The Determinants of Unemployment in Jordan: ARDL Approach

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Abstarct
The importance of this study is due to the fact that unemployment rates in Jordan have reached high rates, reaching 24% of the labor force in 2022, and this is due to many economic, social, demographic and political factors. Therefore, this study attempts to test the effect of some variables such as per capita GDP (PCGDP), Population growth rate (POPG), inflation rate (INF) of unemployment in Jordan for the period 2000-2022 that may affect unemployment rates in Jordan and then reach results and recommendations that may benefit political decision-makers and researchers. This study adopted the econometrics analysis approach to test the study hypotheses. The study used cointegration test, F-bounds test and ARDL model to examine the effect of unemployment determinants in Jordan. cointegration test and F-bounds test results indicated that there is a long term relationship between (PCGDP, POPG, INF) and unemployment in Jordan. ARDL long run results indicated that PCGDP has a negative and significant impact on unemployment in Jordan, while (INF) has a negative and not significant impact on unemployment. In addition, ARDL long run results indicated that POPG has a positive and significant impact on unemployment in Jordan. These results indicated that PCGDP and POPG are good determinants for unemployment rates in Jordan. The study recommends that decision makers should work to maintain high rates of economic growth to ensure a reduction in the unemployment rate in Jordan, and even to eliminate this harmful phenomenon economically and socially
Keywords: Unemployment, Per Capita GDP, Inflation, Jordan, ARDL.

Introduction
The developed, developing and least developed countries of the world, including Jordan, suffer from the phenomenon of high unemployment rates. Where the problem of unemployment is one of the most important problems that concern the economist, politician and decision-makers, because the high unemployment rates are not limited to the negative effects on the economy only, but also go beyond that, as it leads to the spread of many health and psychological problems, drug abuse and high crime rates.
Unemployment viewed as a global economic problem and classified as the most important and biggest impediment to social and economic progress, regardless of the fact that it

represents a great waste of the workforce, especially those who are trained, qualified, creative, and present in abundance in developing countries. Unemployment generates a great loss in economic well-being due to the decline in production and, consequently, the decline in income and the low standard of living (Kenny, 2019).

Jordan suffers from an increase in unemployment rates, as it increased from 13.0% in 2000 to 24.1% in 2022. This is due to many economic, social, political and demographic variables. The motive behind conducting this study is that it is looking at one of the most important issues, which preoccupy the public just as it preoccupies economic and political decision-makers on the one hand. On the other hand, it is an attempt to search for the identification of variables that affect significantly in reducing unemployment rates and the recommendation to work on enhancing them. Identifying the variables that significantly affect the increase in unemployment rates, and recommending work to reduce them and their effects.

Therefore, this study came to examine the determinants of unemployment in Jordan represented by population growth, per capita GDP, and inflation during the period 2000-2022.

Literature Review

Unemployment is viewed as a macroeconomic problem, in addition to being a social problem. In addition, the problem of unemployment occurs as a result of the inability to provide job opportunities that are compatible with the increase in the population in any country. So that in many cases, those who work, especially in the private sector, live with fear because of the lack of job security and follow the policies of reducing employment according to the economic conditions of boom, recession or inflation.

It is said that there is unemployment if it is not possible to find job opportunities for all those who are qualified and able to work and those who are willing and looking for it. It is said that labor is unemployed if it works below its capacity or is not fully utilized, whether in the productive or service sectors of the economy (Anyawuocha, 2005) .

 The causes of unemployment are represented in the use of machines and computers in business instead of labor, which contributed to social problems. Countries privatized their projects and computerized all their businesses, which reduced their ability to employ. The educational system, as countries expanded in the last five decades in education with a focus on humanities, administrative sciences and pure sciences and did not give any attention to vocational, technical and innovation education. Lack of sufficient interest in the agricultural sector and its development. In addition choosing capital-intensive businesses, all of which contributed to the exacerbation of the problem of unemployment in most countries, especially developing and least developed countries (Kenny, 2019).

