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Abstract

The objective of this paper is to measure the impact of economic growth on unemployment in the Jordanian economy in the short and long-run during the period (1980-2011) by implementing the okun's law. The relationship is measured by performing the gap model with Hodrick-Prescott filter (HP filter) to calculate the potential gross domestic product.

To this end, an Autoregressive Distributed Lag (ARDL) approach to co-integration and the Error Correction Model (ECM) are employed to represent the short and long term relationship.

The results indicate that the economic growth has a weak significant negative short- and long-run effect on unemployment.

KAY WORDS : unemployment, okun's law, gap model, Autoregressive Distributed Lag(ARDL) approach, co-integration, Error Correction Model.

Introduction

for long time, unemployment has been one of the most prominent challenges facing Jordan's economy, however Jordan is considered one of the highest rates of human development at the Arab level in terms of the high rate of education and health. Statistics show that unemployment in Jordan is a proximally 15% rate and show a tendency to rise in light of the current political situation experienced by the neighboring Arab states. economists believe that the causes of unemployment in Jordan is limited to structural imbalances in the labor market, and migrations commodes and commodes from neighboring Arab countries, in addition to economic recessions Lieutenant in some of the stages experienced by the Jordanian economy. Unemployment is generally associated with the status of the economic cycle. Where unemployment intensified in economic recession, And that at the time of economic crises which result either due to internal factors related to the procedures of Labor and Employment or imbalance between the outputs of education and The requirements of the labor market or due to factors related to the external pressure system of the international economy. In contrast if there is an economic boom, It will be reflected on the local economy in terms of growth and diversification, leading to the availability many of employment opportunities. Thus, it is obvious that the economic cycle an essential role in the formation of the economy of contemporary societies and there labor market activity.

Trying to understand how the economic cycle influences unemployment, there should be an understanding of the relationship between unemployment and growth, which presented by the American economist (Arthur Okun) in 1962, Where reached to the existence of a negative relationship between changes in unemployment rates around the normal rates and changes in real GDP around the potential average, which is known as the law of (Okun's Law). Okun has been found that the high (or low) GDP by 1% will lead to high (or low) unemployment rates by 0.35%, and this relationship confirmed by several studies conducted in many countries of the world.

Therefore, this study attempts to find out the applicability of the Okun's Law on the Jordanian economy, If there is a relationship between unemployment and growth according to the Okun's Law will estimate the rate of growth in real GDP needed to solve the problem of unemployment in Jordan.

Literature Review

Many studies emphasized the existence of a relationship between economic growth rates and the change of prevailing unemployment rates in the economy, And the

general trend of this relationship seems theoretically through the inverse relationship between growth and unemployment rate, That's where high economic growth leads to increased employment rate and this means lower unemployment rate. But this relationship is not necessarily always true, because economic growth takes place in two directions, the first one is due to an increase of the labor productivity, which does not lead to the creation of additional jobs, The other direction associated with an increase of the amount of labor supply, which leads to the creation of additional jobs and thus reduce the rate of unemployment in the economy.

These contradictions in the perception of the relationship between growth and unemployment has led many economists to study this relationship, one of the most prominent studies is the study carried out by the U.S. economic (Arthur Okun) (1962), which reached to the existence of an inverse relationship between economic growth and unemployment rates in the United States for the period between 1947-1957, Okun has been found to be high (or low) GDP by 3% will lead to high (or low) unemployment rates by 1%.

Many economists have tested the relationship that reached her Okun (Arthur Okun).

In a study of Ting and Ling (2011) that aimed to examine the existence of Okun's relationship in terms of Malaysia economy, The relationship is measured by applying the first difference and gap model with Hodrick-Prescott filter (HP filter), furthered with Autogressive Distributed Lag (ARDL) to determine the co-integration between the variables and their causality. The result show the Okun's coefficient is -1.825 percent which is significant at 1 percent error.

Kreishan (2011) investigates the relationship between unemployment and economic growth in Jordan through the implementation of Okun's law, Using annual data covering the period 1970-2008, The empirical results reveal that Okun's law cannot be confirmed for Jordan. Thus, it can be suggested that the lack of economic growth does not explain the unemployment problem in Jordan.

