Modelling the relationship between unemployment and inflation according to the concept of Phillips in Algeria

نمذجة العلاقة بين البطالة والتضخم وفق مفهوم فيليبس في الجزائر

Dr: Bendakfal kamel, *Universite of M'sila, kamel.bendakfel@univ-msila.dz.*

Received: 22/11/2019 Accepted: 12/01/2020 Published:31/01/2020

Abstract:

The objective of this study is to clarify the relationship between unemployment rates and inflation in Algeria, both theoretically and applied. A relationship was found according to Philips' concept using both structural models and non-structural models through the estimated model elasticities. A causal relationship according to the concept of Granger, heading from variable inflation to the variable unemployment.

Keywords: unemployment, inflation, Phillips curve, structural modeling, non-structural modeling

JEL classification code :E20,E24,E30,E31

ملخص:

تهدف هذه الدراسة بشكل أساسي إلى توضيح العلاقة بين معدلات البطالة والتضخم في الجزائر من الناحيتين النظرية والتطبيقية، حيث تم التوصل إلى وجود علاقة وفق مفهوم فيليبس باستعمال النماذج الهيكلية و النماذج غير الهيكلية على حد سواء وذلك من خلال مرونات النماذج المقدرة ، كما كشفت الدراسة على وجود علاقة سببية وفق مفهوم غرانجر متجهة من متغيرة التضخم نحو متغيرة البطالة.

الكلمات المفتاحية: البطالة، التضخم، منحنى فيليبس، نمذجة هيكلية، نمذجة غير هيكلية.

تصنيف JEL: E20,E24,E30,E31

Corresponding author: kamel Bendakfal, e-mail: kamel.bendakfal@univ-msila.dz

1.Introduction:

The concept of the relationship between the phenomena of unemployment and inflation of concepts that took great importance in contemporary societies in terms of research and analysis, so this topic hauled mainly on political decision makers, attention and the attention of researchers in social and economic spheres, As a matter of imposing himself permanently and salt on the international arena in General and especially Arabic arena. This is hardly scientific and specialized patrol issued related to economics and sociology and not exposed to unemployment or inflation, or both for analysis and discussion.

Given the importance of this subject elderflowers necessary modelling of the relationship between unemployment and inflation in Algeria and whether consent to the perceptions and concepts of economic theory, to get myself up to speed with it the following basic problem is thrown:

What is the nature of the existing relationship between the unemployment rate and inflation rate in Algeria?

Given the importance of the relationship between unemployment at the macro level, it was necessary to try to enrich the subject in theory and practice using the standard methods necessary to highlight the nature of the relation between the two rates in Algeria.

2. Phillips simple model and the relationship between inflation and unemployment:

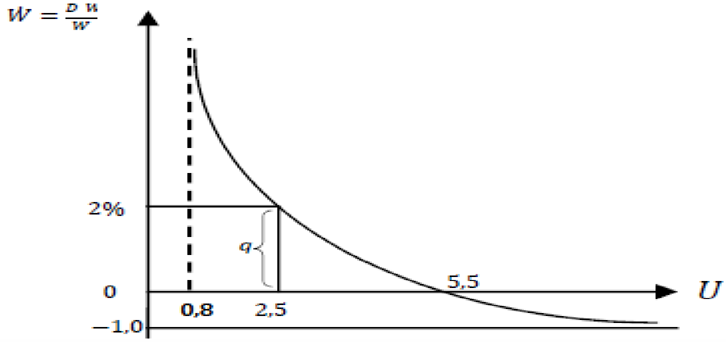
The Phillips curve is the most controversial mechanism because it is an important policy for economic policymakers and a means of government to confront either of the two phenomena (unemployment and inflation)

The study has shown that by "Alban William Phillips" in 1958 " " **(Philips, pp. 283-299)** under the title the relationship between unemployment and the rate of change in Cash Wages in the United Kingdom during the period 1861-1957 showed that there was an inverse statistical relationship between the rate of change in cash wages $w = \frac{\Delta w}{w}$ And the unemployment rate u, Where this relationship demonstrates that cash rates are high when low levels of unemployment and low wage rates at high levels of unemployment, This study also showed that the relationship between unemployment and non-linear relationship is cash remuneration, the standard study results showed that the rate of change in total cash remuneration final value when the unemployment rate drops to 0.8%,

This study also showed that the relationship between unemployment and cash wages is non-linear. The results of the standard study showed that the rate of change in monetary wages is final when the unemployment rate falls to 0.8%

It was also found that the change in the rate of cash wages is minimal -1.0% when the labor supply includes 100% and the following figure shows the results of the study.