Empirical Evidence

There are many studies that dealt with determining the variables that affect unemployment rates, and these studies were distributed among studies at the level of one country, several countries, regions, and at the world level, including:

Muin (2020) examined the effect of the study period and economic growth on unemployment rates in 34 provinces in Indonesia for the period 2015-2018. The results of the analysis of time series and cross-sectional data (panel data) indicated that increasing the study period reduced unemployment rates in the Indonesian provinces, while economic growth had a slight effect. The study recommended the need to obtain appropriate education for all populations.

Kenny (2019) tested the causal relationship between the unemployment rate and the economic growth rate in Nigeria for the period 1981-2016 and used the VAR GRANGER technique based on the VAR model. The results indicated that there is a unidirectional causal relationship from the unemployment rate to the economic growth rate, and this means that the economic growth rate does not cause unemployment in Nigeria.

Riaza & Zafar (2018) tested the impact of the gross domestic product, population, vocational and technical education, and the number of enrollments in universities and institutes on the unemployment rate in Pakistan for the period 1990-2015. The study used ARDL model to test the hypotheses of the study. The results indicated that the gross domestic product has a negative and significant effect on the unemployment rate in Pakistan in the long term, while the population and the number of those enrolled in higher education and colleges had a positive and significant effect on the unemployment rate in Pakistan in the long term.

Muhammad (2015) examined the effect of the rate of economic growth, the rate of inflation, investment spending, and the rate of trade exchange on the unemployment rate in Palestine for the period 1988-2012. The study used a VAR model to test the hypotheses of the study. The results of the econometrics analysis indicated that the rate of economic growth, the rate of investment horizons, and the rate of trade exchange had a significant and negative impact on the unemployment rate in Palestine, while the rate of inflation had a positive and significant impact on the unemployment rate in Palestine.

Chowdhury & Hossain (2014) tested the determinants of the macroeconomic variables of the unemployment rate in Bangladesh for the period 2000-2011. The results of the econometrics analysis indicated that economic growth and the exchange rate had a negative and significant effect on the unemployment rate in Bangladesh, while the inflation rate had a positive and significant impact on the unemployment rate in Bangladesh.

Arslan & Zaman (2014) aimed to identify the variables that affect the unemployment rate in Pakistan for the period 1990-2010. The study concluded that the rate of inflation, the growth rate of GDP and foreign direct investment had a negative and significant impact on the unemployment rate in Pakistan, while the results indicated that the population growth rate had a positive and significant impact on the unemployment rate in Pakistan.

Eita & Ashipala (2010) Examined the determinants of unemployment in Namibia for the period 1971-2007. The results of the causal relationship analysis concluded that there is a negative relationship between inflation, investment and aggregate demand unemployment in Namibia.

Tunah (2010) examined the impact of macroeconomic variables on the unemployment rate in Turkey and use quarterly data for the period 2000-2008. The Johansen cointegration test and the Granger causality test used for the analysis. The results indicated that the real GDP, consumer price index, and the previous unemployment rate had a significant effect on the unemployment rate in Turkey, while the results indicated that the real effective exchange rate had no significant effect on the unemployment rate in Turkey.

Ozturk & Aktar (2009) They worked on testing the relationship between the gross domestic product, foreign direct investment, exports, and unemployment rate. They used variance decomposition and the impulse response function. They concluded that the gross domestic product and foreign direct investment did not work to reduce the unemployment rate in Turkey.

Chang (2007) examined the relationship between economic growth, degree of openness, foreign direct investment and unemployment in Taiwan. And they used variance decomposition and impulse response function to test this relationship. They concluded that

there is no relationship between foreign direct investment and unemployment in Taiwan, while there was a clear and negative relationship between economic growth and unemployment in Taiwan.

It is noted from the review of previous studies that they used different variables such as economic growth, inflation, consumer price index, foreign direct investment, trade openness, vocational and technical education, the number of students enrolled in higher education and the population. Also they used different techniques suc as VAR model, multiple linear regression, ARDL approach, variance decomposition, impulse response function, and johansen cointegration test and granger causality test. None of them dealt with per capita GDP, which considered one of the important economic variables. Therefore, this study contributes to the current literature by examining the impact of per capita GDP on the unemployment rate in Jordan, in addition to the rate of inflation and the rate of population growth. This study is also one of the few studies. Which dealt with the determinants of unemployment in Jordan, in addition to providing additional empirical evidence for the literature that dealt with the determinants of unemployment from a developing country, Jordan.