Arshad (2010) used The gap equation and technique of Hodrick-Prescott filter (HP) for short run analysis to investigate the presence of Okun's (1962) relationship in the Swedish economy, whereas co-integration model and the error correction model is used to test the relationship between unemployment and GDP in the short and long run. The study shows that the Okun's law exists in the Swedish economy from the period 1993 quarter 1 to 2009 quarter 2, and found the Okun's coefficient is -2.22 percent. and also proves that there exist a long run and short run relationship between unemployment and GDP.

Villaverde & Maza (2007), try to analyze Okun's law for Spain and its seventeen regions over the period from 1980-2004. Based on its "gap" specification and using two different detrending techniques, the results show that an inverse relationship between unemployment and output holds for most of the Spanish regions and for the whole country. However, the quantitative

values of Okun's coefficients for these regions are quite different. In addition, the coefficients for each region varied across the two detrending techniques. Even so, these coefficients are lower than those initially estimated by Okun and others. Also confirmed Stephan (2012) in the study presented by the existence of an inverse relationship between unemployment and growth in both Britain and France.

Javeid (2005), used annual time series data during the period 1981-2005 of Pakistan to find the association between unemployment rate and GDP growth which is presented empirically by Arthur Okun's in early 1960s. he applied difference version of Okun's law which is more appropriate to access results directly from empirical data, and used Engle-Granger cointegration technique and Error Correction Mechanism (ECM) to find the short term behavior of GDP growth to its long run value. The result show negative relationship between unemployment rate and GDP growth and both variables have long run relation with each other. Moreover GDP growth will adjust more quickly towards equilibrium in the long run.

A study of Moses (2008) showed Non-applicability of these relations on many Arab countries, where unemployment rate does not intend to downward in the case of high economic growth in Algeria, Egypt, Morocco and Tunisia. Driouche (2013) confirmed the previous result, by adopting The Autoregressive Distributed Lag approach - ARDL to test the relationship between unemployment and growth in Algeria, The results concluded to the absence of long-term equilibrium relationship between unemployment and economic growth in Algeria.

The evolution of unemployment in Jordan

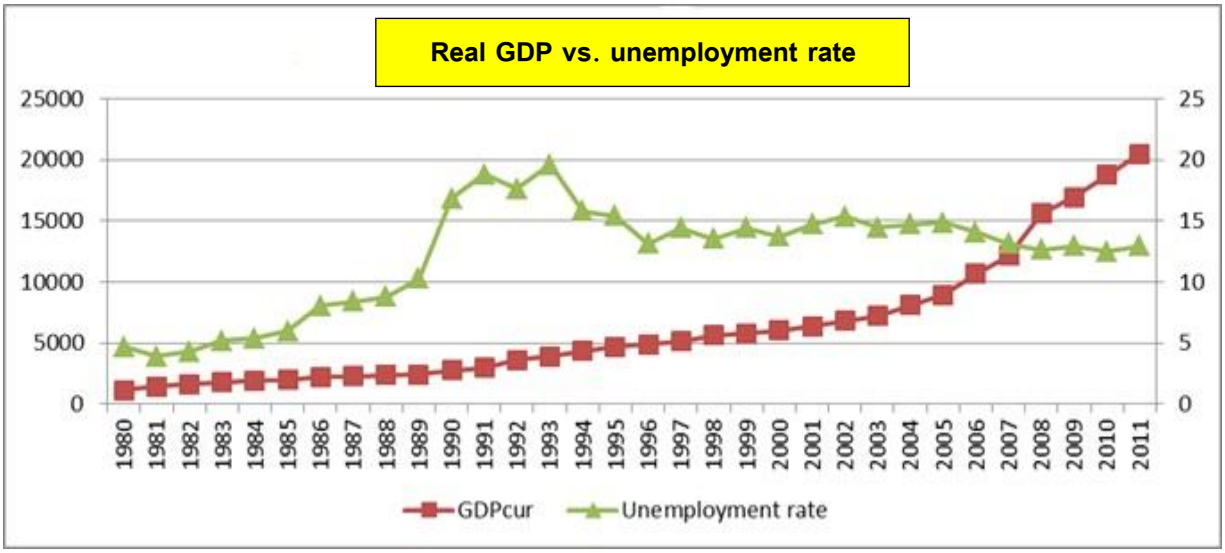
the labor market in Jordan Witnessed major fluctuation in the unemployment rate as a result of political and economic Living situation in the region, In 1967 as a result of the Arab-Israeli war flowed large numbers of Palestinian residents into Jordan, creating imbalances in the labor market from the supply side of Jordan, Which led to high unemployment rates in the following years down to about 14% in 1972. However, Jordan began to recover from the effects of this shock in the mid-seventies during the oil revolution and the growing number of migrant workforce to the Gulf states, Where the unemployment rate fell to reach 1.6% in 1976, And appeared as a result bottlenecks in the labor market in some Jordanian professions, was resolved

this problem by foreign labor, and thus became Jordan the source and importer for labor at the same time in that period.

