Re-examination of the Impact of Economic Growth on Unemployment in Algeria Using Gordon's Dynamic Law

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Abstract:

The purpose of the present paper is to evaluate the effect of economic growth on unemployment, through both short and long-term and this within the Algerian economy during the 1985-2015 period.

Gordon's dynamic law was applied so as to achieve this purpose, this law requires separating unemployment and the general trend of the long-term economic growth rates, in order to respect this condition. Hodrick Prescott filter was used, this latter being one of the most important techniques that allow determining the long-term trend and how both GDP as well as unemployment rates vary around the natural rates.

Thereafter, ARDL Bounds Testing Approach to Co-integration test was used, the research conducted that economic growth and unemployment tend to the same trend. Except during certain periods in which an inverse relationship between the two variables is noticed, which means that economic growth rates in Algeria do not diminish unemployment rates. As second step of the research, the causal relationship between the two variables using Granger Causality Test. The conclusion was the existence of causal relationship in the short-term from unemployment rates to gross domestic Product and this with a signification of 1%.

The Cross Correlation Correlogam showed the existence of a major relationship between product rates and unemployment rates, during the period (T=0) the correlation being 75%. In addition to that product and unemployment rates are equal during this period

Keywords: Economic Growth, Unemployment,, HP filter, Gordon's dynamic law, ARDL
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I. Introduction

Unemployment is considered as one of the world's serious challenges that most countries encounter regardless their differences as far as the systems and degree of development are concerned, as unemployment effects countries politically, economically and socially, which in turn has a direct impact on labor market due to a raise of work demand in comparison to job offers. This point led economists and researchers in the field to undertake researches about unemployment in order to understand and reduce the impact of unemployment on economy.

Economic growth is considered as an economic variable associated directly with unemployment, accordingly in order to increase the growth rates it is necessary to raise the output elements and automatically the labor. Therefore, growth absorbs the proportion of the unemployed from the economy. Which is summarized by Okun's law (Okun, A.M, 1962) and developed by Gordon,1984. Gordon advanced that gross domestic product concerning unemployment rates are associated with growth rates in an inverse relationship in the gross domestic product (GDP). Therefore, policies aiming to increase the output rates are of a primary importance for decreasing the rate of unemployment and poverty[1]

Algeria like all other economies suffers from a noticeable high rate of unemployment and instability in the economic growth rates. Especially after the oil crisis the country faced during 1986, which exacerbated the intensification of unemployment and adversely affected regularly the economic growth rates, since the Algerian economy is characterized by a unilateral income, which forced the Algerian governmental to engage in a series of reforms starting from 1988, for promoting the economy and boosting development. Therefore, this research paper aims at re-exanimating the long-term effects of the economic growth rates on the phenomenon of unemployment in Algeria using Gordon's dynamic law over 1985- 2015 period.

This study will be organized as follows:

The first Part contains a review of the related literature, The **second part**, covers a standard modeling of the re-examination of Gordon's law this latter links the gap in unemployment, wich are represented respectively the rates of conjectural unemployment and conjectural GDP.

II. Review of the related literature

Studies focused on estimating Okun's law in diverse developed and underdeveloped economies through the adaptation of different approaches in the analysis, among them: the study of; Elisabeth et al., 2009[2]; Shujaad, 2014; and Athia Economou and Locovos N.Pesarianos,2016[3]. All of these estimated Okun's law, which links the rates of growth in gross domestic product (GDP) with the rates of unemployment, and showed a variation in the results.

The study of **Elisabeth et al, 2009** was based on integration and balanced modification between economic growth and unemployment in the American economy from 1975 until 2006. It included the extent of the integration of the times series. The study then, tested original Okun's law equation as well as and the possibility of the existence of a long-term stability in the relation with the ability to test the non-balanced contrast.

They stated that Okun's coefficient is between (-0.59, -0.41), and that unemployment rate witnesses a faster increase in periods of recession.

As for the study presented by **Shujaad, 2014**, the author worked on the impact of economic growth on unemployment through, the long-term in Pakistan, from 1990 to 2006. The author used the

approach of joint integration of limits (ARDL) and concluded that a reflexive relation joins the economic growth rates and the unemployment rates in the long-term period, and the absence of this relation in the short-term period. In which in the long-term, when the economic growth rates become 1% higher, the level of unemployment lowers by 1,665% with an adjustable speed estimated at 83%.

The important studies that also tested Okun's law is the study of **Athia Economou and Locovos N.Pesarianos,2016 ,** tested Okun's law in European union via separating the different long-term effect of economic growth fluctuation on employment, the same study also analyzed the effect of labor market policies on Okun's coefficient during the period from 1993 to 2014, using panel model and Mundlak evaluation . The study concluded that the economic growth effects on unemployment are less important in countries with poor labor market protection policies

III. Research Methodology

1. Data collection and variable definition

The present paper examines the issue of the existence of both long and short-term relationship between unemployment and economic growth in Algeria using annual data for the period 1985-2015.