Descriptive Analysis
Table No. (1) Shows the descriptive analysis of the study variables unemployment (UNE) in Jordan and its determinants per capita GDP (PCGDP), inflation (INF) and population growth (POPG) over the period 2000-2022. From table (1) the mean, median, maximum, minimum and Std. Dev for (UNE) are 15.5%, 14.4%, 24.1%, 11.9% and 3.6% respectively. Table (1) shows that the (UNE) is the most most volatile variable, the value of the std. Dev. for UNE is 3.6%, and the least fluctuation is POPG) with a std. Dev of2.2%.

Table No
(1) Descriptive analysis

	UNE	INF	POPG	PCGDP
Mean	0.155261	0.030797	0.038584	3087.841
Median	0.144	0.028727	0.028765	2933.761
Maximum	0.241	0.139712	0.0925	3654.998
Minimum	0.119	-0.00852	0.0213	2723.496
Std. Dev.	0.036925	0.031208	0.022605	320.2227

Correlation Matrix
Table No. (2) shows the results of the correlation matrix between the dependent variable (UNE) and the independent variables (INF, POPG and PCGDP) on the one hand, where the highest correlation value was between the unemployment rate and the per capita GDP (66.3%) and the lowest value between the unemployment rate and the inflation rate (25.04%. As well as between the independent variables on the other hand. Table No. (2) shows that there is no problem of multicollinearity between the independent variables since the highest correlation value between the independent variables was between the inflation rate and per capita GDP (51.9%, with a rate of less than 80%. According to Kennedy (2008) who says that, the multicollinearity problem appears between the two independent variables if the correlation coefficient between them is equal to 80 % or more.

Table 2
Correlation Matrix

	UNE	PCGDP	INF	POPG
UNE	1	-0.66364	-0.25042	-0.4793
PCGDP	-0.66364	1	0.51922	0.218128
INF	-0.25042	0.51922	1	0.008682
POPG	0.4793	0.218128	0.008682	1

Data and Methodology
Data
Data on unemployment rate (UNE) and population growth rate (POPG) in Jordan were collected from the database of the Department of Statistics. While data related to per capita GDP (PCGDP) and inflation rate (INF) were collected from the database of the Central Bank of Jordan for the period 2000-2022

Methodology
This study used the descriptive analysis method and the standard analysis method. Where he used the descriptive analysis approach to write the theoretical framework based on previous studies and published research. The econometric analysis method was used to test the determinants of the unemployment rate in Jordan for the period 2000-2022.

Econometrics Model
The study model formulated based on previous studies as a study of (Riaza & Zafar 2018) in order to clarify the determinants of tax revenues in the Arab countries (Jordan, Egypt, Lebanon) during the period 2000-2021 through the following econometric model:
$UNE_t = f(PCGDP_t, POPG_t, INF_t)$……………(1)
The linear form of the model as follows:
$$UNE_t = \alpha_0 + \alpha_1 PCGDP_t + \alpha_2 POPG_t + \alpha_3 INF_t + U_t ………(2)$$
where:
UNE: unemployment rate (is the percentage change in unemployment).
PcGDP: per capita gross domestic production (GDP/Population).
INF: inflation rate (the percentage change in consumer index).
α_0: intercept.
$\alpha_1, \alpha_2, \alpha_3$: Parameters.
U: error term.
T: time.

Results and Discussion
Unit Root Test
The first step in data analysis is to test whether the data is stationary or not, in order to choose the appropriate econometric analysis method to achieve the objectives of the study and to avoid spurious regression (Granger and Newbold (1974). To achieve this goal, the Augmented Dickey - Fuller (ADF, 1979) test was used.