With the beginning of the eighties, and as a result of the global economic recession and the economic crisis that hit the Jordanian economy at the end of the eighties, As a result of the repercussions of the Gulf War, the unemployment rate has begun to rise, which reached its highest range of 19.8% in 1993. In addition the unemployment rate began to decline gradually as a result of adopted by Jordanian economy to contain the crisis and to achieve economic stability, where unemployment reached the approximately 12.5% in the year 2010.

Figure (1) shows that the behavior of the gross domestic product at current prices and unemployment in Jordan consistent with economic theory during the period (1994-2011), Where we note a gradual decline in unemployment during the period that accompanied rise of the GDP at current prices, On the contrary, it was the period that preceded the 1994 and can attribute it to shocks and crises witnessed by the Jordanian labor market during that period.

Figure 1: Real GDP vs. unemployment rate



Okun's formulation

The negative association between unemployment rate and GDP growth is first documented by Arthur Okun in early 1960s. According to this empirical hypothesis growth slowdown causes unemployment rate to increase. This relationship is more statistical rather than structural economic framework. Moreover there is no economic theory which explains the relationship between unemployment rate and economic growth, so the Okun's hypothesis can be used as a yardstick to measure the association between these two variables. Its simplicity makes this hypothesis better in

understanding.

Okun's law has different versions which are: difference version, gap version, dynamic version and production function approach. Every method has its own pros and cons which is based on assumptions formulated by the researcher (Javeid,2006).

- The Difference Version Approach: $(Ut - Ut\text{-}1) = \alpha + \beta\ (Yt - Yt\text{-}1) + Єt$
  Where Ut = Unemployment rate in period t
  Yt = GDP growth in time period t
  Єt = Error term in time period t

This equation shows how the growth rate and unemployment rate change simultaneously, where

β is the Okun's coefficient having negative value. This means that an increase in growth rate would lead to a decrease in the unemployment level and a reduction in output is associated with rise in unemployment.

- The Gap Version Approach: $(Ut - U^*) = \beta\ (Yt - Y^*) + Єt$
  Where U* = Natural rate of unemployment
  Y* = Potential output
  Єt = Error term in time period t

In the gap version approach, Okun focused on the gap between actual and potential output. He tried to identify the level of production under the condition of full employment. "Full of employment is a situation where everyone is able to get a job if they would like one". Okun considered an unemployment level low enough to produce maximum output without creating extra inflationary pressure. Okun concludes that a high rate of unemployment will be related with idle resources. In such scenario, the actual rate of output is expected to be below its potential and vice versa in case of

low unemployment rate. Okun's gap version equation was based on the assumption that full employment occurs when unemployment is at 4%. On the basis of this assumption, Okun constructed a series of potential output for the US. Different level of potential output can be found with change in the assumptions of full employment.

- The Dynamic Version Approach: $\Delta Ut = \beta0 + \beta1\ Yt + \beta2\ Yt\text{-}1 + \beta3\ Yt\text{-}2 + \beta4\ \Delta Ut\text{-}1 + \beta5\ \Delta Ut\text{-}2$
  Where ΔUt-1 = First lag of unemployment rate
  ΔUt-2 = Second lag of unemployment rate
  ΔYt-1 = First lag of GDP growth
  ΔYt-2 = Second lag of GDP growth

According to Okun's observations, current level of unemployment can be affected by both current and past output. Okun's analysis below indicates a relationship between past and current output on the one hand and current level of unemployment on the other.

- The Production-Function Version Approach: $Y = \alpha (k + c) + \beta (\gamma n + \delta h) + \tau$
  Where Y = GDP growth in time period t
  k = capital input
  c = utilization rate
  n = number of workers
  h = number of hours they work
  α & β = output elasticities
  γ & δ = contributions of the workers and weekly hours to the total labor input
  τ = disembodied technology factor

Okun also consider another shortcoming that unemployment rate is also affected by non-utilization of resources in different sectors of society. In production process, in order to produce output there must be an optimum combination of inputs and according to economic framework that inputs are labor, capital and technology. But now a day most studies focus on labor force, working hours and technological advancement which really effects GDP growth. So according to Production-Function

approach output is the function of capital, labor and technology.

