IMPACT OF GDP GROWTH ON UNEMPLOYMENT DURING THE EXPANSION PERIODS: A STUDY ON OKUN'S LAW FOR TURKEY

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ABSTRACT: The aim of this study is to analyze the relation between unemployment rate and Gross Domestic Product, as it is postulated in the Okun's law. In this study, Gross Domestic Product is divided into two parts by approaching from a different perspective such as gross capital formation of investment and final consumption expenditure as a contribution to the earlier studies. A dummy variable is also added in the model, which represents the periods of expansion in the Gross Domestic Product. According to the results of analyses, existence of the co-integration is confirmed in the long-run between variables. There is a negative and significant relation between unemployment and years of expansion in the short run. The Vector Error Correction Model also unveils that disequilibrium in the model will gravitate toward the balance each period.

Keywords: *Unemployment, Okun's Law, Economic Growth, Co-integration, Vector Error Correction.*
Jel Classification: E20, E24, E27

GENİŞLEME DÖNEMLERİNDE GSYH BÜYÜMESİNİN İŞSİZLK ÜZERİNE ETKİSİ: OKUN YASASINA DAİRE TÜRKİYE İÇİN BİR ÇALIŞMA

ÖZ: Bu çalışmanın amacı, Okun Yasası varsayıldığı haliyle işsizlik ve GSYH arasındaki ilişkiyi analiz etmektir. Benzer çalışmalara katkı sağlamak üzere bu çalışmada GSYH farklı bir bakış açısıyla, gayrisafi sabit sermaye yatırımları ve nihati tüketim harcamaları olarak iki ana başlıktan oluşmuştur. Oluşturulan modele ayrıca ekonomideki genişleme dönemlerini temsil etmek üzere bir kukla değişken dahil edilmiştir. Analiz bulgularına gore, değişkenler arasında uzun dönemde eşbütünleşme olduğu tespit edilmiştir. Kısa dönemde ise işsizlik ve kukla değişken genişleme dönemleri arasında negative bir ilişki gözlenmiştir. Hata Düzeltme Modeli modeldeki dengesizliğin her bir dönem dengeye doğru ilerlediğini ortaya koymaktadır.

Anahtar Kelimeler: İşsizlik, Okun Yasası, ekonomik büyüme, eş bütünleşme, vektor hata düzeltme.

Jel Kodu: E20, E24, E27

1. Introduction

One of the most important problems in the world economy is unemployment. Unemployment rate is high and chronic in some countries: Turkey is also among them. Unemployment is an economic problem as it is a great problem in social perspective. Unemployment is also an important dilemma for political authorities who govern the country. In the literature, there are many theoretical and empiric studies to sort out the issue of unemployment because of its importance: it has been tried to produce a variety of solutions. An important way to increase employment is also providing economic growth. In an article that was written by Okun in 1962, the relation between unemployment and economic growth was analyzed for the first time, and it was proved that there was a negative relation between the variables. There have been many empiric studies after the Okun's work. Some articles have supported Okun's law, whereas others have assumed the invalidity of it. In this study, economic growth is represented by periods of expansion, and a negative relation between periods of expansion in GDP and unemployment.

2. Theoretical Framework

Arthur M. Okun (1962) proved the reverse relation between unemployment and GDP in an empiric study by using the data set after the Second World War for the US, and entered literature as "Okun's law" by his study. Okun's law is formulized in the following equation:

$$u=u^{*}-\beta(y-y^{*}/y^{*}) \quad (1)$$

In the equation given above, u denotes the unemployment rate, u* denotes the natural rate of unemployment, y denotes the actual level of real output, and y* denotes the potential level of real output. Okun's law postulates that the unemployment rate will be decreased if growth rate exceeds by 2,25%. Coefficient of β in Equation 1 was found to be 0,3% in the analysis for the period of 1947-1960 for the US. In the general meaning, Okun's law is accepted as an easy way to convert the growth rate of output to decrease in unemployment. Okun's law provides a conversion from growth to unemployment, although it gives approximate results and it is not valid for each year.

