Testing for asymmetric effect of industrial production index on unemployment rates- study case the Arab countries

اختبار عدم تماثل اثر مؤشر الإنتاج الصناعي على معدلات البطالة –دراسة حالة البلدان العربية

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Abstract: This paper aims to study the relationship between the industrial production index and the unemployment rates in the Arab countries. The study concluded that there is a nonlinear relationship between the two variables. The researcher proposes one method of estimation based on the hypothesis of asymmetry. The researcher suggested the application of an estimation method represented in the non-linear regression of distributed distributions. As for the results in concrete reality, the researcher reached the industrial production index of the Arab countries with different effect on the unemployment rates. This variation in effect is due to the negative and positive effect.

Key words: Arab countries; unemployment rate;IPI; asymmetry

Jel classification: C34 J64

ملخص: تهدف هذه الورقة البحثية إلى دراسة تلك العلاقة الموجودة ما بين مؤشر الإنتاج الصناعي ومعدلات البطالة في الدول العربية، وقد توصلت إلى وجود علاقة غير خطية بين المتغيرين، ما جعل الباحث يقترح إحدى طرق التقدير القائمة على فرضية عدم التناظر، وبما أن العلاقة تعتمد على الديناميكية فقد اقترح الباحث تطبيق منهج تقدير متمثل في الانحدار غير الخطي للإبطاء الموزع، أما عن النتائج في الواقع الملموس فقد توصل الباحث إلى مؤشر الإنتاج الصناعي للدول العربية متباين في تأثيره على معدلات البطالة وهذا التباين في التأثير مرده إلى عدم تماثل الأثر الموجب والسالب للمتغير المستقل في فترة الدراسة.

الكلمات المفتاحية: الدول العربية، معدلات البطالة، مؤشر الانتاج الصناعي، اللاتماثل.

تصنيف Jel: C34 J64

1- Introduction:

The industry in the Arab world until recently was very late; because it was limited to many handicraft industries related to population activity and providing the necessary necessities of individuals such as clothes, food and some household items, which were in all simple, can be controlled by hands, But the revitalization of industry and its emergence from the cycle of underdevelopment is due to the periods that followed the independence of many Arab countries, as most Arab countries developed development programs that include the promotion of the industry as one of the top priorities of the governments of these countries(Tawhid Zuhairi, 2003, p94)

Problem statement of the study:

As most of the Arab industries are consumer industries, due to the acquisition of raw materials in production and the availability of equipment and technical and administrative skills. Necessary to sustain them.

In addition, most of the industrial establishments in the Arab world are small in size, which means low industrial productivity and not relying on modern technology. In addition, most of the Arab industries rely on agricultural and animal materials, and a few of them rely on mineral materials. This affects negatively the rate of industrial development. They differ from one country to another in the Arab world, so the industrial output constitutes only a small percentage of national income(Ahmed Asaf, Hocein Wadi, 2010, p145).

The research on the dialectic existing in the relationship of industrial production and unemployment requires us to raise several questions, especially in the clear discrepancy between the Arab countries in containing the unemployment rates, and affected the latter status of the economies of the Arab countries, and therefore we must research the answer to the following question The relationship between the industrial output index and unemployment rates, and how far can this relationship be asymmetric?)

- Study hypothesis:

From the problematic point of view, the relationship between the index of industrial production can be

1. Their effect is not asymmetric

2-The relationship between the industrial production index and unemployment is a long-term co-integration

3-The negative effect of the Industrial Production Index on the unemployment rate in the Arab countries is more than the positive effect. This is because of the stagnation of the other sectors. In the case of the industrial production index, unemployment rates in most of the Arab countries are increasing. Other sectors are unable to absorb these labor, Depend on industries, especially extractive.

Objectives of study:

-Standard experimental exploration of the non-linear relationship between the index of industrial production and unemployment in the Arab countries.

-To come up with a set of explanatory and illustrative results for this relationship, which can help provide guidance to economic decision-makers and development partners in different Arab countries.