Methodology

In this study of Okun's law is based on the gap version. The argument for the gap version is that it provides a better explanation of unemployment and GDP relationship compared to the dynamic version. The gap version of Okun strives to show the difference between actual and potential output and assume that there will be maximum production level under full employment condition with no pressure of inflation. In regression framework or Okun's gap version equation, unemployment gap is taken as dependent and GDP gap is taken as independent, the equation can be written as:

$(U_t - U_t^*) = \beta (Y_t - Y_t^*) + Ct$

Where Y t is actual real GDP level, Y t *is potential GDP level, U t is the actual unemployment rate, Ut*is the natural rate of unemployment. The right-hand side term represents the output gap, whereas (Ut – Ut*)captures the unemployment gap. In other words, the difference between the observed and potential real GDP captures the cyclical level of output; in the same vein, the difference between the observed and natural rate of unemployment represents the cyclical rate of unemployment. A major

problem with this model is that there are no observable data on yt* and ut* so they have to be estimated, which means it is necessary to generate y and u trend series; a problem then arises concerning the choice of the detrending method. Therefore, we have used the Hodrick-Prescott (HP) filter which is the most widely used model in empirical studies (Khan, 2013; tinigi, 2011; Villaverde, 2007; Huang, 2003).

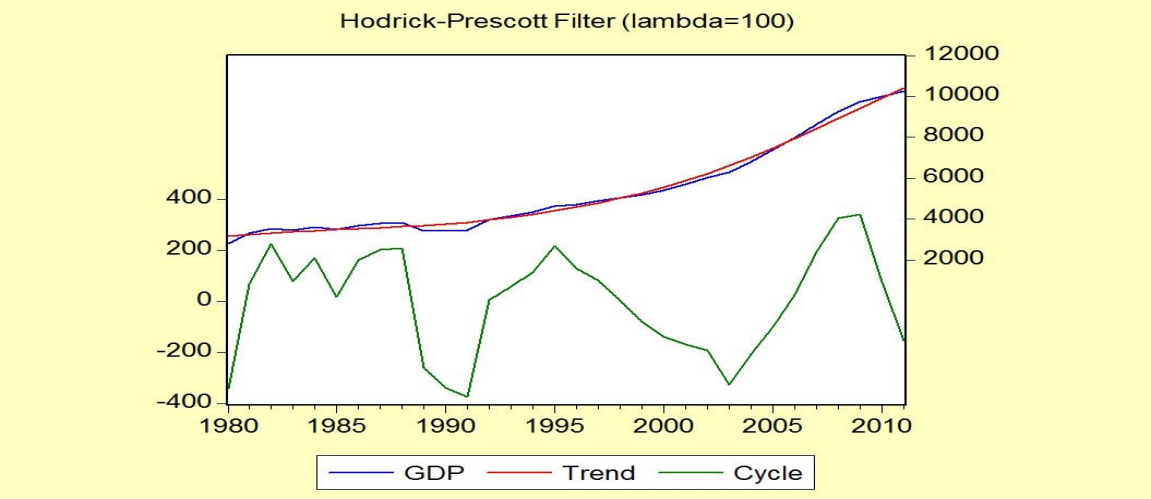
The Hodrick-Prescott filter is a statistical tool used to figure out business pattern strategy to split the cyclical component of a time period from raw data. Usually this filter is checked to obtain a smoothed-curve reflection of a time period sequence of any raw data, that is more delicate to long-term than to short-term variations. The modification of the kindliness of the trend to short-term variations is obtained by changing a multiplier ƛ.

The general equation for Hodrick-Prescott filter (Hodrick, 1997):

$$\text{Min}\left(\sum_{t=1}^{T}(yt-\tau t)2\right)+\lambda\sum_{t=2}^{T-1}[(\tau t+1-\tau t)-(\tau t-\tau t-1)]2)$$

There are usually two terms in this filter. Firstly sum of squared deviations that penalizes the cyclical movement and secondly the multiple ƛ which penalizes the rate of the trend component.

Figure 1: Potential GDP using Hodrick-Prescott Filter



As can be seen in the graph the lower the value of ƛ, lower is the penalty and vice versa.

