THE RELATIONSHIP BETWEEN ECONOMIC GROWTH and UNEMPLOYMENT IN TURKEY: 1951–2006

Taha Bahadır SARAÇ*

Ayşegül ATABEY**

Abstract

The aim of the study to expound the relationship between the economic growth and unemployment by using OLS (Ordinary Least Squares) and VAR (Vector Auto-Regression) methods in Turkey during the 1951-2006 period. Except the OLS method according to the VAR method, we found that economic growth and unemployment had a relationship. Put another way, economic growth affects the unemployment rates in Turkey but such this effect is not sufficient.

Key Words: Turkey, Economic Growth, Unemployment

TÜRKİYE'DE EKONOMİK BÜYÜME VE İŞSİZLİK İLİŞKİSİ: 1951-2006

Özet

Bu çalışmada, 1951-2006 döneminde Türkiye'de ekonomik büyüme ile işsizlik arasındaki ilişkinin En Küçük Kareler (EKK) ve Vektör Otoregresyon (VAR)

* Lecturer, Selcuk University Vocational High School of Hadim, tbsarac @selcuk.edu.tr.

** Assistant Professor, Selcuk University Vocational High School of Social Sciences, aatabey@selcuk.edu.tr.

yöntemi ile açıklanması amaçlanmıştır. Söz konusu metodlara göre ise En Küçük Kareler yöntemi hariç VAR yöntemi sonuçlarına göre ekonomik büyüme ile işsizlik arasında ilişki olduğu belirlenmiştir. Diğer bir deyişle, Türkiye'de ekonomik büyüme işsizlik oranlarını etkilemektedir fakat söz konusu bu etki yeterli düzeyde değildir.

Anahtar Kelimeler: Türkiye, Ekonomik Büyüme, İşsizlik

I. INTRODUCTION

Turkish economy diminished 9. 5 per cent because of the 2001 February economic crisis and economic stability program constituted in May 2001. After the economic crises, Turkish economy enlarged per cent 1.8 every quarter during the 2002:1-2007:4 period. But unemployment rates did not decrease enough, so this situation improved the discussions about the relationship between economic growth and unemployment in Turkey. For this purpose this study was arranged and organized as follows. Section II presents a brief discussion of the theoretical framework on the relationship between economic growth and unemployment. Section III describes the data set and the methodology. Section IV proposes the results of the econometrics tests. Lastly, Section V summarizes the paper and draws the conclusions.

II. THEORETICAL FRAMEWORK

The link between economic growth and unemployment is a matter of ongoing political and economic interest. While politicians assure us that economic growth is the key to reducing unemployment, economists indicate that this link is variable across countries and over business cycles (Attfield and Silverstone, 1995). Typically, growth slowdowns coincide with rising unemployment. This negative correlation between

GDP growth and unemployment has been named "Okun's Law", after the economist Arthur Okun who first documented in the early 1960s (Konotek, 1995). As suggested by Okun, there are two classes of Okun's law specifications: the first difference model and the "gap" model. According to the first–difference model, the relationship between the observed of the real output (y_t) and the observed unemployment rate (u_t) is given by the expression;

$$(u_t - u_{t-1}) = \alpha + \beta(y_t - y_{t-1}) + \varepsilon \quad (1)$$

where α is the intercept, β is Okun's coefficient and ε is the disturbance term. The difference model of the Okun's law captures the contemporaneous corelation between output growth and movements in unemployment–that is, how output growth varies simultaneously with changes in the unemployment rate. So, one would expect Okun's coefficient to be negative, put another way rapid output growth is associated with a falling unemployment rate, and slow or negative output growth is associated with a rising unemployment rate. The ratio "$-\alpha/\beta$" gives the rate of output growth consistent with a stable unemployment rate, or how quickly the economy would typically need to

growth to maintain a given level of unemployment (Villaverde and Maza, 2007 and Konotek, 1995).

In Okun's article, the regression model was estimated for USA with 55 quarterly observations from 1947:2 to 1960:4 and found this result;

$$(u_t - u_{t-1}) = 0.30 - 0.30(y_t - y_{t-1}) \quad (2)$$

In accordance with this estimate, the unemployment rate will rise by 0.3 points from one quarter to the next if real output is unchanged, as secular gains in productivity and growth in the labour force push up the unemployment rate. For each extra one percent of real output, unemployment is 0.3 points lower (Okun, 1962).

