variables used. The study included two-unit root tests, namely the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) experiments. The choice of these tests was based on the need to contrast and achieve accuracy.

The Phillips-Perron (PP) unit root test, as suggested by Hamilton (1994), is considered more reliable than the Augmented Dickey-Fuller (ADF) test due to its robustness in the face of serial correlation and heteroscedasticity. However, it has its own drawbacks. The study will also employ a novel estimation technique called limits testing within an autoregressive distributed lag (ARDL) system, which was proposed by Pesaran and colleagues (Pesaran 1997, Pesaran and Shin 1999, and Pesaran 2001). The ARDL can be used in this study regardless of whether the regressors are I(0) or I(1) since the order of integration is no longer relevant.

The purpose of this research is to investigate a long-term relationship by analyzing an error-correction model that does not assume any predetermined error rates.(UECM):

$\Delta LYt = \alpha 1 + \alpha TT + \alpha LYt - 1 + \alpha Unempl$L$Unemplt - 1 + \sum \alpha i \Delta LYt - i$ Pi

$= 1 + + \sum \alpha j \Delta UNt -$j $q\ j$

$= 0 + \varepsilon 1 t$ (3)

The ARDL method initiates by formulating and computing a universal distributed lag model, incorporating co-integration among variables to justify retaining lagged level variables in Equation 3.

Two asymptotic critical value boundaries serve as a reference for co-integration in cases where independent variables exhibit I(d) with $0 \leq d \leq 1$. These limits rely on the assumption that all regressors are I(0). If computed F-statistics fall below the lower limit, the null hypothesis of no co-integration is rejected. Conversely, if the observed F-statistics surpass the upper limit during calculation, the null hypothesis is rejected, signaling that the model's variables are in a steady state equilibrium. The

examination assesses the normality and homoscedasticity of the model to affirm the ARDL conclusion.

Before applying the ARDL method, it is essential to investigate the unit root properties of the variables under consideration. This can be done using the Phillips-Perron (PP) and Augmented Dickey-Fuller (ADF) unit root tests. These tests help to determine the stationarity of the time series data and ensure that the variables have a tendency to revert to a long-run equilibrium relationship.

5.5.Stationarity tests

The root test evaluates the stability of variable time series by assessing non-stationarity through an autoregressive model. The augmented Dickey–Fuller test, suitable for large samples, is commonly employed for this purpose. It checks if the mean, variance, and covariance of a time series are time-independent.

Table No. (4) Root Test for the study variables

UNIT ROOT TEST TABLE (PP)							
At Level		GUE	GGDP	At First Difference		d(GUE)	d(GGDP)
With Constant	t-Statistic	-1.84	-3.45	With Constant	t-Statistic	-11.54	-12.13
	Prob.	0.36	0.01		Prob.	0.00	0.00
		n0	**			***	***
With Constant & Trend	t-Statistic	-1.73	-3.44	With Constant & Trend	t-Statistic	-11.57	-12.06
	Prob.	0.73	0.05		Prob.	0.00	0.00
		n0	*			***	***
Without Constant & Trend	t-Statistic	-0.45	-1.14	Without Constant & Trend	t-Statistic	-11.58	-12.20
	Prob.	0.52	0.23		Prob.	0.00	0.00
		n0	n0			***	***
UNIT ROOT TEST TABLE (ADF)							
At Level		GUE	GGDP	At First Difference		d(GUE)	d(GGDP)
With Constant	t-Statistic	-1.55	-3.36	With Constant	t-Statistic	-11.49	-11.49
	Prob.	0.51	0.01		Prob.	0.00	0.00
		n0	**			***	***
With Constant & Trend	t-Statistic	-1.50	-3.35	With Constant & Trend	t-Statistic	-11.54	-11.45
	Prob.	0.83	0.06		Prob.	0.00	0.00
		n0	*			***	***
Without Constant & Trend	t-Statistic	-0.43	-1.25	Without Constant & Trend	t-Statistic	-11.53	-11.53
	Prob.	0.52	0.19		Prob.	0.00	0.00
		n0	n0			***	***

Source: Eviews10 outputs.