-To address the dimensions of the relationship between the two variables from other angles not addressed

-Analysis of the employment situation in Arab countries and its relation to industry, and the extent of the impact of industrial production rate on unemployment rates.

the importance of study:

The study is an attempt to uncover the relationship between two macro-economic variables, the unemployment rate and the industrial production index, to examine the extent of the change in the relationship between them. The importance of this study is that it did not focus on a specific Arab country, But rather studied in the framework of conceptual and applied

Literature review:

Although the topics of industry have been addressed in many literature and academic research, with a scarcity of studies on the reality of industry

in the Arab countries, we will highlight the previous studies that developed standard approaches to the index of industrial production and some other variables similar to Unemployment rate, and these studies include:

A study conducted by(David Mardsen in, 1995, p53) included the countries of the OECD and focused on research on the impact of industrial production on unemployment in these countries. It concluded that industrial production is efficient in reducing unemployment rates, unless these countries overstate the use of capital technology Employment Account.

Another study by(Mueen Nasir and Archad Hassan Zafar, 2010, p53) dealt with the impact of the industrial production index on inflation, oil prices and unemployment, as well as the balance of the goods and services market in Pakistan. The nardl models were used and came out with a series of results, Of prices, but it is significant to the unemployment rate.

A study by(Ihej Irika and Warri Branch, 2012, p16)

The efficiency of using the index of industrial production and industrial profits distributed in the State of Nigeria and concluded the need for government intervention in the formulation of industrial policy of the country to avoid some of the negative effects on the rate of employment, and has(Arched Noman, 2017, p22) estimated the relationship between the industrial production index and the unemployment rates in Bangladesh in 2017 using nardl models and found a proof of the asymmetry hypothesis of the industrial production index on the unemployment rate in that country.

Another study by Korhan Gokmenoglu, Vahid Azin and Nigar Taspinar on the relationship between industrial production, GDP, inflation and oil prices in Turkey in 2016. This study confirmed the long-term correlation between these variables.

Rodriguez Agustín Alonso studied the index of industrial production and its effect on a set of macroeconomic variables such as unemployment and inflation in both Japan and South Korea in 2016 and concluded that there is a non-linear relationship between this index and Korea is more

significant than the Japanese model. In the long term, Other nonlinear Such as nardl approach.

Rohana Kamurddin and Kamaru zama Jusoff have reached their conclusions on the approach of non-linear self-regression to estimate the impact of food and food industries on the economic growth path of Malaysia.

We add another study by Guido Bulligan, Roberto Golinelli and Giuseppe Parigi on the prediction of the industrial production index and the role of information and the appropriate method of estimation in Italy. Several estimation methods such as ARIMA and ARCH have been used. The NARDL method is the most efficient in estimating the relationship between the production index Industrial and some economic variables in Italy depending on the role of information in it.

While Levent Erdogan, Ahmed Tiryaki and Resat Ceylan discussed the relation between selected macroeconomic variables and the return of capital in Turkey. Several relationships were used in this regard. The most important of these was the nonlinear relationship between the industrial production index and the return on capital with an asymmetric effect, This study recommended the trend towards small and medium industries as the productivity index has an impact on capital return

2-Econometric approach:

In this part of our study we will seek to uncover the economic and standard relationship between unemployment as a whole variable and another variable is the industrial production index.

Standard economic studies have assumed that the linearity of models based on the existence of linear relationships between variables similar to the widely used ARMA models in most standard studies, However, the expansion of economic studies and their comprehensiveness of many motives, such as the economic cycle, positive and negative impact of explanatory variables.

Oil prices affect economic growth but there is no similarity between prices in case of rise and decline (D E Sichel, 1993, p224).

This analysis has resonated widely in the field of financial markets, economic cycles (Abd Rahim Chibi, 2013, p196).

Standardists have limited nonlinear models through two categories:

1. Class 1: Nonlinear process through variance An example of this is the ARCH Family and depends on the velocity and volatility of the random limit and examples of examples such as Arch, Garch, Egarch.

2. Class (2): Non-linear process through the mean, an extension of ARMA models, examples:

Linear double models: developed by Granger and Andersen in 1978;

1) Models of nonlinear moving averages: developed by Robenson (1977);

2) Nonlinear self-regression models: They are the most diverse and diverse of nonlinear models and are also called threshold models.

