

The Study of Oil Incomes on the Employment in Iran Based on Auto Regression Model with Wide Intervals

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Abstract

Unemployment is so important and sensitive that in most of developing countries, high unemployment rate is considered as one of the most important signs of underdevelopment. It is clear that employment creation in any economic sector needs investing. On the other hand, oil incomes have been always considered as one of the main resources of state income in the economy. Because oil has a double role both in providing energy needed for economic development plan and providing currency needs of these plans, it is a driving force and key sector of national economy. Given to the mentioned issues by ARDL method, this research studies the effect of oil and nonoil incomes on the employment in Iran during 1961-2006. The method of error correction model was used in order to estimate the short-term relationship between variables in which most variables were meaningful at 90% level and the coefficient of error correction term equaled -0.2436 that shows 0.24 adjustment of imbalance of one period in employment during next period and so adjustment toward balance is slow. R2 value is also 0.98 that indicates high explanatory power of pattern. In long-term adjustment relationship, intercept has no effect and according to unit root hypothesis test, there is long-term adjustment relationship between variables of pattern and all variables are meaningful. Coefficient of oil and nonoil incomes variables is positive and revolution dummy variable is positive and the coefficient of gross domestic production and dummy variable for years of war is negative.

Keywords: ARDL Method, Employment, Iran, Nonoil Incomes, Oil Incomes, Oil Price, Unemployment, Job Creation

Introduction

During two past decades the importance and sensitivity of unemployment has attracted the attention of both developed and developing countries so that in most developing countries high rate of unemployment is one of the most important signs of underdevelopment. In fact one of fundamental ways for reducing poverty and inequity in particularly less developed countries is job creation and development of employment. So, any proposed policy on poverty alleviation should cover employment. Regardless of negative noneconomic consequences of unemployment it is clear that higher employment in the country causes more national production and as the result more per capita production and by assuming that other conditions are stable, it causes higher welfare of the society.

It is clear that job creation in any sectors of economy needs investing and on the other hand oil incomes are always considered as one of the main resources of the state income in the country.

More than any other factor it is oil that is very important for employment. In twentieth century modern colonialism period, by the use of political, economic and martial tools developed countries and colonialists sought to turn the economy of mentioned countries to mono-product economy and if necessary through economic pressure by affiliating them to one product they could control those countries and to get their wealth and resources; and whereby they could supply cheap raw material and proper fuel for their own countries. On the other hand, gradual decline and collapse of other economic sectors of these countries prevents them to escape from a poor economic situation in short-term and quickly. Today, there are specific and known examples of "mono-product economies" in the world which are ranged from Latin and South America to Asia and Af-

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rica. Most of these countries, of course, are moving to get rid of the dependency on one product and they try to be no longer the plaything for great powers.

No specific time can be determined for such a perspective that these countries can get rid from dependency and limitation, but by scheduling them it can be recognized that where they located in terms of time limitation of mentioned process and where their position in the path of getting ride from dependency is. Since oil has such a role in Iran's economy from previous decades, the study of oil role in Iran's economy can provide a proper and realistic way for the reader to understand the effect of oil incomes and factors on the employment.

Given that oil incomes constitute the major part of government income and they affect on important variables of national economy directly and indirectly, and regarding to the importance of employment especially in present conditions in which Iran faces with unemployment complication this research examines the effect of oil incomes on employment in Iran (during 1961-2006).

Theoretical Literature

With the increased unemployment rate since 1970s in industrial countries, economists investigated extensively so that everyone started to explain unemployment in the common theories framework. They suggested that in addition to exercising effective monetary and financial policies in total demand, other fundamental factors in micro level have effect on increased unemployment that should be taken into account. In this regard countries performed various programs for job creation that using their experiences is very important, such factors as flexibility of product inputs for increasing power of competition with foreign rival agencies as well as their educational pattern in basic areas (higher and vocational education) in order to cope with job skills and to develop investing security and observing individual property rights have effect on the structure of job market for labor force demanding. (Dabagh, 2005) By new initiatives, different countries use various job creation policies in order to fight unemployment. During past years the World Bank has related about creation and implementation of active labor programs of job market (except payment plan for job creation).

State members of Organization for Economic Cooperation and Development are proactive in performing various new plans of labor market and they have applied policies of labor market (Geraeenezhad, 2001)

Concerning that which of different sectors of economy has more potential for job creation most experts and scholars on economy emphasized that in compare with agricultural sector, industrial sector has more potential in this respect. Industrialization is the major goal of economic development in lot of developing countries. Also in the industrialization process economic growth should be accompanied by structural changes in which relative contribution of different sectors will change over time. It means that relative importance of agricultural sector declines and relative importance of industrial and services sector will be added. This relative importance is related to both production and production agents used in the production process.