Table no. (4) variables underwent unit root testing for stationarity at both the level and first difference, employing Phillip-Perron and Augmented Dickey Fuller (ADF) test statistics. The results indicated that the GDP growth rate is stationary in both forms, while unemployment variables exhibited unit root concerns at I (0) and were stabilized through first differences. ARDL estimate and limits tests were employed to assess short and long-term dynamics based on the integration orders of zero and one, respectively. The tests revealed no co-integration in both short and long terms at a 5% significance level.

5.6.ARDL bounds testing approach:

Table No. (5) Bound test

F-Bounds Test		**Null Hypothesis: No levels relationship**		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	0.969238	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.50%	4.18	4.79
		1%	4.94	5.58

Source: Eviews10 outputs.

The ARDL bounds test and the approximation F-test results indicate that there is no long-run relationship between variables. At the 5% level of significance, the decision criteria is based on the F-statistic (0.969238), which is lesser than the lower bound of the critical value of (3.62), and we should not reject the null hypothesis that co-integration does not exist (no cointegration exist).

5.7.Estimation Error Correction Model (ECM-ARDL)

Table No. (6) ARDL Error Correction Regression

Dependent Variable: D(GUE)
Selected Model: ARDL(5, 9)
Case 2: Restricted Constant and No Trend
Date: 12/23/23 Time: 18:57
Sample: 1990Q1 2023Q4
Included observations: 127
ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GUE(-1))	0.007	0.076	0.088	0.930
D(GUE(-2))	0.007	0.076	0.088	0.930
D(GUE(-3))	0.007	0.076	0.088	0.930
D(GUE(-4))	0.233	0.076	3.063	0.003
D(GGDP)	-0.386	0.049	-7.871	0.000
D(GGDP(-1))	0.037	0.059	0.627	0.532
D(GGDP(-2))	0.037	0.059	0.627	0.532
D(GGDP(-3))	0.037	0.059	0.627	0.532
D(GGDP(-4))	-0.075	0.060	-1.243	0.217
D(GGDP(-5))	0.022	0.046	0.483	0.630
D(GGDP(-6))	0.022	0.046	0.483	0.630
D(GGDP(-7))	0.022	0.046	0.483	0.630
D(GGDP(-8))	-0.263	0.049	-5.402	0.000
CointEq(-1)*	-0.046	0.026	-1.720	0.088
R-squared	0.525	Mean dependent var		-0.010
Adjusted R-squared	0.470	S.D. dependent var		0.532
S.E. of regression	0.387	Akaike info criterion		1.043
Sum squared resid	16.926	Schwarz criterion		1.357
Log likelihood	-52.233	Hannan-Quinn criter.		1.170
Durbin-Watson stat	1.976			

* p-value incompatible with t-Bounds distribution.

Source: Eviews10 outputs.

The error term coefficient is -0.046, which is not significant, meaning the correction from the short run to the long run *but* it is not statistically significant, meaning that this result cannot be relied upon, and the value of this coefficient is weakly significant.

5.8.Estimation

Derived from the co-integrating relationship outlined in the ARDL(p, q) for both difference and gap models, we compute short-term and long-term parameters, commencing with the following equation:

Cointegrating Equation:

D(GUE) = -0.045*(GUE(-1) - (-1.25*GGDP(-1) + 15.26))

Table No. (7) ARDL Long Run Form and Bounds Test

Dependent Variable: D(GUE)
Selected Model: ARDL(5, 9)
Case 2: Restricted Constant and No Trend
Date: 12/23/23 Time: 18:53
Sample: 1990Q1 2023Q4
Included observations: 127

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.695	0.425	1.635	0.105
GUE(-1)*	-0.046	0.028	-1.653	0.101
GGDP(-1)	-0.057	0.044	-1.293	0.199
D(GUE(-1))	0.007	0.079	0.085	0.933
D(GUE(-2))	0.007	0.079	0.085	0.933
D(GUE(-3))	0.007	0.079	0.085	0.933
D(GUE(-4))	0.233	0.079	2.955	0.004
D(GGDP)	-0.386	0.051	-7.498	0.000
D(GGDP(-1))	0.037	0.061	0.614	0.540
D(GGDP(-2))	0.037	0.061	0.614	0.540
D(GGDP(-3))	0.037	0.061	0.614	0.540
D(GGDP(-4))	-0.075	0.061	-1.224	0.223
D(GGDP(-5))	0.022	0.048	0.471	0.639
D(GGDP(-6))	0.022	0.048	0.471	0.639
D(GGDP(-7))	0.022	0.048	0.471	0.639
D(GGDP(-8))	-0.263	0.050	-5.255	0.000

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GGDP	-1.252	0.770	-1.626	0.107
C	15.260	3.458	4.412	0.000

EC = GUE - (-1.2518*GGDP + 15.2596)

Source: Eviews10 outputs.