They can appear in several transmission mechanisms, including: TAR .STAR. LSTAR. ESTAR

3):along with models of transition or models of change of systems, and its features that the effect of the independent variable, unobserved and depend on the economic cycle.

The nonlinear autoregressive distributed lags (NARDL)

   This is a special case of the ARDL regression models and their non-linearity features because the independent variable is not symmetric, meaning that the independent variable effect on the dependent variable (positive effect) is not the same or not equal to the effect of the independent variable (negative effect)

   This evidence of non-linear relationship, mathematical formulation of these models can be written as follows:

$Y_t = Ø0 + Ø1 \sum_{i=0}^{k} x + \xi_t$

By distinguishing the positive effect from the negative effect we find

$Y_t = Ø0 + Ø1\ xt^+ + Ø2\ Xt^-$ (Ibrahim Mansor, 2015, p12)

   Note that Ø is the vector of long-term coefficients and the effect of homogeneity is evident when the positive effect (+) is separated from the negative effect (-), where Xt + and Xt - are parts of the Xt effect on the Yt When we separate the effect we find

$xt\ + = \sum \Delta xt = max\ (xi\ ;\ 0)$

$Xt^- = \sum \Delta X^-t^{=\sum_{i=0}^{k} x} \sum max(xi ، 0\ )$(Gracia, 2005, p05).

The effect of the long-term relationship between Tak and the positive shock in the explanatory variable on the dependent variable can be determined by parameter 1 by positive sign while the parameter 2 Ø represents the relationship between the negative shock caused by the explanatory variable in the dependent variable and this is by negative sign , And both are not alike(Ibrahim   Mansor, 2015, p09)

Ø1 ≠ Ø2

The above equation can be written in the UECM format as follows

$$\Delta yt \quad = \alpha0 + \alpha1Yt\text{-}1 + \alpha2\, x^+t\text{-}1 + \alpha3X\, t^-1 + \beta1i\Delta \sum yt\text{-}i + \beta2^i\sum$$

$$x^+t\text{-}i \quad + \quad \beta3i\sum \quad X^- \quad t\text{-}i \quad Ut$$

P; m; n represent the dynamic relationship gaps between the two variables, and the relationship effect of the variable

The explanatory effect of positive xt^+ long term is Ø1 = α2 / α1

The same variable with its negative effect X t^- is Ø2 = α3 / α1

In the short term the parameters are not equal

Σ i = 0; β2i ≠ Σ i = 0; β3i

This is one of the characteristics of the non-linear regression models of the NARDL, which applies to the same conditions as the ARDL model, including the integration of the variables at the level or the first difference or their co-integration is a combined of this (M Hashem Pesaran et all p10)

Which suggests an asymmetric effect of the independent variable on the dependent variable

3-Representing study variables:

To illustrate the study, we examined the relationship between the two variables, the unemployment rate in the Arab world (um), which is the dependent variable, and the independent variable is the industrial production index of the Arab countries (ind), and other variables were generated based on this study

Fig 1 Unemployment rate and gdp curves in Arab countries
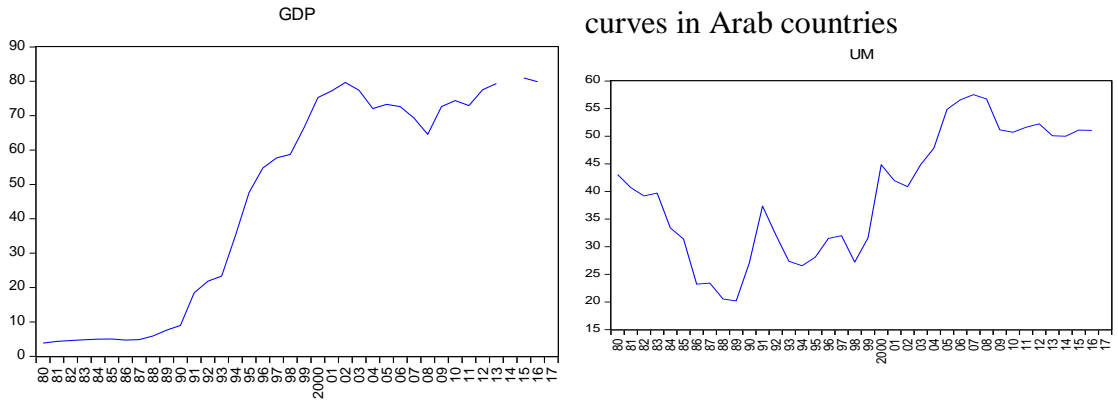
The direct observation of the previous two forms suggests that many of the refractions are in the path of the curve of um and ind. This can be explained by the general economic situation that many Arab countries have experienced, such as the transition between capitalist and socialist economic approaches, geopolitical changes and oil price fluctuations. An attempt to estimate the relationship between the two variables considered below