Table No. (3)
Results of the Augmented Dickey-Fuller (ADF) Unit Root Test

Variable	At level at 5%	At First difference at 5%	Stationary
UNE	0.362014 (0.9762)	-3.1112 (0.0411)	I(1)
PCGDP	-2.22625 (0.2035)	-4.416 (0.0027)	I(1)
POPG	-2.14852 (0.2291)	-4.92808 (0.0008)	I(1)
INF	-4.31417 (0.003)		I(0)

It is noted from Table No. (3) that shows the results of the unit root test (ADFthat the variables (UNE, PCGDP, POPG) are not stationary at the level and when taking the first difference of these variables they became stationary and this indicates that they are integrated of the first degree I (1), where the values of The absolute Dickie-Fuller critical values are greater than the absolute Dickie-Fuller critical values at the 5% level of significance. While the results of ADF test shows that the variable (INF) is stationary at level.

5.2 Choosing the appropriate number of lag periods:

The appropriate number of lag periods should be chosen carefully because an inappropriate number of lag periods leads to biased and unacceptable results for the analysis (Shahzad, et al., 2014). The selection of the optimal or appropriate number of lag periods is necessary to conduct the cointegration test and other tests. The study used the VAR Lag order selection criteria to choose the appropriate number of lag periods. The results in Table 4 indicate that all criteria indicate that the optimal number of lag period(1) .

Table No. (4)
Results of choosing the appropriate number of lag periods.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	193.4337	NA	3.90E-13	-17.2213	-17.0229	-17.1745
1	258.3359	100.3033*	4.72e-15*	-21.66690*	-20.67504*	-21.43325*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Cointegration Test
The results of the time series stationary test showed that not all the study variables are stationary at the level except for the (INF), so it is necessary to conduct the cointegration test in order to use the appropriate econometric model. The cointegration test developed by Johansen (1991) was used to determine whether the variables of the study were cointegrated or not. This test determines the number of long-term relationships between variables. The Johansen test offers two tests, the Trace test and the Maximum Eigenvalue test. The results of co-integration test in Table (5) indicate that there is one equations for co-integration between the variables of the study at a significant level of 5%. This result indicates the existence of a long-term equilibrium relationship between the variables of Per capita GDP, population growth, inflation rate and unemployment rate in Jordan. That is, there is a relationship that goes from Per capita GDP, population growth, and inflation rate to unemployment rate in Jordan. This result is consistent with the feedback hypothesis which states that there is a causal relationship between Per capita GDP, population growth, inflation rate and unemployment rate.

Table No. (5)
Trace Test Cointegration Test Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.73381	51.42897	47.85613	0.0222
At most 1	0.540191	23.63452	29.79707	0.2163
At most 2	0.291749	7.318685	15.49471	0.5409
At most 3	0.003546	0.074599	3.841466	0.7847

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Bound Test Results
The Bound test used to find the co-integration between the study variables. The results in the Table (6) revealed that the value of F Statistics is (3.751) which is greater than the upper bound value I(1) at a significance level of 5%, which means there is a long run relationship between (UNE) and the independent variables (PCGDP, POPG, INF).

Table 6
Bound Test

F-Bounds Test		Null Hypothesis: No levels relationship			
Test Statistic	Value	Signif.		I(0)	I(1)
				Asymptotic: n=1000	
F-statistic	3.751829	10%		2.37	3.2
K	3	5%		2.79	3.67
		2.50%		3.15	4.08
		1%		3.65	4.66

ARDL Long Run Results

The results of estimating the ARDL model in Table No. (7) show that the per capita GDP (PCGDP) has a significant and negative effect on the unemployment rate in Jordan, where the (PCGDP) coefficient -.72973 and significant level of 5%. This indicates that an increase in the (PCGDP) by one unit will lead to a decrease in the unemployment rate by one unit. Economic growth is a vital and important factor affecting unemployment. In theory, there should be a positive relationship between economic growth and employment, or a negative relationship between economic growth and unemployment. The economic theory that talks about the relationship between economic growth and unemployment is the so-called Okun's Law, which studies the trade-off between economic growth and unemployment (Chowdhury & Hossain ,2014). This result consistent with the result of Arslan & Zaman 2014; Muhammad, 2015; Riaza and Zafar, 2018; Tunah, 2016 and not consistent with the result of Ozturk and Aktar, 2009.