The results of the model tests showed that there is no direct relationship between GDP Growth as an independent variable and the growth of the unemployment rate as a dependent variable, but there is relationship at the At the difference at level and the influence factor by approximately (-0.386), with a significance at level of 5%, meaning that an increase in the growth rate of output by 1% leads to a decrease in the

unemployment rate by (-0.386%) In a later period, holding other factors constant. which is in line with Okun's law, but This relationship is only in the short run, while the no existence of a long-run cointegration relationship between the two variables has not been proven.

5.9.Goodness of the Model

Several tests were executed to evaluate the appropriateness and durability of the model employed for estimating the indicated parameters, as depicted below:

Table No. (8) ARDL Long Run Form and Bounds Test

R-squared	0.959266	Mean dependent var	9.911402
Adjusted R-squared	0.953762	S.D. dependent var	1.816016
S.E. of regression	0.3905	Akaike info criterion	1.074535
Sum squared resid	16.92643	Schwarz criterion	1.432857
Log likelihood	-52.23295	Hannan-Quinn criter.	1.220117
F-statistic	174.2672	Durbin-Watson stat	1.975568
Prob(F-statistic)	0		

Source: Eviews10 outputs.

The value of the Adjusted R-squared was 95%, which indicates the strength of the model's significance, as it measures 95% of the population. The value of the F-statistic was also greater than its tabular value, which confirms the quality of the model. The probability was less than 5%, which indicates the significance of the model, and thus the model is capable of efficiently and significantly indicating its parameters.

a. Autocorrelation Test:

Table No. (9) Breusch-Godfrey Serial Correlation LM Test

Null hypothesis: No serial correlation at up to 10 lags

F-statistic	0.767359	Prob. F(10,101)	0.6596
Obs*R-squared	8.96764	Prob. Chi-Square(10)	0.5352

Source: Eviews10 outputs.

The Breusch-Godfrey serial correlation LM Test was employed to examine autocorrelation. The Statistic-F and Chi-Square values indicated non-significance in both short and long terms at a five percent significance level. Consequently, the null hypothesis stands, and the model is free from autocorrelation issues.

b. Heteroskedasticity Test:

Table No. (10) Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null hypothesis: Homoskedasticity

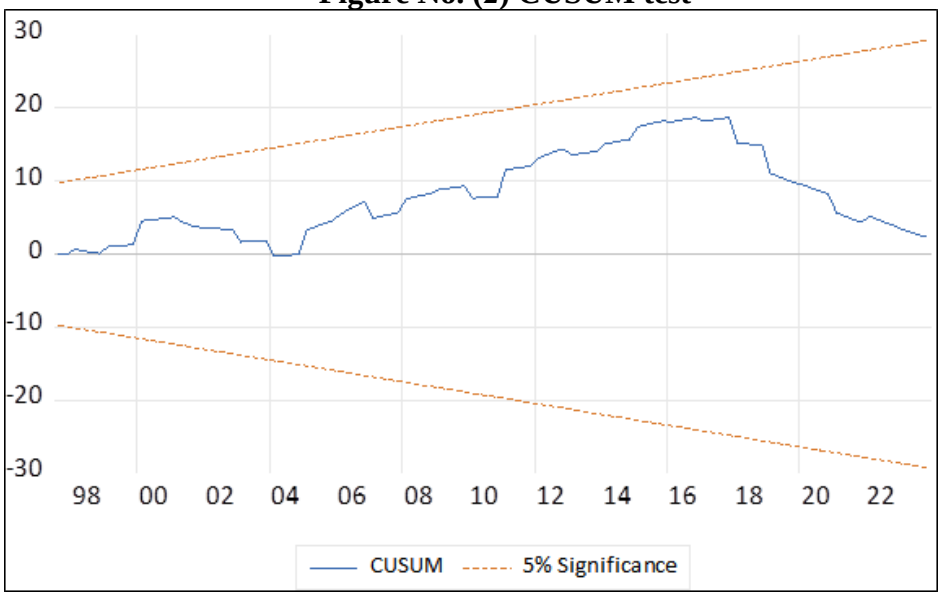
F-statistic	0.553	Prob. F(15,111)	0.904
Obs*R-squared	8.826	Prob. Chi-Square(15)	0.886
Scaled explained SS	30.595	Prob. Chi-Square(15)	0.010

Source: Eviews10 outputs.