While Okun's first relationship relied on readily accessible macroeconomics statistics, his second relationship connected the level of unemployment to the gap between potential output and actual output. In potential output, Okun sought to identify how much the economy would produce "under conditions of full employment". In full employment, Okun considered, what he believed to be an unemployment level low enough to produce as much as possible without generating too much inflationary pressure. On the other hand, a high rate of unemployment, Okun reasoned, would typically be associated with idle resources. In such a circumstance, one would expect the actual rate of output to be

below its potential. A very low rate of unemployment would be associated with reverse scenario. In summary, Okun's second relationship, or the gap version of Okun's law, took the form;

$$(u_t - u_{t-1}) = \alpha + \beta(y_t^* - y_t) + \varepsilon \qquad (3)$$

where $(y_t^* - y_t)$ is the real output gap that eguals the difference between real potential output and actual real output. The variable α can be interpreted as the unemployment rate associated with full employment and called natural rate of unemployment. The coefficient β would be negative when the actual real output is above the real potential output. If not, β coefficent would be positive. When the β coefficent negative, the unemployment rate remains the below of the natural rate of unemployment. In this context, Okun estimated the regression model marked with a number (3) for USA between 1953–1960 by quarterly data and found this result as below;

$$(u_t - u_{t-1}) = 3.72 + 0.36(y_{gt}) \qquad (4)$$

This estimated is implies that an increment of unemployment of one percent is associated with an output loss equal to 2.8 percent of real potential output or a somewhat larger percentage of real actual output is under real potential output. The estimated unemployment rate associated

with a zero gap is 3.72 percent (Konotek, 1995 and Okun, 1962). In the light of the foregoing, a very simple regression specification of Okun's law can be represented as;

$$(y_t - y_t^*) = \alpha + \beta(u_t - u_t^*) + \varepsilon, \qquad \beta < 0; \qquad (5)$$

In this regression specification, u_t^* is the natural rate of employment.

III. DATA AND METHODOLOGY

In this study, we used annual data for real GNP (Gross National Product) growth rates (1987=100) and unemploymet rates from Rebuplic of Turkey Statistics Organization and Akalın and Erkisi's study. The growth rate and unemployment rate are all percent change according as previous year and OLS and VAR methodology were embraced in this study. Nonetheless, firstly we estimated first–difference model of Okun's law for Turkey. But, before we estimated the regression model, we determined that series were stationary or not. Because, when the variables y_t and x_t are non-stationary and independent of each other, ordinary least squares (OLS) applied the regression model;

$$y = \alpha + \delta(x_t) + \varepsilon \qquad (6)$$

have the following implications: (i) the OLS estimator of $\delta(\hat{\delta})$ does not converge to its true value of zero, and (ii) the *t*-statistic for testing the

null hypothesis $H_0 : \delta = 0$ $(t(\hat{\delta}))$ diverges, thus indicating the presence of an asymptotic spurious relationship between y_t and x_t (Noriega and Santaulària, 2007). In summary, when there is spurious relationship, the assumptions embedded in the usual hypothesis tests are violated, so that any t-test, F-test, or R^2 values are unreliable. Hence, the estimated residuals from a spurious regression will exhibit a high degree of autocorrelation (Enders, 1995). In this reason, we inquired the series stationary conditions for using the Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test.. For the unit root test, the auxiliary regression is run with a intercept and a time trend and specified as; F-test

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 t + \sum_{j=1}^{P} \gamma_j \Delta \gamma_{t-j} + \varepsilon_t \qquad (7)$$

where y_t is the variable, whose time-series properties are being investigated, Δ is the difference operator, and where ε_t is the random error term with $t = 1.....N$ is assumed to be Gaussian white noise. The augmentation terms are added to convert the residuals into white noise without affecting the distrubition of the test statistics under the null hypothesis of a unit root. The ADF and PP tests have a null of unit root against the alternative of trend stationary. On the other hand, the

usefulness of the PP test over the ADF is that it allows for the possibility of heteroscedastic error terms. For the PP test, the maximum lag length was chosen based on the Newey-West criteria (Kristin and Frank, 2005 and Hamilton, 1994).