3. Literature Review

Prachowny (1993) found out a converse relation between unemployment and growth for the US. Apel and Jansson (1999) analyzed the relation between unemployment and output for the US, Canada, and the UK. According to the findings, a deviation of unemployment is positive when the deviation of production is negative. Mussard and Philippe (2009) reached the conclusion that the creation of money, which is provided by the equation of saving and investment, has an impact on unemployment rate by affecting the economic activity. Malley and Molana (2008) analyzed the relation between unemployment and economic growth for the G7 countries by implementing the Kalman filter, and indicated that a stable relation between unemployment and growth is more dominant in Germany. Weber (1995), Sögner (2000), and Lee (2000) unveiled that there is a stable relation between unemployment rate and economic growth. The finding of Sögner and Stiassny (2000), which also supports the earlier studies, states that there is a negative relation between unemployment and economic growth for the 15 members among the OECD countries for the period of 1960-1999. Moosa (1997) also studied 7 members of the OECD countries to predict the Okun's coefficient using the OLS and Chow test. As a result, a low Okun's coefficient is predicted for Germany and France. Huary and Lin (2008) examined the relation between unemployment and economic growth for the US. Findings of the analyses showed that Okun's coefficient is negative and Okun's law is valid. Villaverde and Maza (2009) revealed that there is a negative correlation between unemployment and growth in Spain for many regions for the period of 1980-2004; also Okun's coefficient varies by region.

Holmes and Silverstone (2006) found out the asymmetry relation between growth and unemployment for the US economy. Cuaresma (2003) states that the impact of growth on unemployment is asymmetric, and this impact is effective especially for the economic recession periods in the US. Harris and Silverstone (2000) suggested that real GDP causes the unemployment by using cointegration analyses, but causality will not be valid in the case of adverse condition for New Zealand. Okun coefficient was found to be -0.103 in the study. Muscatelli and Tirelli (2001) confirmed that there is an adverse relation between unemployment and growth by using the VAR model for OECD countries for the data set of 1955-1990.

Christopoulos (2002) analyzed the relation between revenue and unemployment by implementing the panel data by dividing Greece into districts. According to the results, in the analyses, there is a long-term relation between unemployment and revenue for all districts that are subject to study in Greece.

Zagler (2003) , studied the Okun law by using the vector error correction model (VECM) for France, Germany, Italy, and the UK. The result of the study shows that there is a cointegration between growth and unemployment, and the direction of the relation is positive. Loria and Jesus (2007) examined the Okun law for Mexico by using the Granger causality and found out that there is a unidirectional relation from unemployment to revenue.

Beaton (2010) stated that there are major changes in the Okun law for the US and Canada. Aliva and Usabiaga analyzed whether unemployment, which is either permanent or not, happened as a result of frequently occurred shocks in the US and Spain for the period of 1976-2004. In the study in which Lagrange multiplier and unit root test are used, unemployment in Spain is revealed to be more permanent than it is in the US. Kim (2005) stated that there is a relation between unionization, unemployment, and growth in the long run using the multi- variable cointegration and VECM. Adanu (2005) predicted the Okun coefficient for 10 cities in Canada using the real GDP and unemployment rates. The Okun coefficient is predicted as -1.58 in the study in which Hodrick-Prescott was used.