The objective of this study is to employ co-integration and error-correction modeling to test the causal relationship between unemployment rate and the real GDP by using annually data from 1980 to 2011. We use a relatively new estimation technique, which is the bounds testing approach to co-integrate within an autoregressive

distributive lag (ARDL) framework, as proposed by Pesaran and others (Pesaran and Pesaran,1997; Pesaran and Shin,1999; Pesaran et al., 2001).

The ARDL method yields consistent and robust results for the long-run and short-run relationship between real GDP and unemployment. This approach does not involve pretesting variables, which means that the test for the existence of relationships between variables is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1), or a mixture of both In order to obtain robust results, we utilize the ARDL approach to establish the existence of long-run and short-run relationships. ARDL is extremely useful because it allows us to describe the existence of an equilibrium relationship in terms of long-run and short-run dynamics without losing long-run information. The ARDL approach consists of estimating the following equation :

$$\Delta UN_t = \alpha_0 + \sum_{i=1}^{n} \beta i \, \Delta UN_{t-i} + \sum_{i=0}^{n} \gamma i \, \Delta Y_{t-i} + \lambda 1 UN_{t-1} + \lambda 2 \, Y_{t-1} + \varepsilon_t$$

The first part of the equation with βi , γi represents the short-run dynamics of the model whereas the parameters λ1, λ2 represents the long-run relationship. The null hypothesis of the model is :

H0 : $\lambda 1 = \lambda 2 = 0$ (there is no long-run relationship)

H1 : $\lambda 1 \neq \lambda 2 \neq 0$

We start by conducting a bounds test for the null hypothesis of no cointegration. The calculated F-statistic is compared with the critical value tabulated by Pesaran (1997) and Pesaran et al. (2001). If the test statistics exceeds the upper critical value, the null hypothesis of a no long-run relationship can be rejected regardless of whether the under lying order of integration of the variables is 0 or1. Similarly, if the test statistic falls below a lower critical value, the null hypothesis is not rejected. However, if the test statistic falls between these two bounds, the result is inconclusive. When the

order of integration of the variables is known and all the variables are I(1), the decision is made based on the upper bound. Similarly, if all the variables are I(0), then the decision is made based on the lower bound.

The ARDL methods estimates $(p+1)^k$ number of regressions in order to obtain the optimal lag length for each variable, where p is the maximum number of lags to be used and k is the number of variables in the equation.

In the second step, if there is evidence of a long-run relationship (cointegration) among the variables, the following long-run model :

$$UN_t = \alpha_1 + \sum_{i=1}^{n} \beta i \, UN_{t-i} + \sum_{i=0}^{n} \gamma i \, Y_{t-i} + \varepsilon_t$$

If we find evidence of a long-run relationship, we then estimate the error correction model (ECM), which indicates the speed of adjustment back to long-run equilibrium after a short-run disturbance. The standard ECM involves estimating the following equation.

$$\Delta UN_t = \alpha_2 + \delta_1 ECM_{t-1} + \sum_{i=1}^{n} \Psi i \ \Delta UN_{t-i} + \sum_{i=0}^{n} \rho i \ \Delta Y_{t-i} + \varepsilon_t$$

To ascertain the goodness of fit of the ARDL model, diagnostic and stability tests are conducted. The diagnostic test examines the serial correlation, functional form, normality, and hetroscedasticity associated with the model.

Empirical results

The first practice in applying any cointegration technique is to determine the degree of integration of each variable. For this reason, the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests were employed.

Unit Root Tests

Before testing the co-integration relationship, a test of order of integration for each variable using the Augmented Dickey-Fuller (ADF) test is conducted. Even though the ARDL framework does not require the pre-testing of variables, the unit root test could help in determining whether or not the ARDL model should be used. The results of ADF are reported in table (1) with 95% critical value, the results suggest to reject the null hypothesis, which indicates that the series have no unit root, accordingly we accept that the two variables are stationary on level in both cases (with intercept only and with intercept and trend).

Table 1 : Unit root tests result Augmented Dickey-fuller (ADF)

Time Series	Level		1ST Diff.		Deg. of Co-integration
	Intercept only *	Intercept and trend**	Intercept only *	Intercept and trend**	
UN	-55.98	-55.86	-55.75	-55.7	I(0)
GDP	-254.2	-251.5	-247.66	-245.6	I(0)

(*):95% critical value for the augmented Dickey-Fuller statistic = -2.9627

(**):95% critical value for the augmented Dickey-Fuller statistic = -3.5671

Co-integration Tests

In order to check the existence of a co-integration relationship among the variables, the bounds test, Pesaran et al. (2001), was implemented, which is a three-step procedure. In the first step, we select a lag order on the basis of the Schwarz-Bayesian criteria (SBC) because the computation of F-statistics for cointegration is very sensitive to lag length. In the second step of the ARDL analysis, we use F-test for the presence of long-run relationship. Table (2) reports the results of the calculated F-statistic when each variable is considered as a dependent variable (normalized) in the OLS regression. The result show that the calculated F-statistics for model is exceeding the upper critical bound at the 5% level of significance. Thus the null hypothesis of no co-integration can be rejected, so only one co-integration relationship exists in these models.