Fig (1): the original Phillips curve.



Source: Osama Bashir Dabbagh, Unemployment and Inflation, El Ahlia Publishing, Distribution and Printing, Lebanon, 2007, p 197.

The relationship relied on by Phillips was as follows: $\dot{w}_t = a_0 + a_1 u_t^{-1}$

whereas:

$\dot{w}_t$ Nominal wage change rate.

u_t^{-1} Inverted unemployment rate at t time.

a_0 Constant that specifies the location of Phillips curve

a_1 Phillips curve slope

The Phillips curve has faced a number of criticisms, most notably the absence of a theoretical basis for its statistical relationship, In other words, the tendency to formulate this curve was devoid of any specific theoretical framework. This was offset by the work of the Canadian economist Richard Lipsy in 1960 **(Lipsay, 1960, pp. 1-30)**, Which emphasized a strong correlation between the rates of change in the monetary wage and the rates of change in labor market demand, using unemployment data as an indicator of the excess labor market demand, Where the greater the surplus demand for labor in each industry (the decline in unemployment) wage rates rose, As expressed in the following relationship:

$$\dot{w} = \phi\left(\frac{L^d - L^s}{L^s}\right)$$

Where:

$\dot{w}$ Rate of change in cash wages.

L^s and L^d Two labour supply and demand functions, respectively.

In December 1959, Paul Samuelson and Robert Solow introduced their work linking unemployment to inflation rather than monetary pay change, Where they reached an inverse relationship between unemployment and the rate of inflation **(Hisham Lebza, 2014, p. 10)**, It also concluded that the inflation rate is equal to the difference between the rate of increase in nominal wages and the rate of increase in labour productivity, as illustrated by the following relationship **(.K, analytical aspects of anti-inflation policy , p. 177)**:

$$\dot{P} = \theta.\phi(U_t) - \dot{\Pi}_t$$

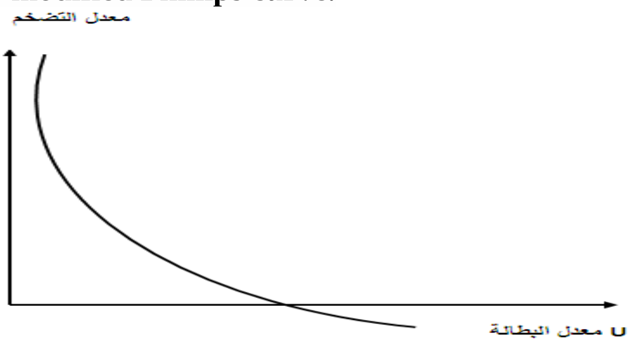
$\dot{P}_t$ the inflation rate

U_t Original Philips function

$\dot{\Pi}_t$ The rate of change of productive growth.

The following figure illustrates the adjusted Phillips curve

Figure (02): modified Phillips curve.



Source: Ramzi Zaki, the political economy of unemployment: an analysis of the most serious problems of contemporary capitalism, the world of knowledge, Kuwait, 1997, p. 363.

3. Estimating the relationship between inflation and unemployment in Algeria from the point of view of structural modeling.

To estimate the relationship of Phillips, we use a simple nonlinear regression in measuring nonlinear relationship between two variables, one of which is dependent and the other is independent of X, It is possible to use the so-called Box-Cox converters To determine the different formulas that a simple nonlinear relationship can take between Y and X. To illustrate this, we assume that the general formula for the relationship between X and Y is as follows **(laaraf Fayza, 2011)**:

$$\mathbf{Y^{\lambda 1} = a_0 + bX^{\lambda 2} + u}$$

in which:

$$Y^{\lambda_1} = \begin{cases} \dfrac{Y^{\lambda_1}}{\lambda_1} & for \quad \lambda_1 \neq 0 \\ Ln \quad Y & for \quad \lambda_1 = 0 \end{cases} \qquad Y^{\lambda_2} = \begin{cases} \dfrac{Y^{\lambda_2 - 1}}{\lambda_2} & for \quad \lambda_2 \neq 0 \\ Ln \quad X & for \quad \lambda_2 = 0 \end{cases}$$

Thus, there are many cases that describe the relationship between X and Y according to the former promoters. As for the linear relationship we find that it occurs

when $\boldsymbol{\lambda 1 = \lambda 2 = 1}$ By offsetting the two values in the Box-Cox compiler, the relationship between X and Y takes the following formula: $Y = a + bX + u$