- There is a non-linear relationship between the two variables
- The effect of the independent variable in the dependent variable is not identical

Therefore, we will take the following steps in our standard study:

1 - Develop variables that are consistent with the curriculum of the study

2 - Studying the stability or silence group using one of the stability tests

3 - Estimate the relationship between the two variables using the gradual gradient stepwise least squares

4 - Conduct some tests such as asymmetry

5 – Perform residual diagnostic tests

In the following we develop the parameters of the equilibrium relationship between the two variables after they were generated from the two variables(ind) And(um)according to the following table

Description	Variable in long term	Description	Variable in short term
Dep variable	Um	Diff of dep variable	DUM
Dep variable lag 1	Um(-1)	Diff of indep variable	DIND
Indep variable leg 1	IND (-1)	Diff of indep variable leg 1	DIND (-1)
Indep variable positive	IND_p	Diff of indep variable positive	DIND_p
Indep variable negative	IND_n	Diff of indep variable negative	DIND_n

By using (genr) on eviews

Lag length Criteria:

The gaps depend on the situation studied according to the delay criteria, namely, one delay gap, $p = 1$, as we will see

This is confirmed by test delay criteria

Using the e views program in its ninth version for an annual sample of 41 views: For the dynamic process of the time series, we set the delay or delay times

Since the method of this method depends on the distribution of delays or delays, we may obtain delay data for the model variables we specified in the following table

HQ	SC	AIC	FPE	LR	variable
1	1	1	1	1	UM
1	1	1	1	1	IND

he delay process is determined by the LM test or the serial self-correlation. Delays are stopped on the basis of this test. If there is no self-correlation, the delay periods can be added. If the self-correlation is confirmed, stop the delay. That the two variables were ideally delayed by one period depending on the smallest value in each standard and thus the model is NARDL (1.1)

- We will test the relation or impact of the industrial production index whether positive or negative on the speed of unemployment rates in the Arab countries and the state of variation of this effect. The relationship does not become linear between the two variables. If there is a long-term integrative relationship with different stability of the variables between the level and the difference First (without   2and difference), the conditions for the application of ARDL models are available. If the effect of the independent variable is different between the positive and negative effects, the relationship does not become linear and becomes Non linear ARDL models.

The first formula: does not contain an intercept and a trend

$$\Delta y_t = y_{t-1} + \lambda u_t$$

The second formula: contains only the intercept

$$\Delta y_t = c + \lambda y_{t-1} + u_t$$

The third formula: contains the the intercept and trend

$$\Delta y_t = c + B_t + \lambda y_{t-1} + u_t$$

In the case of nonlinearity, some statisticians recommend using other tests like Kapitanos Shin Snell (KSS). After testing, we get the following table. Based on the results of the stability test, the UM time series is still at the same level as the IND series It is noted here that the integration of time series is a combination between I (0) and I (1). This is a condition of using the ARDL approach

Kss test (1)

1st difference		Level		rank	series
Intercept and trend	Intercept	Intercept and trend	Intercept		
/	/	* -5.06	* -5.12	I(0)	Um
* -4.00	* -4.03	/	/	I(1)	Ind

 *sig at 1% ** sig at 5%

Based on the results of the KSS test, we have confirmed that the rank of the two variables is a combination between I (0) and I (1), one of the conditions for the use of ARDL as linear or nonlinear

Simultaneous Integration Testing:

As previously mentioned, NARDL models are more effective in small samples and therefore their integration test requires a special type of testing called the Wald test compared non-standard values of Fisher distribution

H0: F.Wald stat value less than I (1)

There is no co-integration

H1: FWald calculated value greater than I (1) There is a long-term co-integration between the studied variables and I (0) and I (1) are the limits of co-integration.