Pierdzioch *et al*. (2008) stated that the Okun coefficient is negative and valid for G7 countries using the panel data method for the data set of 1989-2007. Ceylan and Şahin (2010) used cointegration analyses that consist of Tar and M-TAR models to test the asymmetric relation between growth and unemployment in Turkey for the period of 1950-2007. According to the findings, Okun law is valid in the long run and has an asymmetric relation. Mıhçı and Atılgan (2010) indicated that Okun law is valid for Turkey for the period of 1991-2006. Tarı ve Abasız (2010) analyzed the relation between growth and unemployment in Turkey for 1968-2008 using the threshold error correction model, alleged that fluctuations in growth will affect more than the regime of expansion, and found out that the Okun coefficient is 0.48 in the long term. Barışık *et al*. (2010) analyzed the relation between growth and unemployment in the aspect of Okun law for Turkey using the data set of 1988-2008. The relation between the variables for the current periods is in the asymmetric structure, and the present growth in Turkey does not create employment in the study in which the Markov regime-switching model is used. Tiryaki and Özkan (2011) tried to determine the causes of high unemployment in Turkey for the quarterly data set of 1988:1-2010:4. In the study, beside Granger causality test, ımpulse response and variance decomposition implementations were held, and as a result, some microsolutions and macrosolutions are asserted to decrease the unemployment. Demirgil (2010) also tested the validity of the Okun Law in Turkey for the period 1987-2007. Obtained results show that the Okun law is no more valid in periods where productivity occurred above the average. Muratoğlu (2011) analyzed the relation between economic growth and unemployment using the quarterly data in Turkey from 2000 to 2010 and reached the conclusion that growth has an impact on the formation of unemployment, but unemployment does not have an effect on the formation of growth. Tatoğlu (2011) studied the relation between unemployment and growth for 19 European countries for 1977-2008. By using non stationary panels, findings of the analyses show that the Okun law and the significance of the relation between unemployment and growth varies between countries.

4. Model and Methodology

In this study, the causality relation between unemployment rate and GDP is analyzed. To approach the subject from a different aspect, GDP is divided into two parts. First of them is gross capital formation investment, and the latter is final consumption expenditure. In the study, a dummy variable, which represents the expansion periods of GDP, is also added in the model. According to this explanation, the model can be written as the following equation:

$$dlnu = \beta_0 + \beta_1 \mathrm{dln}gcf + \beta_2 \mathrm{dln}con + \beta_4 \mathrm{D}_1 + e_t \tag{2}$$

As time series used in the analyses, their stationary situation should be checked first to determine which technique to be used in the following part of the study.

Stationarity of the time series can be checked by controlling whether they have a unit root or not using the method which is designed by Dickey and Fuller. The simplest way to test the stationarity (in other words, having a unit root or not) is to consider the following model:

$$y_t = a_1 y_{t-1} + \xi_t \quad (3)$$

When y_{t-1} is subtracted from both sides,

$$\Delta y_t = (a_t - 1) y_{t-1} + \xi_t \quad (4)$$

According to this, $\gamma = a_1 - 1$. In other words, testing the hypothesis of $a_1 = 1$ also means testing the hypothesis of $\gamma =$ (Enders, 2010: 195-206).

If $\gamma =$

$$\Delta y_t = y_t - y_{t-1} = \xi_t$$

(5) equation exists (first differentiation). If a time series becomes stationary after taking its first differentiation, the original series is an integrated series of first-degree, that is. [I(1)].

Differentiation is taken for the second time for the series, which did not become stationary after the first differentiation. If the series becomes stationary after this procedure, it is an integrated series of second-degree, that is. [I(2)]. This process will continue until it becomes stationary.

There are two different types of hypothesis to test the stationarity in the ADF unit root test:

If $H_0: \gamma = 0 \ (a_1 = 1)$; y_t time series is not stationary, that is, it has a unit root.

If $H_1: \gamma \neq 0 \ (a_1 \neq 1)$; y_t time series is stationary, that is it does not have a unit root (Sevüktekin and Nargeleçekenler, 2007a).

After the unit root tests, analyses of long-term relation between the time series is carried out. According to the unit root tests, if related series are integrated at the same order (especially at first order [I(1)]), cointegration test can be used to research the long-term relation between the time series (Sevüktekin and Nargeleçekenler, 2007).

Johansen (1988) aimed to obtain the maximum likelihood estimation of cointegration vectors for autoregressive processes with independent Gaussian residuals and derive the likelihood ratio test for the hypothesis in the equation.

In the approach of "Maximum Likelihood Estimation" developed by Johansen and Juselius, following equation is considered:

$$X_t = \Pi_1 X_{t-1} + \cdots \Pi_k X_{t-k} + \mu + \Phi D_t + \xi_t \quad (6)$$

t=1,…T

Here,

$\xi_1 \ldots \xi_t$, $\Pi N_p = (0, \Lambda)$,

X_t is a vector with dimension of (nx1),

$X_{-k+1},..., X_0$ denotes the constant,

D_t denotes the dummy variable, and

Π denotes the unknown matrix to be predicted. In total three dummy variables and a constant are used. Unrestricted parameters

($\mu, \Phi, \Pi_1, .. \Pi_k, \Lambda$) are predicted from a vector autoregressive process on the basis of T observation.