If they are $\boldsymbol{\lambda 1 = 1}$ and $\boldsymbol{\lambda 2 = -1}$ By compensating in the Box-Cox converters we get the previous equation in the following picture called the inverse conversion relationship:

$$Y = a + b\left(\frac{1}{X}\right) + u \quad \ldots\ldots\ldots\ldots.(*)$$

While neglecting the random limit **u** It is clear that the tendency of this relationship is variable and not fixed, It then expresses a non-linear relationship where:

$$\frac{dY}{dX} = -\frac{b}{X^2}$$

The formula (*) can be estimated by first obtaining the inverse values of the independent variable where X*= 1\X, Then use the following formula in the estimate:

$$\hat{b} = \frac{\sum yx^*}{\sum x^{*2}}$$

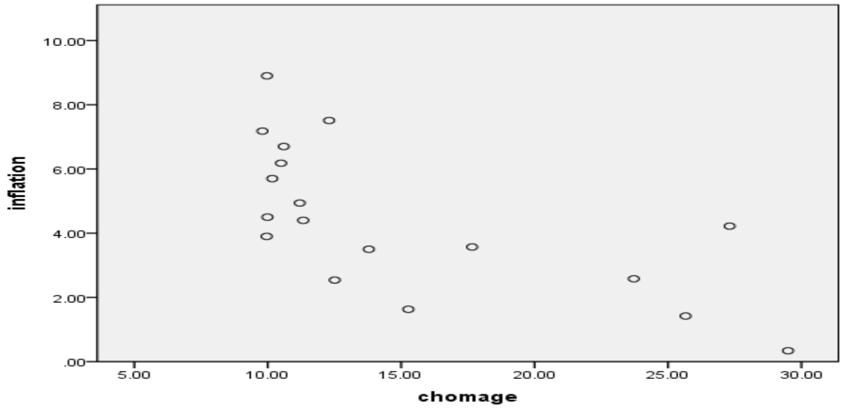
$\hat{a} = \overline{Y} - \hat{b}\overline{X}^*$

An economic example that reflects the formula of conversion is the Phillips curve, which reflects the relationship between inflation and unemployment.

Using data on the unemployment rate and inflation rate during the period 2000-2017, Using the SPSS program, You get us oriented below, Where we can note that the relationship between the rates of unemployment and inflation is an inverse and non-linear relationship, This relationship represents the Phillips curve in Algeria during the 18-year study period.

Depending on the form of propagation, the appropriate formula for estimating this relationship is the reverse conversion formula to which we referred earlier.

Figure (03): Philips curve in Algeria during the period 2000-2017.



.

Source: spss output.

now We estimate the Phillips curve equation in Algeria by first obtaining the inverse values of the independent variable X denoted by X * and calculating the averages and totals as shown in the table below.

Table (10): Estimation of Philips' relationship

x^{*2}	$x^{*}.y$	x^{*}	$y = Y - \overline{Y}$	$X^{*} = 1/X$	Inflation rates X	Unemployment rates Y	the years
6,34	36,37	2,52	14,45	2,94	0,34	29,5	**2000**
0,06	6,47	0,24	27,31	0,24	4,22	27,31	**2001**
0,50	18,07	0,70	25,66	0,70	1,42	25,66	**2002**
0,15	9,19	0,39	23,72	0,39	2,58	23,72	**2003**
0,08	4,95	0,28	17,66	0,28	3,57	17,66	**2004**
0,38	9,37	0,61	15,27	0,61	1,63	15,27	**2005**
0,16	4,93	0,39	12,51	0,39	2,54	12,51	**2006**
0,08	3,94	0,29	13,79	0,29	3,5	13,79	**2007**
0,05	2,58	0,23	11,33	0,23	4,4	11,33	**2008**
0,03	1,78	0,18	10,17	0,18	5,7	10,17	**2009**
0,07	2,55	0,26	9,96	0,26	3,9	9,96	**2010**
0,05	2,22	0,22	9,99	0,22	4,5	9,99	**2011**
0,01	1,09	0,11	9,70	0,11	8,9	9,7	**2012**
0,02	1,36	0,14	9,80	0,14	7,18	9,8	**2013**
0,02	1,58	0,15	10,60	0,15	6,7	10,6	**2014**
0,04	2,27	0,20	11,20	0,20	4,94	11,2	**2015**
0,03	1,70	0,16	10,50	0,16	6,18	10,5	**2016**
0,02	1,64	0,13	12,30	0,13	7,51	12,3	**2017**
8,07	**112,06**	**-**	**-**	**7,62**	**79,71**	**270,97**	**total**
0.45	**6.23**	**-**	**-**	**0,42**	**4,43**	**15,05**	medium

Source: Based on data from the Bank of Algeria.