IV. RESULTS

Table 1 reports deterministic characteristics of the variables. We used five dummy variables in this model to discover the effects of the 24 January Decisions (D1), 1989 Financial Liberalisation Decisions (D2), 1994 April Crisis (D3), 2000 November Crisis (D4) and 2001 February Crisis (D5) on economic growth and unemployment. We saw that economic growth rates had constant at 0.01, 0.05 and 0.10 signifance levels and unemployment rates had constant at 0.05 and 0.10 signifance levels. Except D5 variable, the other dummy variables did not effect the economic growth and unemployment rate. D5 dummy variable effected the unemployment rate positive direction at 0.10 signifance level.

Table 1. Deterministic Characteristics of the Variables

Components	Variables	
	Real GNP Growth Rates	Unemployment Rates
D1	0.003144* (0.9036)***	0.001786 (0.9784)
D2	0.014821 (0.5802)	0.021538 (0.7517)
D3	-0.021881 (0.4451)	-0.009867 (0.8920)
D4	0.041354	-0.124210

	(0.4110)	(0.3321)
D5	-0.014113 (0.7784)	0.247290 (0.0569)
Constant	0.068715 (0.0001)	0.115579 (0.0077)
Trend	-0.000873 (0.3857)	-0.003278 (0.2020)

Note: * Coefficient values *** Prob values.

So, economic growth and unemployment variables were tested with constant component by ADF and PP tests. Table 2 remarks the ADF and PP test results, such the tests denoted that each variables in levels were stationary with constant component.

Table 2. Results of Unit Roots Tests

Variables	Unit Root Tests			
	ADF		PP	
	t-statistic	Test Critical Values	Adj. t-statistic	Test Critical Values
Real GNP Growth Rates (RGNP)	-7.934934	-3.555023* -2.915522** -2.595565***	-7.934934	-3.555023 -2.915522 -2.595565
Unemployment Rates (UR)	-6.221355	-3.555023 -2.915522 -2.595565	-6.179971	-3.555023 -2.915522 -2.595565

Note: *, ** and *** denote rejection of the null hypothesis at the 1%, 5% and 10% levels respectively. Lag lengths used in ADF and PP tests as determined by Schwarz Information Criterion set to maximum 4 (four) and select 0 (zero) lag.

After the unit root tests, we estimated the regression model. Table 3 represents the estimation outcomes that economic growth effects the unemployment negative direction. But this results is not statistically significant.

Table 3. Regression Estimation Results

Variables	Coefficients	Std. Errors	t-Statistics	Probability Values
RGNP	-0.024716	0.367137	-0.067320	0.9466
C	0.038555	0.025225	1.528459	0.1323
D5	0.042604	0.052897	0.805415	0.4242
Diagnostic Statistics				
R-squared = 0.012235		Durbin-Watson statistic = 1.582003		
F-statistic = 0.328245 (0.721640) *		Jargue-Bera Normality Test = 77.88227 (0.000000)		
Breusch-Godfrey LM Test Obs*R-squared statistic = 1.857374 (0.172928)		White Heteroskedasticity Test Obs*R-squared statistic = 5.819412 (0.120734)		

Note: * Probability values

By the reason of the regression result, we made a VAR (Vector Auto Regression) model for this variables. As VAR model treats all the variables of interest endogenously. This property is important since macroeconomics and finance exogenous variables are rare. The VAR models furthermore provide the possibility to investigate the causal relationship between the variables (Hatemi-J and Hacker, 2007). And it also possible to investigate the effect of policy changes by using moving average representation of the VAR models to calculate impolse response functions and variance decompositions. The VAR model is also known to have good forecasting properties (Hatemi-J, 2003). On the other hand, when the variables are stationary in levels, a VAR model is employed. Because if the variables are stationary then can be estimated, in which case any shock to the stationary variables will be temporary. If the

variables are nonstationary and not cointegrated, then they have to be transformed into stationary variables by differencing, before VAR can be estimated. Shocks to the differenced variables will have a temporary effect on the growth rate but a permanent effect on its level. In this context, the VAR model proposed by Sims (1980) can be written as follows;