Table 2 : Bound test results

F statistic	Critical values*		
5.44	Sig level	Lower bound	Upper bound
	1%	4.13	5.00
	5%	3.10	3.87

* The critical values are obtained from Pesaran et al. (2001), table CI(v).

The long-run relationship can be estimated as:

$Un_t = 15.16 - 0.007\ y_t$

(0.000) (0.000)

$R^2 = 0.82$, Adjusted $R^2 = 0.81$, DW = 1.81, F(Prob.)= 56.06 (0.00)

The above estimation represents the long-run relationship between unemployment and GDP. The Okun coefficient also shown the immediate impact of changes in the GDP gap is negative and significant at the 1 percent level which means that 1 percent decrease in GDP will increase unemployment rate by 0.013 percent.

Table 3 : Short run results

	Coefficient	t-statistics	p-value
Intercept	6.53	4.55	0.000
$\Delta\ y_t$	-0.003	3.37	0.002
ECM (-1)	-0.43	4.44	0.000

Table (3) shows the results of the ARDL estimation in the short run, Which appear to be similar result in the long run relationship. The weakness in the relationship between unemployment and GDP can be attributed the fact that small size of Jordanian's economy and the public sector dominating role in employing labor force in Jordan, as result the one can conclude that labor elasticity of demand will decrease toward economic growth.

The equilibrium correction coefficient (ECM (-1)) estimated (-0.43) is highly significant (1%level) and has the correct sign. It shows that the system correct its last period disequilibrium (the speed of adjustment to restore equilibrium in the dynamic model) by approximately 43% a year; i.e. about 43% of disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.

The goodness of fit of these models is relatively high, and the overall models are significant. The regression specifications fit well and pass all diagnostic tests against serial correlation, autoregressive

Conditional heterosedasticity, non-normal residual, heterosedasticity, and incorrect functional form. Table (4) reports the diagnostic tests.

Table 4 : Diagnostic tests

ARCH 1-1 test	F(1,22) = 0.868 [0.351]
Normality test	$\chi 2$ (2) = 1.26 [0.53]
Serial correlation Test	F(1,27) = 0.214 [0.644]
RESET test	F(1,22) = 0.161 [0.688]

Conclusion

Okun’s law came from noticing that more labor used in production the more output in economy, this idea was the motive behind this relationship. In this study we used a reverse relationship represents how changes in the unemployment rate behave under the influence of output change. The increasing output growth rate is leads to decreasing unemployment rate, and visa versa.

One of the characteristics of the Labor market in Jordan was its instability, over the past three decades the labor market suffered from political instability and bad economical policy Led to disturbances in the labor market have contributed to a very high rates of unemployment to reached almost 19% in 1993.

In this study we used the gap version that examine the impact of GDP gap which is the gap between actual GDP and potential GDP on Unemployment gap which is the gap between actual unemployment and natural unemployment, When real GDP is higher than potential GDP, unemployment will be relatively low. When real GDP is lower than potential GDP, unemployment will be relatively high. And the percentage change between the two gaps will be the Okun's factor that represents the impact of economic growth on unemployment.

In order to estimate the potential GDP we used the Hodrick-Prescott filter (HP- filter), the (HP- filter) is a statistical tool used to figure out business pattern strategy to split the cyclical component of a time period from raw data. To estimate the natural unemployment we used the 4% natural rate of unemployment to find the unemployment gap.

The casual relationship between the variables is examined by the co-integration and Error correction model, to decide whether Okun's low applies in the case of Jordan or not in long or short term.

The results are weakly agree that is the Jordanian economy is Okun's type relationship, which means that the unemployment rate is weakly affected by the growth rate during the period (1980-2011). The results reveals that when the Jordanian economy rise with 1% rate the unemployment rate will drop by 0.007% on the long term, the results were approximately the same in the short term.

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