$$X^{*} = \frac{1}{X} \qquad \overline{X}^{*} = \frac{\sum X^{*}}{n} = \frac{7.62}{18} = 0.42$$

$$y = Y - \overline{Y} \qquad x = X^{*} - \overline{X}^{*}$$

$$X = \frac{\sum X}{n} = \frac{79.71}{18} = 4.43 \qquad Y = \frac{\sum Y}{n} = \frac{270.97}{18} = 15.05$$

$$\hat{b} = \frac{\sum yx^{*}}{\sum x^{*2}} = \frac{112.06}{8.07} = 13.88$$

$$\hat{a} = \overline{Y} - \hat{b}\overline{X}^{*} = 15.05 - 13.88 * 0.42 = 9.22$$

The estimated function is as follows:

$$Y = 9.22 + 13.88\left(\frac{1}{X}\right) + u$$

It represents an estimate of the Phillips curve in Algeria during the period 2000-2017.

We conclude from the above that the minimum, which does not fall below the unemployment rate in Algeria, no matter how high the inflation rate is 9.22% and that any drop in unemployment rates from this rate is due to other factors, Through this result, monetary authority through the application of monetary policy instruments is bound to target inflation at rates commensurate with an unemployment rate of 9.22%.

Also: $\frac{dY}{dX} = \frac{-13.88}{X^2} = \frac{-13.88}{\overline{\overline{X}}^2} = \frac{-13.88}{4.43^2} = -0.70$

This means that the one-point increase in inflation is accompanied by a decline in the unemployment rate of 0.70 points on average, and flexibility can be calculated as follows:

$$E_{YX} = \frac{-\hat{b}}{\overline{X}\overline{Y}} = \frac{-13.88}{4.43*15.05} = -0.21$$

The elasticity of unemployment for inflation is -0.21, which means that the rise in inflation by 10% is accompanied by a decline in the unemployment rate by an average of 20%.

4. Modeling the relationship between unemployment and inflation from the point of view of non-structural modeling.

4.1. String stability:

We will study stability using the Philip Peron test (pp) on both the unemployment and inflation series at their levels and after the first differences during 1980-2017.

Table (20): Studying the stability of the studied chains.

Statement	Form Type	***Inf*** - Calculated value - Critical value - Critical probability **(0.01)**	***Chom*** - Calculated value - Critical value - Critical probability **(0.01)**	***Dinf*** - Calculated value - Critical value - Critical probability **(0.01)**	***Dchom*** - Calculated value - Critical value - Critical probability **(0.01)**
the Philip Peron test (pp)	***(1)***	1.23 2.62 0.19	0.56 2.62 0.46	23.28 2.63 00.00	11.35 2.63 00.00
	(2)	1.94 3.62 0.30	1.12 3.62 0.69	25.61 3.63 00.00	11.13 3.63 00.00
	(3)	2.15 4.22 0.50	1.45 4.22 0.82	25.86 4.24 00.00	11.57 4.24 00.00

Source: EVIEWS Outputs 9.

4.2. Test common integration and estimate the appropriate model

- Determining the delay of the VAR (P) model:

To determine the degree of delay of the VAR model we rely on several criteria, including:

- (FPE) Final predictor error criterion **(Cromwell, 1994, pp.73-75):**
- Akaike and Schwarz criterion**:**
- Bayesian information criterion (BIC **(V, 2002, p. 97)**)
- Hannan and Quinn information criterion HQIC **(A, pp. 442-446)**

Table (03): Determination of Delays for Self-Regression Model.

VAR Lag Order Selection Criteria
Endogenous variables: CHOM INF
Exogenous variables: C
Date: 04/27/18 Time: 16:17
Sample: 1980 2017
Included observations: 35

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-239.2681	NA	3330.996	13.78675	13.87563	13.81743
1	-165.8242	134.2975*	63.03021*	9.818525*	10.08516*	9.910566*
2	-163.4921	3.997829	69.54798	9.913835	10.35822	10.06724
3	-158.3704	8.194730	65.68785	9.849738	10.47188	10.06450

* 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

Source: EVIEWS Outputs 9.

In view of the above table, it is clear that the maximum number of parameters stabilized at a one-point delay. The LR, SC, HQ, AIC, and FPE agreed to the smallest value that these criteria can take at the delay level of 01.

Hence, the degree of delay of the VAR model is 1.

- the process of testing common integration:

- Engel and Granger Test:

This test was developed by Engel and Granger, in order to clarify the relationship of simultaneous integration between two variables with the same degree of integration, from two stages **(Sandrine Lardic, 2002, pp. 220-230)**:

- By estimating the regression relationship using the normal lower squares method to ensure that the two variables have the same degree of integration:

$$Y_t = a_0 + a_1 X_t + \varepsilon_t$$

- Test the dormancy of the residues $\hat{\varepsilon}_t$ resulting from the regression equation in accordance .

