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Measuring the impact of economic variables on unemployment rate

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Abstract
This study aimed to study impact of economic variables on unemployment rate such as(GDP, INF, G, EX, POP) all this variables is represent independent variables) according to this we enable to determine which the variables impacted on the unemployment rate, and what the nature of relationship between the unemployment rate and (GDP, INF, G, EX, POP) The study hypothesized that the most important variables effect on unemployment rate in Sudan (GDP, INF, G, EX, POP) and assumed that there is positive statistically significant relationship between size of population and unemployment rate, and also assumed that there is negative statistically significant relationship between (gross domestic product and inflation and government expenditure exchange rate unemployment rate).
We found that the size of population is impacted in the unemployment rate.

Keywords: unemployment; exchange rate; gross domestic product, inflation

1. Introduction
The Sudan is suffering from the unemployment problem, this problem is connected by a set of economic and social variables which impact on the unemployment rate.
This study is seeking to answer on this question as they

Follow: What the economic and social variables which impact on the unemployment rates in Sudan at the period (1990-2017)?

2. Objective of the study
- The attempt to know the reality of unemployment phenomena in Sudanese economic and know the most important impact of economic reforms on the level of operation and unemployment,
- The attempt of building an econometrics model to know the impact of economic variables on the unemployment rate and its application in Sudan.

3. Methodology
- Time series: (1990-2018).
- Instrument used: collection of data.

4. Sources of data
- Central bank of Sudan – ministry of finance and economic planning – central statistical bureau

5. Statistical tools used
The research tools used multiple linear regression

Unemployment
The international labor organization id defined by the individuals of the labor force who wish to work according to the prevailing wages and those who seek it.

Unemployment Rate
Calculate the unemployment rate during the year or during a period by the number of unemployed to the individuals of the labor force, this basic which to calculate the unemployment rates, according the international and national statistics organization such as (World Bank, international labor organization, National Bureau of Statistics … etc).
It is expressed in the following relationship:

$$TC_n = \frac{U}{U+E}.100 = \frac{U}{U_F}.100$$

Where:
U: the number of unemployed.
E: the number of employees.
U_F: The group of persons of working age who are engaged or are searching for work.

Relationship of unemployment by inflation and gross domestic product
The interaction between gross domestic product and unemployment and the inflation depend on three relations is:
- The curve of Philips which that demonstrates the relation of unemployment by the inflation.
- The okun law which that demonstrates how to impact the GDP rate on the unemployment.

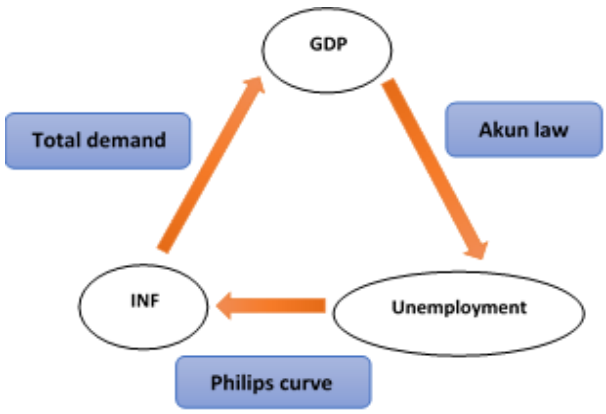

Fig 1: demonstrates the relations between gross domestic product (GDP) and unemployment and inflation (INF)

Flows in and out of unemployment

The loss of jobs is the most important of the flow within unemployment, and there are fluctuations in the business cycle and economic growth. These flows can be illustrated by the following form:

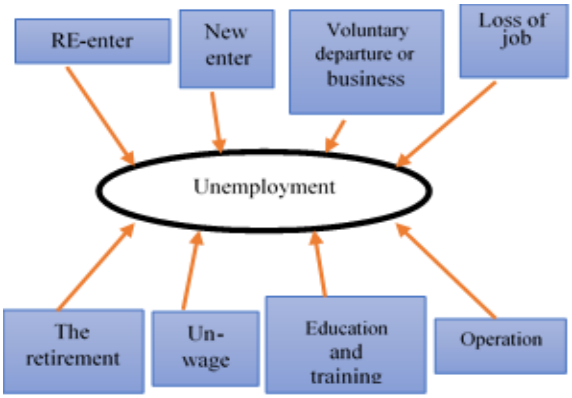

Fig 2: flow in and out of unemployment

The Model

$$U = \beta_0 + \beta_1 EX + \beta_2 G + \beta_3 INF + \beta_4 GDP + \beta_5 POP$$

Where:

β_0 = Intercept (constant)
U = unemployment
EX = Exchange rate
G = Government expenditure
INF = Inflation
GDP = Gross domestic product
Pop = Population size
$\beta_1,\beta_2,\beta_3,\beta_4,\beta_5$ = parameters of model

Estimation the Model

Table 1: Results of linear model for unemployment rate (1990-2018)

Dependent Variable: U
Method: Least Squares
Date: 07/04/19 Time: 13:38
Sample: 1990 2018
Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	36.22007	19.69339	1.839200	0.0788
GDP	7.50E-06	3.52E-05	0.213123	0.8331
EX	1.129849	1.138737	0.992195	0.3314
G	0.000188	0.000365	0.515893	0.6109
INF	-0.069518	0.054165	-1.283450	0.2121
POP	-0.000477	0.000610	-0.781699	0.4424

R-squared	0.707859	Mean dependent var	26.44207
Adjusted R-squared	0.644350	S.D. dependent var	11.54754
S.E. of regression	6.886540	Akaike info criterion	6.879006
Sum squared resid	1090.762	Schwarz criterion	7.161895
Log likelihood	-93.74559	Hannan-Quinn criter.	6.967603
F-statistic	11.14581	Durbin-Watson stat	0.686686
Prob(F-statistic)	0.000015		

***Source*:** EVIEWS 7 program

Interpretation

The equation of multiple regression (unemployment rate) we can write as follow:

$$U = 36.22 + 7.50E - 06\ GDP + 1.130\ EX + 0.00019\ G - 0.0695\ INF - 0.0005\ Pop$$

Table 2: Test the significant of parameters.

Coefficients	t-statistic	prob
GDP	0.2131	0.83
EX	0.9921	0.33
G	0.5159	0.61
INF	-1.2834	0.21
Pop	-0.7817	0.04

Source: EVIEWS 7 program

Interpretations

- From the above table (2) we show that the probabilities (p-value) is greater than level of significant (0.05) (prob$^{>}$ 0.05) for the parameters ($\beta_1,\beta_2,\beta_3,\beta_4$) then the variables (GDP, INF, G, EX) is not impact on the unemployment rate, the parameter of (β_5) is significant this mean the variable of (Pop) is impacted on unemployment rate.

Table 3: Test the significance of model

F-statistic	Prob(F-statistic)
11.145	0.0000

Source: EVIEWS 7 program

Interpretations

Null hypotheses: the model is not significant
Alternative hypotheses: the model is significant
From the above table (3) we show that the prop (F-statistic) is less than the level of significance (0.05) (prob for F-statistic $^{>}$ 0.05) in this case we reject the null hypotheses and accept the alternative hypotheses this mean the model is significant.