According to mentioned economists the movement of economy toward industrialization and development of industry is firstly a fundamental principle and secondly throughout the path of development the relative importance of major sectors of economy in the increase of economic growth and labor force recruitment is changed; meanwhile in compare with agriculture sector industry sector has more effective role in promoting economic growth as well as in increased employment and decreased unemployment rate. Thirdly in this process it is necessary to address some factors that can cause the increase in employment. These factors include: emission of price distortions of production factors, choosing proper technologies, changes in vocational education system in order to adjust the relationship between education and employment, labor productivity, change or explore the relative advantages (as a result of changes in the composition of exports), microeconomic reform and full use of the capacity utilization (Farjadi, 1997), gradual reduction of state's dependency on oil incomes, creating an investing look to oil resources, creating a labor culture against rentier culture and strengthening existing social networks (Chamber of Commerce, Industries and Mines, Chamber of Cooperative and State Assembly guilds and unions) and creating new social networks (Think tank and Center Seminar) as a part of definition and secure net of property rights that can guarantee permanent employment opportunities for sustainable economic development. The entrance of oil into Iran's economy and exchange in the field of oil, like any other exchange imposes exchange costs. Since the oil sector's contribution to the economy is significant, the costs imposed by oil on the economy would not naturally be small. (Razavi & Alavi, 2008)

Materials and Methods

Auto-Regression model with wide intervals (ARDL)

The basic objective of the econometric model is to explore the effects of oil incomes and other different factors on employment over the period 1966-2006; the used method for estimating mentioned pattern was simultaneous equations and auto regression model with wide intervals. At first the durability of referred variables is studied by using generalized Fuller-Dickey method.

Dynamic Models

The simplest form of a dynamic model that can be adjusted for the above long-term stationary relationship in order to help achieving the estimations of relatively unbiased coefficients of long-term pattern is the following dynamic model:

$$Y_t = \gamma_0 X_t + \gamma_1 X_{t-1} + \infty Y_{t-1} + U_t$$

By subtracting expression ∞Y_t from the extremes of above equation and adding and subtracting $\gamma_1 X_t$ from right extreme we have:

$$Y_t - \infty Y_t = \gamma_0 X_t + \gamma_1 X_{t-1} + \gamma_1 X_t - \gamma_1 X_t + \infty Y_{t-1} - \infty Y_t + U_t$$

$$Y_t (1 - \infty) = (\gamma_0 + \gamma_1) X_t - \gamma_1 (X_t - X_{t-1}) - \infty (Y_t - Y_{t-1}) + U_t$$

$$Y_t (1 - \infty) = (\gamma_0 + \gamma_1) X_t - \gamma_1 \Delta X_t - \infty \Delta Y_t + U_t$$

$$Y_t = \frac{\gamma_0 + \gamma_1}{1 - \infty} X_t - \frac{\gamma_1}{1 - \infty} \Delta X_t - \frac{\infty}{1 - \infty} \Delta Y_t + \frac{U_t}{1 - \infty}$$

$$Y_t = \beta X_t + D_t \Delta X_t + d_t \Delta Y_t + V_t$$

Where in the above equation $\beta = \frac{\gamma_0 + \gamma_1}{1 - \infty}$ and the

existence of ΔX_t and ΔY_t variables lead to bias in β parameter estimate remove based on a small sample.

Condition to achieve equilibrium:

As β coefficients are used the condition is $\infty < 1$ in order that short-term patterns approach long-term pattern (short-term changes are in the long-term course).

Note: In order to reduce bias related to estimate pattern coefficients in small samples it would better to assume a dynamic pattern that considers many intervals for variables. In this equation Schwarz-Bayesian, Henan Quinn and Akaike criteria can be used. It is noteworthy that it is better Schwarz-Bayesian criterion being used as guideline for samples with relatively low volume because it saves the

numbers of intervals. So it is better to estimate following equation instead of equation:

$$A(L)y_t = B(L)X_t + U_t$$

In where:

$$A(L) = 1 - \alpha_1 L - \alpha_2 L^2 - \dots - \alpha_p L^p$$

$$B(L) = \gamma_0 + \gamma_1 L + \gamma_2 L^2 + \dots - \gamma_q L^q$$

and $L^r X_t = X_{t-r}$

In order to find β long-term parameter estimation it is enough to calculate from estimated equation as follow:

$$\hat{\beta} = \frac{\sum_{i=1}^q \hat{\gamma}_i}{1 - \sum_{i=1}^n \hat{\alpha}_i}$$

In order that dynamic model approach long-term equilibrium it is necessary that sum of $\alpha_i (i=1, \dots, p)$ be less than one, $\hat{\beta}$ standard deviation can be also calculated by the use of logarithm.