The null hypothesis of non-dormancy is rejected if t_{cal} it is based on DF and ADF below the critical values of t_{tab}, which means that it is stable at $I(0)$ the level indicating a long-term static relationship between the two variables X and Y .

- Johansen test

This test is used to study the long-term relationship of a set of integrated variables and of the same class. We can determine the number of co-integration relationships by calculating the number of co-integration rays called the matrix of cointegration. This test depends on estimating the regression vector model Self VAR using the method of great reasonableness .

In his study, Johansen concluded that the test of joint integration of model variables is mainly related to the rank of matrix A where:

- The first case: if the rank of the matrix is equal to zero $rang(A) = 0$, Which $r = 0$, Which means that the elements of matrix A are zero and all variables have a unit root, This explains why there is no synchronous integration relationship between variables. In this case we estimate a VAR model on the first differences of variables.

- **The second case:** if the rank of the matrix is completely greater than zero and completely less than the number of variables k which $rang(A) = r$, Where $k > r > 0$, in this case, the beam variables X_t are time-synchronized, and there is r a synchronous integration relationship between the variables. Thus we can estimate the error correction model $VECM$.
- **The third case:** if the rank of the full-scale matrix, where $rang(A) = k$, which $r = k$, This means that the variables are stable $I(0)$ It has no root of unity and is not a problem of a concurrent integration relationship. In this case, we estimate a self-regression model VAR directly on the beam variables X_t without making any differences.

Table (04): Test the number of simultaneous integration relationships using the impact test.

Date: 04/25/18 Time: 18:53
Sample (adjusted): 1983 2017
Included observations: 35 after adjustments
Trend assumption: Linear deterministic trend
Series: DINF DCHOM
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.393521	22.43717	15.49471	0.0038
At most 1 *	0.131491	4.934198	3.841466	0.0263

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: EVIEWS Outputs 9.

From the above table, the test results of the number of concurrent integration relationships are under the following assumptions:

$i / H_0 : r = 0 / H_1 : r > 0$

$ii / H_0 : r = 1 / H_1 : r > 1$

In the hypothesis (i),(ii) we reject the hypothesis H_0, regardless of the level of significance, because the statistic *Johansen* is greater than the critical value. This statistic takes the following values: 22.43 and 4.93, and the critical values at 5% are respectively: 15.49, 3.84.

And it will be $rang(A) = 2$. Ie the number of concurrent integration relationships is two (2) synchronous integration relationship.

This means that the variables are stable $I(0)$ and have no unit roots and are not a problem of a synchronous integration relationship originally presented. In this case, we estimate VAR a self-regression model directly on the self-regression beam variables without making differences on them, which corresponds to the third case referred to earlier.

Table (05): Determination of the values of the test of the greatest intrinsic values.

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.393521	17.50297	14.26460	0.0149
At most 1 *	0.131491	4.934198	3.841466	0.0263

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: EVIEWS Outputs 9.

The values of the test of the great intrinsic values shown in the table above show that the prob value for all test hypotheses is less than 0.05, which means rejecting the null hypothesis at all levels at the level of significance of 5%, Thus, the number of concurrent integration relationships is equal to 02 as a synchronous integration relationship, ie we estimate the self-regression beam model on the study strings at their levels.

- Var model estimation process:

In order to estimate the parameters of the VAR (P) model, we use the lower squares method (MCO) **(Sandrine Lardic, 2002, pp. 90-94)**:

Table (06): Estimation of the self-regression model.

Vector Autoregression Estimates
Date: 04/25/18 Time: 18:58
Sample (adjusted): 1981 2017
Included observations: 37 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	INF	CHOM
INF(-1)	0.844296	0.118023
	(0.09984)	(0.03140)
	[8.45635]	[3.75902]
CHOM(-1)	-0.097122	0.934849
	(0.12688)	(0.03990)
	[-0.76548]	[23.4301]
C	3.220771	-0.005450
	(2.42416)	(0.76233)
	[1.32861]	[-0.00715]

R-squared	0.684269	0.950474
Adj. R-squared	0.665697	0.947561
Sum sq. resids	798.9132	79.00576
S.E. equation	4.847417	1.524368
F-statistic	36.84334	326.2571
Log likelihood	-109.3389	-66.53488
Akaike AIC	6.072374	3.758642
Schwarz SC	6.202989	3.889257
Mean dependent	9.402973	18.38541
S.D. dependent	8.383784	6.656768
Determinant resid covariance (dof adj.)		54.38482
Determinant resid covariance		45.92319
Log likelihood		-175.8004
Akaike information criterion		9.827049
Schwarz criterion		10.08828

Source: EVIEWS Outputs 9.