Generally, the economic time series are not stationary, and VAR models are mostly represented in the form of first differentiation. In addition to this, the differentiation process also means the loss of information in the data, unless the difference operator is applied to the error process and considered clearly.
Δ denotes the difference operator, and *L* denotes the lag operator using the Δ = (I-*L*): the following model can be written as

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \cdots \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \mu + \Phi D_t + \varepsilon_t \quad (7)$$

Here,

$$\Gamma_i = -(I - \Pi_1 - \cdots - \Pi_i), \qquad (i = 1, \ldots, k-1),$$

and

$$\Pi = -(I - \Pi_1 - \cdots - \Pi_k),$$

Here, model (6) represents a classic VAR model, which is in the form of the first difference except ΠX_{t-k}. The main purpose of this procedure is to find out whether the coefficient of matrix Π contains information about long-term relation between variables in the data vector (Johansen and Juselius, 1990).
It is possible to carry out the co-integration test of Johansen-Juselius as the series are integrated at the same order (Demirci and Er, 2007). In this analysis, the long-term relation is controlled by considering the Trace and Max-Eigen cointegration tests. It is the standard Granger test which exposes the causality between two variables. Causality test is developed by recent changes on time series analyses. VECM and Granger test can be used for causality analyses. If the variables are not stationary and also not cointegrated, the differences of the variables are used for Granger causality test (Sevüktekin and Nargeleçekenler, 2007a). If the series are not stationary but their linear combination is stationary, VECM should be made up because the standard Granger causality estimations are invalid. Therefore it is indispensable to test the presence of cointegration specification for the original series before Granger causality test.

5. Data and Findings
In this study, the causality relation between unemployment and GDP is analyzed for 1980-2006.
To approach the subject from a different aspect, GDP is held in two parts. The first is gross capital formation investment, and the latter is final consumption expenditure. In the study, a dummy variable which represents the expansion periods of GDP, is also added in the model. According to this explanation, the model can be written as the following equation:

$$dlnu = \beta_0 + \beta_1 \mathrm{dln}gcf + \beta_2 \mathrm{dln}con + \beta_4 D_1 + e_t$$

In the model, d represents the process of taking the first difference of the variable. lnu denotes the logarithmic value of unemployment rate. Another variable of lngcf denotes the gross capital formation investment; lncon denotes the final consumption expenditure, and D_1 denotes the dummy variable, which symbolizes the expansion periods from 1980 to 2006. D_2 also represents the period of recession. To avoid dummy variable trap, just one variable, which is D_1 out of two, is added in the model.

Dependent variable of (*u*) is acquired from "economic and social indicators" in the official Website of the Ministry of Development. Independent variable of (*gcf*) and (con) are obtained from the Turkish Statistical Institute upon information request. D_1 is calculated by considering the increase in GDP by comparing it with the value of the previous year.

Definitions and explanation for variables are given in the following table.

Table 1: Variables Used in the Model

Variables	**Definition**	**Explanation**
u	Unemployment rate	Unemployment rate by years
gcf	Gross capital formation investment	Gross capital formation investment is carried out by public and private sectors.
con	Final consumption expenditure	Final consumption expenditure is carried out by public and private sectors.
D_1	Years of expansion	Dummy variable. Years of expansion in the GDP represented by (1), others with (0).

E-views econometric packaged software is used to carry out the tests such as unit root tests, cointegration, and VECM.

5.1. Unit Root Tests

Stationarity test should be done before checking the long-term relation between time series as stationarity level of the series will determine the selection of econometric analyses to present the long-term relation. Augmented Dickey-Fuller (ADF) unit root test is used to control the stationarity for the series in this study. Tables given below provide the information about the stationarity of both dependent and independent variables.