Banerjee, Dulado and Master(1992) have obtained t statistic from following equation that its quantity can be compared with critical quantity represented by them for performing the desired test.

$$i = \frac{\sum_{i=1}^q \hat{\alpha}_i - 1}{1 - \sum_{i=1}^n S \hat{\alpha}_i}$$

Given to mentioned matters and thanks to dynamic model, mentioned model can be considered as follow in order to estimate the effect of oil and nonoil incomes on employment:

$$N = \alpha_0 + \sum_{i=1}^n \alpha_i N_t - j + \sum_{i=1}^{q_1} \beta_{1i} OIL_t$$

$$j + \sum_{i=1}^{q_2} \beta_{2j} NOIL_{t-j}$$

The above model is known as auto-regression model with wide intervals(ARDL). Numbers of optimized intervals for each auto-regression variable can be determined by the help of one of Akaike(AIC), Schwarz-Bayesian(SBC), Henan-Quinn(HQC) criteria, and R2.(Nofersti, 1999, p 96)

Error correction model(ECM) and the existence co-integration of a set of economic variables provide a statistical basis for using error correction models. Error correction models are known because short-term fluctuations relate variables to their long-term equilibrium

values. If two X_t and Y_t variables are stacked, there would be a long-term equilibrium relation between them and maybe there are short-term imbalances that in this case according to following equation their error term can be considered as equilibrium error:

$$Y_t = \beta X_t + U_t$$

$$U_t = Y_t - \beta X_t$$

This error can be used for linking short-term behavior of Y_t to its long-term equilibrium value regarding that all variables represented in the equation are a group of $I(1)$ order, so a model is set as follow:

$$\Delta X_t = \alpha_0 + \alpha_1 \Delta Y_t + \alpha_2 \hat{U}_{t-1} + \varepsilon_t \quad \varepsilon_t \sim \text{IID}(0, \delta^2)$$

where \hat{U}_{t-1} is a term of regression estimation error with one interval and regarding that ΔY_t and ΔX_t are stable, all variables of ECM model of the equation are $I(0)$ and this model can be estimated by OLS method without any fear of spurious regression.

Research Data

Given to stated model and related theoretical and experimental principle, results and effects of introduced variables have been extracted. By the study of the effects of macro variables on employment in Iran in order to estimate the stated model by ARDL method during 1961-2006 we firstly examine the durability of mentioned variables by the use of generalized Dickey-Fuller method; its results are shown in the table.

Table 1: Generalized Dickey- Fuller unit root test ADF

GDP	NOIL	OIL	N	Variable
-1.2188	1.1149	-2.4107	-0.82347	ADF Statistic
-3.5136	-3.5136	-3.5136	-3.5136	Critical value at 5 percent level

Resource: Researcher calculations

As above table shows, regarding that calculated values are smaller than critical at the 5% level concerning all variables, H_0 that states there is unit root (non-durability) can not be rejected and as a

result all variables are non-durability. Now we examine the durability of variables at their first order of differential level that its results are shown in the following table.

Table 2: Generalized Dickey -Fuller unit root test ADF at first order of differential level of variables

DGDP	DNOIL	DOIL	DN	Variable
-3.9934	-3.6437	-3.8308	-3.7320	ADF Statistic
-3.5162	-3.5162	-3.5162	-3.5162	Critical value at 5% level

Resource: Researcher Calculations

Regarding to above table it is obvious that concerning to all variables, calculated values are bigger than critical values at 5% level, so H_0 that states there is unit root(non-durability) can be rejected and as the result all variables of first order differential level are durable.

Then we examine fitting of model by ARDL method.

The model processed by ARDL method is as follow:

$$N = \alpha_0 + \sum_{j=1}^p \alpha_j N_{t-j} + \sum_{i=0}^{q_1} \beta_{1i} OIL_{t-i} + \sum_{i=0}^{q_2} \beta_{2i} NOIL_{t-i}$$

where represents the intercept and dummy variables for the years of war and revolution. Schwarz-Bayesian criterion is used in order to determine numbers of intervals(given to relatively low size of the sample). Which in this case number of intervals equals 2 and the results of the above estimation model are represented in the following table:

Table 3: The estimation of macro variables on employment by ARDL method

Significant possibility	Coefficient	Variable
0.00	0.9029	
0.002	-0.494	
0.177	-27.9	OIL
0.069	6.68	
0.305	-18.38	NOIL
0.287	20.53	GDP
0.902	-25670.2	
0.013	-240406.9	
0.139	113859.6	

Resource: Researcher calculations

In the following we examine the short-term equilibrium relationship and its adjustment extent in relation to long-term equilibrium relationship by error correction model.