Table 4: Test the power of model

R-squared	0.71

***Source*:** EVIEWS 7 program

Interpretations

From the above table (4) we show that the R-squared is approaching from (1) this mean that the model is strong.
We can write this model after the test of significant of parameters as follow:

$$U = 36.22 - 0.0005\ Pop$$

To test this model to be valid to forecasting or prediction, firstly testing if it was suffering from any problem such as (multicollinearity, autocorrelation, Heteroscedasticity).

i) Heteroscedasticity

Null hypotheses: Ui's are homoscedastic
Alternative hypotheses: Ui's are heteroscedastic

Table 5: Test the heteroscedasticity problem

Heteroskedasticity Test: White

F-statistic	19.30298	Prob. F(20,8)	0.0001
Obs*R-squared	28.41126	Prob. Chi-Square(20)	0.1000
Scaled explained SS	23.46686	Prob. Chi-Square(20)	0.2665

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/07/19 Time: 08:49
Sample: 1990 2018
Included observations: 29

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6225.905	1528.477	4.073273	0.0036
GDP	-0.015014	0.003942	-3.808718	0.0052
GDP^2	-1.01E-08	4.49E-09	-2.259101	0.0538
GDP*EX	0.001924	0.000561	3.428286	0.0090
GDP*G	5.91E-08	7.02E-08	0.841978	0.4243
GDP*INF	7.94E-05	1.65E-05	4.797532	0.0014
GDP*POP	3.09E-07	9.95E-08	3.110148	0.0144
EX	-286.3771	194.1924	-1.474708	0.1785
EX^2	-12.49183	19.50162	-0.640554	0.5397
EX*G	-0.018765	0.003115	-6.023844	0.0003
EX*INF	0.159654	0.980104	0.162895	0.8746
EX*POP	0.013174	0.003729	3.533181	0.0077
G	0.292662	0.043050	6.798259	0.0001
G^2	5.90E-07	3.46E-07	1.704333	0.1267
G*INF	-0.001105	0.000188	-5.873068	0.0004
G*POP	-7.25E-06	1.15E-06	-6.303420	0.0002
INF	-22.89647	4.860424	-4.710797	0.0015
INF^2	0.014453	0.009652	1.497391	0.1727
INF*POP	0.000834	0.000206	4.040262	0.0037
POP	-0.398425	0.105793	-3.766074	0.0055
POP^2	6.07E-06	1.66E-06	3.650830	0.0065

R-squared	0.979699	Mean dependent var	37.61248
Adjusted R-squared	0.928945	S.D. dependent var	62.03252
S.E. of regression	16.53551	Akaike info criterion	8.609318
Sum squared resid	2187.384	Schwarz criterion	9.599429
Log likelihood	-103.8351	Hannan-Quinn criter.	8.919409
F-statistic	19.30298	Durbin-Watson stat	2.579690
Prob(F-statistic)	0.000105		

***Source*:** EVIEWS 7 program

Table 6: Test the heteroscedasticity problem

White Test	P-value
28.411	0.1000

***Source*:** EVIEWS 7 program

Interpretations

From the above table (5) we compare the P-value of with the level of significance (0.05) (P-value $>$0.05) this mean accept the null hypotheses this mean that the model is not suffering from the heteroscedastic problem (Ui's are homoscedastic).

ii) Autocorrelation

Null hypotheses: Ui's are independent

Alternative hypotheses: Ui's are correlated

We can write this hypotheses by symbols as follow:

$H_0: \rho = 0$

$H_1: \rho \neq 0$

Table 7: Test the autocorrelation problem

DW	d_l	d_u
2.58	1.03	1.85

***Source*:** EVIEWS 7 program

Interpretations

From the table (7) we note that the value of DW falls between ($4 - d_l < DW < 4 - d_u$) in this case we accept the alternative hypotheses so there is problem autocorrelation.

6. Findings

- There is some variables is impacted on the unemployment rate such as size of population.
- The model is significant so valid to predict in the future
- The model is just suffering from the problem of autocorrelation.
- The model is strong.
- The model is valid to forecasting in the future.

7. Conclusions

From the study it has been clear there is just one variable is impacts on the unemployment rate is the size of population and also we found the model is featured by the significant this means is valid to use this model for prediction in the future, while this model is just suffering from the problem of autocorrelation, from my point of view this model is valid to the forecasting.

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