From the table above we can write the inflation equation as follows:

$$\inf = 3.22 + 0.844 \inf(-1) - 0.09 c\hom(-1)$$

$n = 37$ $R^2 = 0.68$ $F = 36.84$

- From the results of the estimate we note that the logarithm rate of inflation is explained by 68% in previous values and values prior to the other variables.

- Fisher statistics: $F_{calculé} = 36.84 > F_{tabulé}^{\alpha=0.05} = 3.28$

From which we accept the alternative hypothesis (H_1), Ie accept the previous equation. Thus, the logarithm function of the inflation rate is statistically acceptable, The relationship also shows the negative relationship between inflation rates and unemployment rates in one stage, That is, an increase in the unemployment rate by 1% will lead to a decrease of 0.09% inflation.

The unemployment equation is written as follows:

$$\text{chom} = -0.005 + 0.93c\,\text{hom}(-1) - 0.11\inf(-1)$$

$$n = 37 \qquad R^2 = 0.95 \qquad F = 326.25$$

- From the results of the estimate, we note that the logarithm of the unemployment rate is explained by 95% in its previous values and the previous values of the other variables.

- Fisher statistics: $F_{calculé} = 326.25 > F_{tabulé}^{\alpha=0.05} = 3.28$

From which we accept the alternative hypothesis (H_1), Ie acceptance of the previous equation. Thus, the logarithm function of the unemployment rate is statistically acceptable, The relationship shows the negative correlation between unemployment rates and inflation rates lagged in one stage, That is, an increase in the inflation rate by 1% will lead to a decrease in unemployment of 0.11%.

4.3. tests of diagnosis and stability of the model.

After estimating the VAR model, make sure that the estimated model of reality matches any dynamic variables under study, We calculate the Portmanteau radial count to test the hypothesis of self-correlation between errors for all model equations.

- Test portmanteau radial:

This test is used to test the hypothesis of correlation errors at the model level as a whole. It was proposed by Hosting in 1980 and lütkepohl in 1991, and was developed by Doornik-Hendry in 1997.

Table (07): Test portmanteau radial.

VAR Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: no residual autocorrelations up to lag h
Date: 04/25/18 Time: 19:03
Sample: 1980 2017
Included observations: 37

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	3.300901	NA*	3.392593	NA*	NA*
2	8.625321	0.0712	9.021265	0.0606	4
3	8.979377	0.3440	9.406562	0.3092	8
4	10.94191	0.5339	11.60697	0.4777	12
5	13.71142	0.6202	14.80922	0.5387	16
6	20.60275	0.4208	23.03436	0.2871	20
7	26.63874	0.3216	30.47875	0.1694	24
8	33.14891	0.2303	38.78483	0.0844	28
9	38.53520	0.1979	45.90243	0.0530	32
10	39.44870	0.3184	47.15425	0.1010	36
11	39.84803	0.4770	47.72253	0.1876	40
12	44.70860	0.4419	54.91618	0.1253	44

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

Source: EVIEWS Outputs 9.

Looking at the table above we find that $LB(s) = 54.91 \leq \chi^2_{2^2(11-1)} = \chi^2_{40;0.05} = 55.76$, Which means that we reject the null hypothesis that there is a correlation between the locks of all equations of the var model, It is also possible to prove that the model locks are not linked by prob value, Since all values are greater than 0.05 and therefore there is no hypothesis of correlation between the model's locks.

- The inverse of the roots associated with the AR part test:

To verify the stability of the model, using Eviews, we tested the VAR (1) by testing the inverse of the roots associated with the AR part.

Figure (08): Test results of the inverse of the roots associated with the AR part

Roots of Characteristic Polynomial
Endogenous variables: INF CHOM
Exogenous variables: C
Lag specification: 1 1
Date: 04/25/18 Time: 19:05

Root	Modulus
0.889573 - 0.097019i	0.894847
0.889573 + 0.097019i	0.894847

No root lies outside the unit circle.
VAR satisfies the stability condition.

Source: EVIEWS Outputs 9.

In the above figure we find that the inverted monolithic roots of many borders are less than one and therefore present within the single circle, from which the VAR model is stable.

4.4. the dynamics of self-regression models.

Self-regression models allow us to analyze the effects of economic policy, by simulating random shocks and error variance analysis, As this analysis assumes the stability and stability of the economic situation.