Table (10) presented the Breusch-Pagan-Godfrey test, revealing that both the F-statistic and Chi-Square values were not significant. Hence, the model is unaffected by the issue of heteroscedasticity.

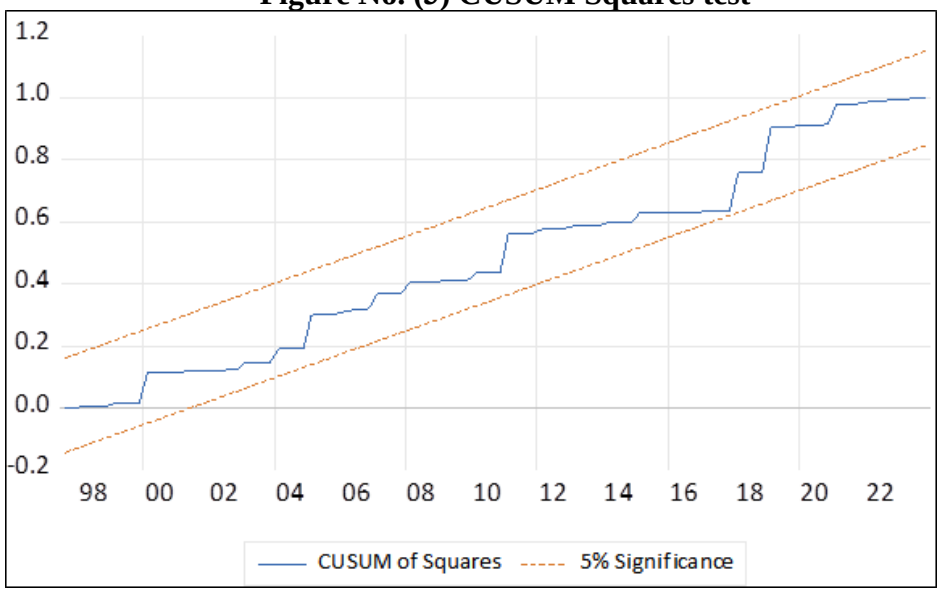
c. Structural Stability Test:

Figure No. (2) CUSUM test



Source: Eviews10 outputs.

Figure No. (3) CUSUM Squares test



Source: Eviews10 outputs.

The structural stability test of the model utilized the CUSUM test, CUSUM Squares test depicting the cumulative total of residuals remain within the five percent limit, indicating the model's structural stability. The outcomes of preceding tests affirm the appropriateness and high quality of the employed model.

6. Conclusion and Discussion

The study critically investigates the influence of unemployment on Egypt's economic growth using time series data from 1990 to 2020. The relationship between unemployment and economic growth was found to be adverse, indicating that reducing unemployment would ensure Egyptian economic growth. The effects of Okun's law coefficient suggest a negative association between unemployment and GDP, since low economic growth is one of the reasons for the rise in unemployment. As the decrease in aggregate demand triggers the decline in aggregate supply, a decrease in production leads to a decrease in economic growth rates. Thus, companies cut staff, which raises unemployment, exacerbating long-run unemployment issues. In summary, the study's findings support Okun's law, as they prove that growing GDP decreases unemployment in Egypt. Based on the findings, the following recommendations are presented:

1. The government and policymakers should develop policies to promote self-employment and lower the cost of doing business in the country to achieve fast and sustainable economic growth.
2. Formulation of efficient policies and programs to reintegrate unemployed youth, especially into the informal sector of the economy.
3. The government should ensure that the educational system is changed so that young school leavers and graduates can create jobs rather than look for them.
4. There is a need to implement policies geared toward improving the informal economy to promote entrepreneurship, which would likely minimize unemployment and increase Egyptians' welfare and living standards.

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