$$Y_t = k + A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots\ldots\ldots + A_p Y_{t-p} + u_t ; u_t \sim i.i.d.(0, \sum) \tag{8}$$

where Y_t is an (n x 1) vector of variables, k is an (n x 1) vector of intercept terms, A is an (n x n) matrix of coefficients, p is the number of lags, u_t is an (n x 1) vector of error terms for $t = 1,2,\ldots\ldots T$. In addition u_t is an independently and identically distrubed (*i.i.d.*) with zero mean , *i.e.* $E(u_t) = 0$ and an (n x n) symmetric variance-covariance matrix $\sum$, *i.e.* $E(u_t u_t') = \sum$ (Robinson, 1998 and Ito, 2008).

In the light of this legends, we formed the VAR model with variables which used in this study, as below;

$$UR_t = \alpha_{10} + \sum_{i=1}^{P} \alpha_{11} UR_{t-1} + \sum_{i=1}^{P} \alpha_{12} RGDP_{t-1} + \varepsilon_{1t} + D5 \tag{9}$$

$$RGNP_t = \alpha_{20} + \sum_{i=1}^{P} \alpha_{21} UR_{t-1} + \sum_{i-1}^{P} \alpha_{22} RGNP_{t-1} + \varepsilon_{2t} + D5 \tag{10}$$

A critical element in the spesification of VAR models is the determination of the lag length of the VAR. The importance of lag length determination is demonstrated by Braun and Mittnik (1993) who show that estimators of a VAR whose lag length differs from the true lag length are inconsistent as are the impulse response functions and variance decompositions derived from the estimated VAR. Lütkepohl (1993) indicates that overfitting (selecting a high order lag length than the true lag length) causes an increase in the mean square-forecast errors of the VAR and that underfitting the length often generates autocorrelated errors (Ozcicek and McMillin, 1999). Therefore, we chose the optimal lag order for sequential modified LR test statistic and determined 5 lag for our model at 5% significant level as denoted Table 4.

Table 4. Optimal Lag Order of the VAR Model

Lag Orders	Lag Order Criterions				
	LR	FPE	AIC	SC	HQ
0	.....	1.79e-05	-5.255703	**-5.104187***	**-5.197804***
1	9.876979	**1.70e-05***	**-5.308988***	-5.005957	-5.193191
2	2.122567	1.90e-05	-5.199294	-4.744747	-5.025598
3	0.713310	2.19e-05	-5.059020	-4.452957	-4.827425
4	7.089283	2.16e-05	-5.075066	-4.317488	-4.785573
5	**12.61063***	1.85e-05	-5.241553	-4.332458	-4.894161

Note:* Indicates lag order selected by the criterion. LR: sequential modified LR test statistic, FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

A block exogeneity test is useful for detecting whether to incorporate a variable into a VAR. Given the aforementioned distinction between causality and exogenity, this multivariate generalization of the Granger causality test should actually be called a "block causality" test (Enders, 1995). In this context, we designated the causality relation between economic growth and unemployment with 5 lag by VAR model and the results were represented in Table 5. As can be seen in Table 5 there is a one way causality relation from economic growth to unemployment at all significant levels.

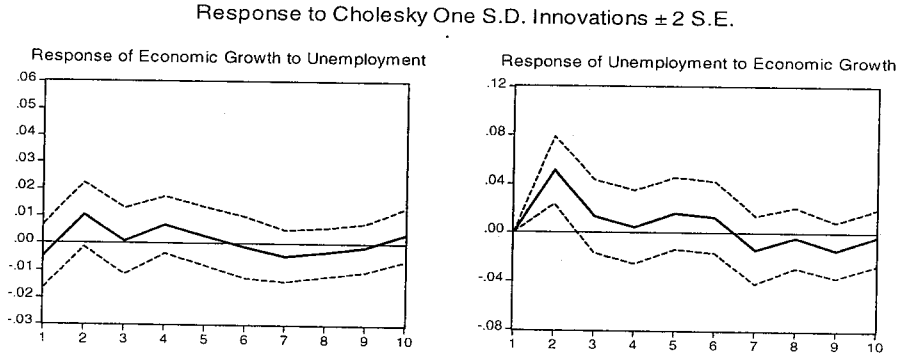
Table 5. VAR Causality/Block Exogeneity Wald Tests Results