- Study of causality test:

In the case of non-structural modeling where there is no specific economic theory of the model, the study of causality should be given attention because the renewal or knowledge of who causes us to give a clear picture of the relationship between economic variables, This is in order to understand economic phenomena. In addition to the effective role of determining the direction of causality in the correct formulation of economic policy. **(Sandrine Lardic, 2002, pp. 99-101)**.

Table (09): Results of the Granger Causality Test.

Pairwise Granger Causality Tests
Date: 04/25/18 Time: 19:10
Sample: 1980 2017
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
CHOM does not Granger Cause INF	37	0.58595	0.4493
INF does not Granger Cause CHOM		14.1302	0.0006

Source: EVIEWS Outputs 9.

Through the results of the above table, some causal relationships between the variables can be observed which can be summarized as follows:

- There is a causal relationship with the concept of Ganger moving from variable inflation to variable unemployment, at the level of 5% significance, which means that the variable inflation contributes significantly to improve the predictive capacity of the variable unemployment at a confidence level of 95%.
- There is no causal relationship to the concept of Ganger moving from changing unemployment to variable inflation, at a level of 5%, which means that unemployment does not contribute significantly to improve the predictive capacity of the variable inflation at the level of confidence of 95%.

- Analysis of shocks and response functions.

The use of pulse response functions determines the behavior of the motor model variables and determines the direction of the relationship between the model variables. Variable values are called at each time of the response rate ((Impulse response function).

Table 10: Relationship Matrix between Residuals.

Chom	***inf***	
0.062	1.00	***Inf***
1.00	0.062	***Chom***

Source: EVIEWS Outputs 9.

Through the correlation matrix between residuals, we note that there are no strong links between renewals, This confirms to us that in the event of a shock to any variable, leads to the emergence of real reactions shown by the other variables.

In the case of links between the two residues, this will block the real reactions of the other variables, However, this problem can be eliminated by making renovations associated with orthogonal renovations which is achieved by dismantling the cholesky matrix of variations and common variations of the original renewals.

However, this problem can be eliminated by making renovations associated with orthogonal renovations which is achieved by dismantling the cholesky matrix of variations and common variations of the original renewals.

Through the results obtained in the table below, We find that the occurrence of a positive random shock in the variable inflation of one standard deviation will lead to the emergence of positive and increasing revenge on unemployment rates in the next ten years, As this shock does not have any effect on unemployment in the first year, but it left an impact of 45.22% in the third year and continues to rise until it reaches 146.7% during the tenth period.

In addition, a positive random shock on the unemployment rate of one standard deviation will result in decreasing positive effects during the first period (14.2%) and the second (0.6%) on inflation rates and negative effects from the third period (-10.0%) To the tenth period (-34.77%).

Table 11: Determination of response functions.

Response of CHOM: Period	CHOM	INF
1	1.542570	0.000000
2	1.476821	0.452265
3	1.400900	0.799937
4	1.318242	1.059767
5	1.231653	1.246347
6	1.143402	1.372345
7	1.055299	1.448700
8	0.968760	1.484821
9	0.884874	1.488755
10	0.804450	1.467353
Response of INF: Period	**CHOM**	**INF**
1	0.142859	4.536264
2	0.006639	3.722433
3	-0.100429	3.022183
4	-0.182845	2.422637
5	-0.244550	1.912025
6	-0.288976	1.479643
7	-0.319105	1.115800
8	-0.337513	0.811758
9	-0.346414	0.559674
10	-0.347704	0.352533

Source: EVIEWS Outputs 9.

- Analysis of error variation:

The response functions explain how a particular shock is spread in one of the variables within the system and on the other variables, The process of disassociation of variance, it helps to clarify the relative importance of each variable of the system in the interpretation of changes that occur in a variable, By knowing the percentage of the contribution of each variable of the system variables in the error variance in a specific horizon of the variable concerned. To calculate the weight or proportion of the participation of each variance, we divide the value of this variance by the variance of the total prediction error.

The disassembly tool suffers from the same problems as the response functions, Since the problem of link errors is, This impedes the process of isolating the effect of all innovations individually, and to avoid this problem we use the dismantling of Kolski. The latter also can not be given an economic explanation for the shocks obtained, because the results of this method change according to the changing order of variables.

Table 12: Disparity of the unemployment rate variance.