The variables are: (UN) Unemployment rate, (GDP) Gross Domestic Product as indicator of economic growth, (U_t^c) The unemployment general trend, (Y_t^c) The gross domestic product general trend.

Data variables of: the overall levels of unemployment, GDP, are obtained from the Word Bank database. But the remaining data link (U_t^c),(Y_t^c) are to be calculated in different methods

2. Model Specification

This is achieved by implementing some univariate and multivariate methods for estimating the potential output including the popular production function approach using annual data. Univariate detrending methods include the Hodrick-Prescott (HP) filter, The Running Median Smoothing filter (RMS), and the Kalman filter[4].

In order to examine Gordon's dynamic law, this latter links the gap in employment and output, which are represented respectively the rates of conjectural unemployment and conjectural gross domestic product and their estimate the elasticities between both the short and long-term with the following equation[5]:

$$U_t^c = \sum_{i=1}^{K} b_{t-i}\, U_{t-i}^c + \sum_{i=0}^{k} C_{t-i}\, Y_{t-1}^c + \varepsilon_t \dots\dots (1)$$

U_t^c Unemployment General Trend

$$U_t^c = U_t - U_t^T$$

Y_t^c. Gross Domestic Product General Trend

$$Y_t^c = \log_t Y - log\, Y_t^T$$

To define unemployment general trend and economic growth general trend HP Filter[6] was utilized, which is one of the most important techniques that allow the researcher to determine the long-term and how product and unemployment rates vary around the general trend (around the natural rates).

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Hence, estimating long-term elasticity $\propto_{LT}$ becomes possible using the following equation:

$$\propto_{LT} = \frac{\sum_{i=0}^{K} Ct - i}{1 - \sum_{i=1}^{K} b_{t-i}} \dots\dots\dots (2)$$

The study is based on ADF and p-perron test stationarity of times series, in order to test long-term relationship, robust economic techniques were used, Autoregressive Distributed Lag Model (ARDL) popularized by (pearson & shin, 1998)[7], and (pearson & all,2011**)** [8]

IV. Result Discussions

1. stationarity of times series (Unit root test)

In empirical economics studies, the macroeconomic variables contain non-stationary series. Dealing with non-stationary variables in the empirical analysis is central so that obtaining results of spurious regression can be prevented. According to the concept of co-integration, In case two or more non-stationary times series share a common trend, they are said to be cointegrated.

We use our (ADF) test or (PP) test to examine stationary of the series of these Macroeconomic variables.

The results show that each of the variables in integrated of different order.($\boldsymbol{U_T^C}$) stationary at first difference : I(1), each of ($\boldsymbol{Y_T^C}$) is stationary at level I(0), wich means that there is no long-term relationship between variables under study, thus cointegration techniques cannot be applied.

In order to choose a robust model for estimation of growth equation, the researcher estimates different growth equations and selects three of them for comparison; these equations have been estimated via ARDL co-integration techniques

2. Lag Selection of ARDL

After determining the stationarity level of all variables, the ARDL co-integration system is implemented for Algeria using annual times series over the period 1985-2015.

◆ **The first step** : Determining the length order which obtained automatically with Eviews9 via: Akaike info criterion, (Schwarz criterion) and the following equation:

$$U_t^c = \alpha_0 + \sum_{i=1}^{n} \beta_i \left(U_t^c\right)_{t-i} + \sum_{j=0}^{m} \delta_j \left(Y_t^c\right)_{t-j} + u_t \quad (1)$$

◆ **Second step**: The ARDL bounds testing approach is used in order to estimate the model by ordinary least squares (OLS). We conduct a Wald test (F-Statistic) by imposing restrictions on the estimated long-term coefficients.

The null and alternative hypotheses are:

$H_0 : \beta_1 = \beta_2 = 0$ (no long-term relationship).

$H_1 : \beta_1 \neq \beta_2 \neq 0$ (a long-term relationship exists).

The computed F-statistic is 1.78 but for ARDL (ARDL (2.0)), the 0.1 level critical values are 4.95 (lower bound) and 5.58 (upper bound). The result indicates the absence of co-integration (below the lower bound).

3.Granger Causality Test

The absence of a stable (balanced) relationship in long-term does not necessarily mean the absence of any correlation between economic growth and overall unemployment rates. That also does not mean that the relationship does not exist but times series are very short and more accurate data is needed, in order to validate this relationship.

In addition to that the causality relationship between variables will be tested using Granger Causality Test this latter requires a times series stability as a condition.

As a first step, both gross domestic product Y_T^C and unemployment U_T^C stability were tested, the stability condition was respected at first difference for unemployment U_T^C whereas it was respected at level for gross domestic product Y_T^C.

Due to the sensitivity of the test results to the used, lag periods, these latter were chosen according to the following criteria (Akaike info criterion, Schwarz criterion). The most appropriate lag period noticed (optimal lag) was equal to one (n=1) wich explains the choice of the first difference the results are show in the table 4.