Table (7)
ARDL long Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PCGDP	-0.72973	0.288837	-2.52646	0.0224
INF	-0.08235	0.394093	-0.20897	0.8371
POPG	1.86451	0.738367	2.52518	0.0225
C	2.79252	1.010072	2.764675	0.0138

The results of estimating ARDL model also indicate that the rate of inflation (INF) has a negative and non-significant effect on the unemployment rate in Jordan. The non-significance is due to the fact that inflation rates (INF) were generally low during the study period in Jordan. As for the negative relationship, it is due to the fact that every increase in economic growth will be accompanied by an increase in demand. This will undoubtedly lead to higher rates of employment and inflation rates (INF). This is consistent with what was stated by the Phillips curve. Inflation is one of the important variables that affect the unemployment rate. Phillips assumed in 1958 that when an economy witnesses growth, inflation accompanies it, and this would lead to the generation of more job opportunities and thus lead to a decrease in the unemployment rate. This trade-off theory is called the Phillips curve (Kaur, 2014;

Dholakia & Sapre, 2011). This result consistent with the result of (Tunah, 2010; Eita & Ashipala, 2010).

Finally, the results of estimating the ARDL model indicated that the population growth rate (POPG) has a positive and significant effect on the unemployment rate in Jordan, where the coefficient of the population growth rate (POPG) was 1.86 at a significant level of 5%. This indicates that an increase in population growth by one unit will lead to an increase in unemployment rates by 1.8 unit, and this is consistent with economic theory. In theory, there should be a positive relationship between economic growth and employment, or a negative relationship between economic growth and unemployment. The economic theory that talks about the relationship between economic growth and unemployment is the so-called Okun's Law, which studies the trade-off between economic growth and unemployment (Chowdhury & Hossain, 2014). This result consistent with result of (Arslan and Zama, 2014).

5- 6The ARDL Residuals Diagnostic Tests

The following diagnostic tests (normality test: Jarque Pera, Heteroskedasticity Test: Breusch-Pagan-Godfrey, and Breusch-Godfrey Serial Correlation LM Test) were performed to ensure the model's reliability and validity. Tables (8), (9), (10) show the results of the diagnostic tests, which indicate that the level of significance for the three tests is greater than 5%, This is an indication that there is no problem of serial correlation, heteroskedasticity, in addition to residuals are normally distributed. This is evidence of the model validity.

Table (8)
Normality Test Jarque Pera Result

0.076569	0.962439

Table (9)
Breusch-Godfrey Serial Correlation LM Test Result:

F-statistic	1.97714	Prob. F(2,14)	0.1753
Obs*R-squared	4.845316	Prob. Chi-Square(2)	0.0887

Table (10)
Heteroskedasticity Test: Breusch-Pagan-Godfrey Result

F-statistic	1.017504	Prob. F(5,16)	0.4397
Obs*R-squared	5.307661	Prob. Chi-Square(5)	0.3795
Scaled explained SS	2.759765	Prob. Chi-Square(5)	0.737

Conclusions and Recommendations

This study aimed to test the effect of unemployment determinants in Jordan for the period 2000-2022 and used the cointegration test, F- Bound test and ARDL model to test the impact of PCGDP, POPG,INF on unemployment rate in Jordan. The results of Cointegration test and F-Bound test indicated that there is long term relationship between (PCGDP, POPG,INF) and unemployment rate in Jordan for the period 2000-2022.

The results also indicated that the per capita GDP has a negative and significant impact on the unemployment rate, meaning that the greater the economic growth, the lower the unemployment rate.

The results indicated that the population growth rate had a positive and significant impact on the inflation rate in Jordan,   and this is due to the fact that the increase in population growth

rates at rates greater than the economic growth rates will be accompanied by an increase in the supply of the labor force in a way that is greater than the available job opportunities in the economy, which raises the unemployment rate.

As for the inflation rate, it had a negative and non-significant effect, and this is due to the low inflation rates during the study period in Jordan

In the light of these results, the study recommends that decision makers should work to maintain high rates of economic growth to ensure a reduction in the unemployment rate in Jordan, and even to eliminate this harmful phenomenon economically and socially. The study also recommends controlling population growth rates, controlling forced and voluntary migration, and replacing expatriate workers with local workers. The study also recommends conducting more studies on the determinants of unemployment in Jordan.

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