K	Prob	F-stat	relationship
2	0.007	5.26	F(um/,ind ,)
	I(1)	I(0)	Bounds
	5.23	3.93	1%
	4.25	3.12	5%
	3.79	2.75	10%

Based on the table above, we have two hypotheses

H0: = C4 = C3 = C2 = 0 There is no cointegration

H1: C4 ≠ C3 ≠ C2 ≠ 0 There is a cointégration

Hence, since the value of F.Wald = 5.26   is greater than at I(1) 1%, which is greater than 5.23, and thus we ensure that there is a joint integration between um and the industrial production index positive and negative effects, and this in the long term and in terms of Statistics The existence of a ointegration relationship between the two variables can be recognized in the long term

4 -Estimation method:

After confirming the existence of a long-term cointegration relationship, we come to the next step, which is to choose the appropriate method of estimation of the studied case. Some statisticians are advised to use the stepwise least squares rather than the (Arched 2017)

prob	Estimated value	,Variable
0,0047	1.54	C
0.0000	-0.24	Um(-1)
0.015	- 0,04	ind_p (-1)
0.0318	- 0,8	Ind_n(-1)
0.35	0.029-	Dind_n (-1)
0.39	0.03-	Dind_n)

2,03	DW	0.935	R^2
1.99	AIC	0.79	Adj R^2
0.000	Prob F	23.98	F

Since the characteristics of NARDL models are characterized by short-term separation from long, according to the elasticities, this effect can be divided into two parts:

Long term: By dividing the long term coefficients ie -c (3) / c (2) equals to -0.16 /0.24 = 0,04. This negative effect

The positive effect is calculated as -c (4) / c(2) and equals -0.8 /-0.24=3.33

Ultimately, we get the next long-term relationship model following

um=1.54 +3 .33 ind_p-0.16 ind_n

We note that the elasticity of the positive effect is greater than the negative effect and this is evidence that the industrial production index affects the unemployment index more than the positive effect of positive effect, although both parameters are significant according to t-student test In the sense that in the case of the decline of the industrial production index, unemployment rates are increasing in most Arab countries and other sectors are unable to absorb these labor, because the Arab countries' economies depend on industries, especially extractive ones

Asymmetry test:

This test is based on the acceptance or non-acceptance of the idea of symmetry or symmetry of influence in the sense of whether the index of industrial production affects equally the unemployment rates? or not? If the answer is yes, the relationship between the two variables is linear and

therefore the long-term impact is the same because the relationship is a long-term relationship and vice versa if the answer is no and the relationship between the two variables is nonlinear and not equal. This leads us to test the following hypotheses

H0: C (3) / C (2) = C (4) / C (2) There is no asymmetry in the relationship

H1: C (3) / C (2) ≠ C (4) / C (2) There is asymmetry in the relationship

Using the WALD test, we find

Decision	prob	F-Wald stat	Hypothesis
H0 rejected There is an asymmetry of the long-term effect between ind_p and ind_n on um	0.04	4.27	H0 : C(3)/C(2)=C(4)/C(2) H1: C(3)/C(2) ≠C(4)/C(2)

Residual diagnostic tests:

Test	Value	Prob	The desicion
Reset	F=0.032	0. 8	Model has a misspecification.
Jarque-bera	J B=1.68	0.43	Residuals are normaly distributed
LM	n.R²=1.93	0.47	Residuals have not a serial correlation
ARCH	n.R²=1.47	0.25	Model has not heteroskedasticity

Through this paper, which includes the study of the relationship between the industrial production of the Arab countries and their relation to unemployment rates, the following results can be obtained:

1- **theoretical section results** :

-The industry in the Arab countries still suffers from great difficulties, which can be summarized in the following points:

Economic challenges have become one of the realities of living in the Arab countries at the present time, and one of the most serious challenges that bothers everyone interested in the Arab world.