Dependent variable: UR			
Excluded	**Chi-square**	**Degrees of Freedom**	**Probability**
RGNP	23.97940	5	0.0002
All	23.97940	5	0.0002
Dependent variable: RGNP			
Excluded	**Chi-square**	**Degrees of Freedom**	**Probability**
UR	7.282353	5	0.2005
All	7.282353	5	0.2005
Diagnostic Statistics			
LM Autocorrelation Test Statistics Value = 2.785485 (0.5943)*			
White Heteroskedasticity Test Chi-Square Value (with no cross terms) = 75.58171 (0.1330)			
Normality Test Jargue-Berra Value = 6.990329 (0.1364)			

Note: * Probability values showed that such VAR model haven't autocorrelation and heteroskedasticity problems. And residuals of such VAR model are normally distributed.

Impolse response analysis is used widely in the empirical literature to uncover the dynamic relationship between macroeconomic variables within VAR models. Impulse responses measure the time profile of the effect of a shock, or impolse, on the (expected) future values of a variable. (Mitchell, 2000). In light of the foregoing, we determined the impulse response analysis with such variables and presented in Figure 1. And we confirmed significant impolse response relation between the variables in the medium of second period. As the impulse response relation economic growth effected the unemployment rate negatively.

Figure 1. Impulse Response Results



Variance decomposition is an alternative method to the impulse response functions for examining the effects of shocks to the dependent variables.

This technique determines how much of the forecast error variance for any variable in a system, is explained by innovations to each explanatory variable, over a series of time horizons. In the light of the foregoing, the variance decomposition of such variables was determined and represented in Table 6. The results of variance decomposition were pointed out that economic growth effected the unemployment during the 10 period. In other words, each percentage change of the unemployment rate was explained the percantage change of the unemployment rate. As such the Granger Causality test result was also espoused mainly the variance decomposition test result.

Table 6. Variance Decomposition of UR

Periods	Standart Errors	UR	RGNP
1	0.083356	100.0000	0.000000
2	0.098034	72.92555	27.07445
3	0.098985	71.68533	28.31467
4	0.101101	72.64788	27.35212
5	0.105530	72.67960	27.32040
6	0.106301	71.64626	28.35374
7	0.109976	71.86298	28.13702
8	0.111573	72.53307	27.46693
9	0.113159	71.70322	28.29678
10	0.113543	71.78669	28.21331

Note: Cholesky Ordering: UR RGNP

Table 7. Variance Decomposition of RGNP

Periods	Standart Errors	UR	RGNP
1	0.042019	1.334089	98.66591
2	0.043670	6.963233	93.03677
3	0.043796	6.947918	93.05208
4	0.044552	9.009632	90.99037
5	0.045612	8.913109	91.08689
6	0.045716	8.977180	91.02282
7	0.046516	9.643606	90.35639
8	0.046698	10.04534	89.95466
9	0.046961	10.03227	89.96773
10	0.047155	10.46841	89.53159

Note: Cholesky Ordering: UR RGNP

V. CONCLUSION

In this study, the relationship between economic growth and unemploymet in Turkey over the period of 1951-2006 with annual data were investigated by the tests of OLS and VAR methods. The results of OLS method were showed that economic growth effected the unemployment rate negative direction. But the results of the OLS were not significant at any statistical level. All the same we used VAR model that we found a single causal relation between economic growth and unemployment. Such the causal relationship was from economic growth to unemployment and then we estimated the impulse response and variance decomposition tests and the causal relationship was supported by the such tests. In this context, these results showed that in Turkey,

economic growth effected the unemployment but it was not enough. In view of the fact, if Turkish economy want to decrease the unemployment rate, it should decrease the cost of the wage* and develop education programs to response especially the private sector labour demands. Because, the Turkish labour force also includes less than high school person*.

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* In the total labour force of Turkey, 15.263.000 people's education level is less than high school. http://www.tuik.gov.tr/VeriBilgi.do?tb_id=25&ust_id=8. (15.09.2008)

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