Variance Decomposition of INF:

Period	S.E.	INF	CHOM
1	4.847417	100.0000	0.000000
2	6.339789	99.94568	0.054318
3	7.190866	99.82413	0.175867
4	7.706547	99.64134	0.358657
5	8.020244	99.40610	0.593895
6	8.207096	99.12999	0.870005
7	8.314406	98.82682	1.173183
8	8.373377	98.51154	1.488459
9	8.404780	98.19891	1.801091
10	8.422181	97.90201	2.097989

Variance Decomposition of CHOM:

Period	S.E.	INF	CHOM
1	1.524368	0.395917	99.60408
2	2.187323	9.345883	90.65412
3	2.778014	21.48958	78.51042
4	3.344634	33.05869	66.94131
5	3.885852	42.73272	57.26728
6	4.392070	50.41688	49.58312
7	4.854958	56.41225	43.58775
8	5.269417	61.07334	38.92666
9	5.633459	64.70415	35.29585
10	5.947581	67.54157	32.45843

Cholesky Ordering: INF CHOM

Source: EVIEWS Outputs 9.

From the results of the previous table, we find that most of the situational fluctuations that affect inflation in the short term are mainly produced by the self-shocks of the same variable,

This shock explains 99.94% of the changes in inflation during the second period following the shock period, and the self-shocks of inflation are relatively low to 97.9% after 10 periods of time.

In addition to the decrease in the contribution of inflation-changing shocks in the interpretation of their own changes, the contribution of each of the shocks of the other variables increases. The contribution of unemployment shocks to the variable inflation has moved from 0.05% during the second period to 2.09% during the tenth period.

We also find that most of the situational fluctuations that affect unemployment rates in the short term are mainly produced by self-shocks of the same variable, This shock explains 99.60% of the changes in the unemployment rate during the second period after the shock period, We also note that the rate of self-shocks of unemployment rates is falling relatively to reach 32.45% after 10 periods of time.

In conjunction with the decrease in the contribution of unemployment variable shocks in the interpretation of their own changes, the contribution of each of the shocks of the rest of the variables increases, The share of inflation shocks on the unemployment variable moved from 0.39% during the second period to 67.54% during the tenth period.

5.summary:

Through the previous study stages, the following results were obtained:

- The results of the second axis of the study on the existence of a relationship between unemployment and inflation according to the concept of Philips, There was an inverse correlation between the two rates. The increase in inflation is accompanied by a drop in unemployment until it reaches a minimum of 9.22%. No matter how high inflation is, this will not reduce the unemployment rate. Consequently, any decline in unemployment rates below 9.22% is due to other factors.
- There is a causal relationship with the concept of Ganger moving from variable inflation towards the variable unemployment, At a level of significance of 5%, which means that the variable inflation contributes significantly to improve the predictive capacity of the unemployment variable at a confidence level of 95%, On the other hand, there is no causal relationship to the concept of Ganger moving from variable unemployment to variable inflation,
- The results in the third axis of non-structural modeling and the estimation of the self-regression model showed an inverse relationship between inflation rates and unemployment rates, As the sacrifice of high inflation rates would lead to a reduction in unemployment rates Algeria, which is in line with the content of Phillips relationship, This

means that the relationship between unemployment and inflation in Algeria is a kind of Keynesian influence during the study period.

- The results of the analysis of the impulse response functions confirmed the results of the causal tests, Where there were significant responses from the variable inflation to the unemployment variable.
- By dismantling the variance we found that the share of inflation shocks on the variable unemployment has moved from 0.39% during the second period to 67.54% during the tenth period.
- Philips' relationship between unemployment and inflation in Algeria was present both in the structural model and in the non-structural model.

6.References

1-.K, S. .. (n.d.). analytical aspects of anti-inflation policy . *American economic review*.

2-A, G. C. (n.d.). *Séries temporelles et modèles dynamiques. Ed. Econom.* paris: Economica.

3-Cromwell, J. M. (1994). *Multivariate test for time series models.* California: SAGE publications.

4-Hisham Lebza, M. A.-H. (2014). The study of economic causality between the phenomena of inflation and unemployment in Algeria. *Journal of Economic Visions*.

5-laaraf Fayza, S. N. (2011). Phillips Curve Study in Algeria. *International Activities Government Strategy to Eliminate Unemployment and Achieve Sustainable Development.* m'sila: M'sila University.

6-Lipsay, R. (1960). *the relation between unemployment and the rate of change of money wage rate in the U.K 1862-1957, a further analysis* . economica.

7-Philips, A. (n.d.). *the relation between unemployment and the of change of money wage rates in the united kingdom 1861-1957.* economica.

8-Sandrine Lardic, V. M. (2002). *Econométrie des séries temporelles macroéconomiques et financières.* paris: Economica.

9-V, L. s. (2002). *économétrie des séries temporelles macroéconomiques et financières.* paris: Economica .