According to the table, ***lnu*** has a unit root so it is not stationary at level, but it becomes stationary after taking the first difference [I(1)]. The finding of this result can be reached by two different approaches. The first of them depends on the probability value. If the probability value is smaller than the critical value of 1%, 5% or 10%, the null hypothesis which assumes that variables have a unit root, can be rejected. As it is seen in the table, probability value is 0,0000 and null hypothesis can be rejected at 1%. The latter approach relies on the t-statistics. If the absolute value of the t statistic is greater than the absolute critical value at 1%, 5% or 10%, null hypothesis is rejected at related level. According to the table, the absolute value of t-statistic is greater than the absolute critical value at 1%, which means that the null hypothesis of "***dlnu*** has a unit root", which can be rejected at 1%.

Table 2: Augmented Dickey-Fuller Unit Root Test on d(*lnu*)

Null hypothesis: dlnu has a unit root Exogenous: None Lag length: 0 (Automatic based on SIC, MAXLAG = 6)			
		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-5.057658	0.0000
Test critical values:	1% level	-2.650145	

	5% level	-1.953381	
	10% level	-1.609798	

The second variable of the model is ***lngcf*** that has a unit root at level, and it becomes after taking its first difference. As the probability value is smaller than 1%, the null hypothesis is rejected at 1%. The second approach also gives the same result as the absolute value of t-statistic is greater than the absolute critical value of 1%.

Table 3: Augmented Dickey-Fuller Unit Root Test on d(*lngcf*)

Null Hypothesis: d(lngcf) has a unit root			
Exogenous: None			
Lag length: 0 (automatic based on SIC, MAXLAG = 6)			
		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-4.136197	0.0002
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

Another variable in the model is ***lncon*** that has a unit root at level, and after taking its first difference, it becomes stationary. As the probability value is smaller than 1%, the null hypothesis is rejected at 1%. The second approach also gives the same result as the absolute value of t-statistic is greater than absolute critical value of 1%.

Table 4: Augmented Dickey-Fuller Unit Root Test on d(*lncon*)

Null hypothesis: d(lncon) has a unit root			
Exogenous: None			
Lag length: 0 (automatic based on SIC, MAXLAG=6)			
		t-Statistic	Prob.
Augmented Dickey-Fuller test statistic		-3.422387	0.0014
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

According to the above-mentioned ADF test results stationarity of the series, it is found out that the dependent variable of ***lnu*** and independent variables of ***lngcf*** and ***lncon*** became stationary after taking their first difference [I(1)].
After stationarity tests, co-integration analyses should be carried out to find the long-term relation between series.

5.2. Johansen Cointegration Test

Cointegration means that two or more time series are not stationary individually but their linear combination is stationary, and it tests whether these series move together in the long-run (Gökalp e*t al.*, 2011). If the related series are integrated at the same order (especially at first order [I(1)]), cointegration test developed by Johansen and Juselius can be used to find out the long-term relation (Sevüktekin and Nargeleçekenler, 2007).
Optimal lag length should be determined prior to starting the cointegration analysis. Optimal lag length is chosen (3) by AIC selection criteria as it gives the smallest value.

Table 5: Determination of Lag-Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	24.25851	NA	2.17e-06	-1.688209	-1.491867	-1.636120
1	115.6843	144.7576*	4.15e-09*	-7.973695	-6.991983*	-7.713247*
2	129.7548	17.58812	5.54e-09	-7.812903	-6.045822	-7.344096
3	149.5917	18.18378	5.80e-09	**-8.132640***	-5.580190	-7.455474

* 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

After deciding the lag length, AIC criteria is considered to find out which model to be used out of the five models for the co-integration analysis, and model number (5) is decided to be the most appropriate one as a result.