The results showed to a causality relationship in the short-term from unemployment rate to GDP rates, which leads to the conclusion that product rates are affected, by unemployment rate with a significance of 1%

4.Cross Correlation Correlogam

This test allows the explanation of the effects and links between the variables in general. While in the present test it is used to explain the phenomenon in, question in short-term

The results in the chart above show a considerable relation between product rates and unemployment rates during the period (T=0) relation is estimated to (75%).

In addition to that, the values of both product and unemployment are equal which show that the dynamic impact is specific to the short-term . Also the variables are Procyclical.

Nevertheless, the relation value decreases and becomes negative (-0.11) in the future which means that gross domestic product growth is followed by a decrease in unemployment rates, however with law values.

Since the Algerian GDP is related to the variable oil prices which are impossible to predict through the long-term.

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Conclusion:

Through a quantitative econometric analysis, the times series of both gross domestic product and unemployment were disassembled using the HP filter so as to determine their general trends, in order to estimate Gordon's law 1984, and this during the period 1985-2015. After designing a data mathematical model and testing it, the results showed that both Gross domestic product and Unemployment rates evolved in the same direction expect during some period. In which an inverse relationship was noticed as a result the Algerian gross domestic product growth rates are not able to reduce unemployment rate, which means that Gordon's law cannot be applied in Algeria during the study period.

However, the absence of an inverse relationship does not mean the absence of a link in between but shows a weak relation instead; consequently, the study was directed towards testing causality relation between the two variables via Granger's Causality Test, which identified the existence of a causality relationship in the short-term with a 1% significance.

Concerning the Cross Correlation Correlogam, the test showed a major relationship between gross domestic product and unemployment during the period (T=0) estimated at (75%).

Also, Gross Domestic Product and Unemployment estimations are equal, which leads to the conclusion that the dynamic effect concerns only the short-term and that the variables are Procyclical, consequently the Algerian economic growth rates are unable to reduce unemployment rates due to the heavy reliance of the Algerian economy on oil production which does not provide steady national revenues.

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Appendices :

Table1 . Tests for Unit Roots

Variables	ADF (Intercept & trend)			PP(Intercept & trend)		Degree of Integration
	Level	1st diff		level	1st diff	
VC	-4.05*	/		-4.32	/	I(0)
UC	-2.03	-4.55*		-3.75	-4.31**	I(1)

* Indicates statistical significant at the 1 percent level

** Indicates statistical significant at the 5 percent level

*** Indicates statistical significant at the 10 percent level

( ) Optimal lag is selected by Schwarz criterion automatically in ADF test.

PP t-statistics are obtained from the MacKinnon (1996) table.

() Bandwidth parameters of the PP tests are selected automatically by the Newey and West (1994) method using the Bartlett kernel MacKinnon : 1996.

Table2 . Lag Length Selection

kaike info criterion	Schwarz criterion
ARDL(2.0)	

Source: Eviews 9

The results based on the bounds testing procedure (ARDL)

Table 3. Present the result of ARDL Bounds Test

ARDL(2.0)	F-statistic		Result
	1.78		No co-integration
Critical Value	Lower bound	Upper bound	
1% level of significance	4.95	5.58	
5% level of significance	3.62	4.16	
10% level of significance	3.02	3.51	

Note: Border critical value achieved from Pesaran and Pesaran (1997) p.478 Appendices. Table CI(iii) . Case II: intercept and no trend, Case III: intercept and trend.

*, ** and *** significant at 1%, 5% and 10% significance level

Table 4.Present The Granger Causality Test

Observations	D	Null hypothesis	F statistic	Prob
29	1	dGAPY mot cause dGAPU	0.02468	0.8764
	1	dGAPU mot cause dGAPY	6.74384	*0.0153

*, ** and *** significant at 1%, 5% and 10% significance level

Table 5.Present Cross Correlation Correlogam

Sample: 1985 2015

Included observations: 31

LOGTGDPREND,UTREND(-i)	LOGTGDPREND,UTREND(+i)	Lag	Lead
. |******** |	. |******** |	0.7579	0.7579
. |******* |	. |******** |	0.6608	0.7872
. |****** |	. |******** |	0.5537	0.7960
. |**** |	. |******** |	0.4380	0.7846
. |***. |	. |******** |	0.3155	0.7542
. |**. |	. |******* |	0.1891	0.7063
. |* . |	. |****** |	0.0624	0.6432
. *| . |	. |****** |	-0.0606	0.5676
. **| . |	. |***** |	-0.1756	0.4827
.***| . |	. |**** |	-0.2783	0.3918
****| . |	. |***. |	-0.3649	0.2988
****| . |	. |**. |	-0.4321	0.2071
*****| . |	. |* . |	-0.4778	0.1192
*****| . |	. | . |	-0.5012	0.0360
*****| . |	. *| . |	-0.5028	-0.0426
*****| . |	. *| . |	-0.4845	-0.1166

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6. **The HP filter** is a common technique used to derive the trend in an actual data series. It is a simple and an univariate technique which allows working on a relatively short times series.

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