Results relating to short-term relationship between variables and coefficient of error correction term are represented in the following table.

Table 4: Estimation of short-term relationship between variables of model and coefficient of error correction term

Significant possibility	Coefficient	Variable
0.001	0.4993	DN
0.069	-29.45	
0.171	-19.67	DNOIL
0.141	22.0089	
0.008	-243560.1	
0.0052	107376.1	
0.046	-0.2436	

As the table shows all of variables are significant at 90%. Coefficient of error correction term equals -0.2436 that indicates 0.24 of imbalance of one period in employment is adjusted in the next period in each year. So the adjustment toward balance is relatively slow. R2 value also equals 0.89 that shows high explanatory power of model.

Given that coefficient of error correction term is negative and significant, we can estimate long-term relationship. Since table shows that the intercept is not significant so intercept variable is omitted and we estimate again which its results are shown in the following table.

Table 5: The estimation of the effect of macro variables on employment by ARDL following the omission of intercept

Significant possibility	Coefficient	Variable
0.00	0.5436	
0.001	-0.499	
0.069	-29.45	OIL
0.06	6.65	
0.172	-19.67	NOIL
0.141	22.008	GDP
0.009	-243560.1	
0.052	107376.7	

Then we test the unit root or lack of co-integration between variables of model. Regarding that according to Schwarz-Bayesian criterion numbers of optimized dependent variable is two intervals($p=2$), hypothesis 0 and against hypothesis are as follow:

$$H_0 = \sum_{i=1}^p \hat{\alpha}_i - 1 = \hat{\alpha}_1 + \hat{\alpha}_2 - 1 \geq 0$$

$$H_0 = \sum_{i=1}^p \hat{\alpha}_i - 1 = \hat{\alpha}_1 + \hat{\alpha}_2 - 1 < 0$$

Then the null hypothesis of unit root or no co-integration between the variables of the model is tested. The null hypothesis and the opposed hypothesis are as follows:

$$H_0 = \sum_{i=1}^p \hat{\alpha}_i - 1 = \hat{\alpha}_1 + \hat{\alpha}_2 - 1 \geq 0$$

$$H_0 = \sum_{i=1}^p \hat{\alpha}_i - 1 = \hat{\alpha}_1 + \hat{\alpha}_2 - 1 < 0$$

Regarding to estimations represented in the above table and appendix tables, the quantity of t statistic is calculated as follow:

$$i = \frac{\sum_{i=1}^q \hat{\alpha}_i - 1}{\sum_{i=1}^p S \hat{\alpha}_i} = \frac{\sum_{i=1}^2 \hat{\alpha}_i - 1}{\sum_{i=1}^p S \hat{\alpha}_i} = \frac{0/5036 - 0/4993 - 1}{0/13889 - 0/14422} = -3/517$$

Since the critical quantity represented by Banerjee, Duladola and Master at 90% confidentiality equals -3.45, hypothesis 0 is rejected. So, we conclude that there is a long-term balance relationship between the variables of the model. Then we estimate the long-term balance relationship between variables which its results are shown in the following table.

Table 6: The estimation of long-term balance relationship between variables of model by ARDL

		GDP	NOIL	OIL	Variable
-24747474	56161616	-5070.2	4631.9	5252.4	Coefficient
0.057	0.046	0.084	0.028	0.048	Significant possibility

Resource: Researcher calculations

As it can be seen in the long-term balance relationship represented in the above table, all variables are significant that coefficient of oil incomes variable(OIL), nonoil incomes(NOIL) and dummy variable of revolution DU_{57} are positive and gross domestic product(GDP) variable and dummy variable for years of war DU_{59} are negative.

Conclusion

Regarding to research hypotheses, research results can be stated as follow.

Intercept has no effect in long-term balance relationship and according to test of unit root hypothesis there is long-term balance relationship between variables of model and all variables are significant. The coefficient of oil incomes variable is positive and so the first hypothesis is rejected. As a result oil incomes have effect on employment. The coefficient of nonoil incomes is negative and so the second hypothesis is rejected and nonoil incomes have also effect on employment. The coefficient of revolution dummy variable DU_{57} is positive and gross domestic product variable and dummy variable for years of war DU_{59} is negative. According to the estimation of short-term relationship all variables are significant at 90% level and the coefficient of error

correction term is also 0.2436 that indicates 0.24 adjustment of imbalance in one period in employment during next period and R2 value is equals 0.89.

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