There are different patterns and images of the economic challenges facing the Arab countries, and perhaps the most important challenge for these countries is to diversify the economy and phase out dependence on oil revenues.

These economic challenges have many adverse effects on the future of Arab development.

Arab economic action is no longer a developmental necessity, but a necessity, a reality and a future for economic blocs

-Most industries in the Arab countries are concentrated on strategic industries

-The relative delay in technology ownership has made most Arab countries lagging behind in the industrial sector transformation, which is clearly lagging behind

The intra-Arab trade and joint Arab action can contribute to highlighting these challenges in the coming period, which will revive the industrial sector. The latter will contribute to reducing the unemployment rates in the Arab countries because the manufacturing industries need qualified and trained workers.

There is no doubt that the ability of the economic system of the Arab countries to meet the challenges if identified elements of Arab responsibility, it can achieve the Arab countries some economic balances and high rate of economic growth, and this is an important criterion to judge the degree of success of that experience or failure, and therefore needs the Arab economic system In order to be successful and effective, to take firm and rapid steps in the face of economic challenges and improve growth rate.

There is a clear difference between the Arab countries in the indicators of industrial production if we rely on the comparison to the extractive industries.

2-application section results:

-Nonlinear models have become a reflection of the fact of many economic relations characterized by instability, and asymmetry, especially in the dynamics of rise and fall, as well as the impact of variables not seen as economic cycles

-Nardl models are a special case of ardl models and are based on the nonlinear formula ie non-self-distributive models with distributed decomposition, and are based on the idea that the dynamic effect of the independent variable on the dependent variable is asymmetric

-Due to the multiplicity of parameters that were generated from the two variables over the short and long term, we used the stepwise least squres method, which differs from the method of the lower squares in the fact that they distinguish significant explanatory variables from variables that have no statistical significance

-The effect of the explanatory variable on positive and negative factors is not symmetric, but that the negative effect exceeds the positive effect. This is supported by the economic theory and the reality of industry in the Arab world because if the industrial production index in the Arab countries rises, this affects the unemployment rate and will decrease according to the ratio and the relationship referred to But in the case of low industrial production will rise unemployment but not the same proportion, but a larger proportion because unemployment can not be absorbed in other sectors such as agriculture and tourism, and this is because of the contribution of industry, especially extractive in reducing unemployment in most Arab countries, and Based on this relationship is not identical in both cases came the idea of non-linear relationship

The diagnostic tests of the model and the booths came to support the validity of the relationship between the two variables such as Ramsey test, which confirmed this, but tests of the model locks have supported the econometric approach of the model

5-Conclusion:

Non-linear models have become a reflection of the fact that many economic relations are characterized by instability, asymmetry, especially

in the dynamics of rise and fall, as well as the impact of variables not seen as economic cycles

- nardl models are a special case of ardl models and are based on the nonlinear formula and are based on the idea that the dynamic effect of the independent variable on the dependent variable is asymmetric

Due to the multiplicity of parameters that were generated from the two variables over the short and long term, we used the stepwise least squares method, which differs from the method of the least squares in the fact that they distinguish significant explanatory variables from variables that have no statistical significance

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- The diagnostic tests of the model and the booths came to support the validity of the relationship between the two variables such as Ramsey test, which confirmed this, but tests of the model locks have supported the standard approach of the model

Appendix:

test. KSS root unit, which is abbreviated in the KSS code relative to Kapetanios Snell Shin

Of the unit roots and study the stability of the strings but in a nonlinear form. The latter is synonymous with the ADF test and the following nonlinear formula is:

$\Delta Yt = \rho 1 Yt\text{-}1 + \rho 2\ Yt\text{-}1 F(qt\ ;\gamma,c) + \varepsilon t :$

$\sigma y^3 t\text{-}1 + error = \Delta Yt$

NLadf= ß/SE(ß) The approximate distribution of this test is non-standard and therefore the table of critical values for the test is approximate.

model ⟍ sig level	NLADF1	NLADF2	NLADF3
99%	-2.82	-3.48	-3.93
95%	-2.22	-2.93	-3.40
90%	-1.92	-2.66	-3.13

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