Table 6: Model Choosing Test for Cointegration (Akaike Information Criteria)

Data Trend: **Rank or** **No. of CEs**	**None** **No Intercept** **No Trend**	**None** **Intercept** **No Trend**	**Linear** **Intercept** **No Trend**	**Linear** **Intercept** **Trend**	**Quadratic** **Intercept** **Trend**
0	-6.165059	-6.165059	-6.385511	-6.385511	-6.549284
1	-7.073725	-7.545742	-7.817076	-8.147814	-8.357673
2	-7.255462	-7.772743	-8.025182	-9.472532	-9.619050
3	-7.125451	-7.736778	-7.895641	-9.570642	**-9.747375***
4	-6.509336	-7.513869	-7.513869	-9.235281	-9.235281

After deciding lag length and model number, cointegration analysis can be conducted by doing the Trace and Max-Eigen test. According to the Trace test, 3 cointegrated vectors have been found at 1%, 5%, and 5% respectively. (The first hypothesis is also rejected as trace statistics 43.86699 is greater than critic value of 35.01090 at 5%. Similarly, the second and third null hypotheses are rejected due to greater trace statistic).

Table 7: Unrestricted Cointegration Rank Test (Trace)

Trend assumption: Quadratic deterministic trend
Series: *lnu, lngcf, lncon*
Lags interval (in first differences): 1 to 3
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.629152	43.86699	35.01090	0.0045
At most 1 *	0.488361	21.05186	18.39771	0.0208
At most 2 *	0.217422	5.638710	3.841466	0.0176
Trace test indicates 3 cointegrating eqn(s) at the 0.05 level.				
* denotes rejection of the hypothesis at the 0.05 level.				
**MacKinnon-Haug-Michelis (1999) p-values.				

But, Maximum Eigenvalue test does not give the similar result with Trace Test. As the probability value of first hypothesis is smaller than %5, it is accepted. Same conclusion can be obtained through comparison of max-eigen statistic with %5 critical value. As max-eigen statistic is smaller than %5 critical value, this hypothesis cannot be rejected.

Table 8: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.629152	22.81514	24.25202	0.0765
At most 1	0.488361	15.41315	17.14769	0.0879
At most 2*	0.217422	5.638710	3.841466	0.0176
Max-eigenvalue test indicates no cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

After confirming the long-term relation by considering the Trace test result, the causality relation can be analyzed using the VECM model. In the VECM model, ***dlnu*** which is the dependent variable, is explained by its and other variable’s lagged values. In this model, error correction term (ect), which shows the *long-term* causality. This mechanism will operate if the *ect* is significant and its sign is negative as expected. Other coefficients represent the short-term causality. If they are significant, it means that they will cause the unemployment rate in the short run.

Expansion of the model includes the lagged values of variables that are given in the following box. In the model, the value, which is in bold denotes the ect, and C(1) also denotes coefficient of ect. In the model, the letter of (d) denotes the process of taking the difference of the series, and C(8) denotes the intercept. Other coefficients represent the coefficient of the difference of the lagged value of dependent and independent variables (except dummy variables, which is D_1).

d(lnu) = C(1)***(lnu(-1) + 1.907221493*lngcf(-1) -2.757980639*lncon(-1) + 15.39892942)** + C(2)*d(lnu(-1)) + C(3)*d(lnu(-2)) + C(4)*d(lngcf(-1)) + C(5)*d(lngcf(-2)) + C(6)*d(lncon(-1)) + C(7)*d(lncon(-2)) + C(8) + C(9)*D_1

Table 9: VECM Estimation Results

Dependent Variable: d(lnu)				
Method: Least squares				
Included observations: 24 after adjustments				
	Coefficient	Std. Error	t-Statistic	Prob.

C(1)	**-0.195497**	0.090272	-2.165646	**0.0469****
C(2)	-0.083981	0.242636	-0.346120	0.7341
C(3)	-0.063351	0.240212	-0.263730	0.7956
C(4)	-0.010425	0.321138	-0.032464	0.9745
C(5)	0.312550	0.318559	0.981136	0.3421
C(6)	-0.076593	0.934963	-0.081921	0.9358
C(7)	-0.712488	0.880186	-0.809475	0.4309
C(8)	0.126728	0.063203	2.005073	0.0633
C(9)	**-0.120033**	0.055229	-2.173355	**0.0462****
R-squared	**0.370182**	Mean dependent var		0.012812
Adjusted R-squared	0.034278	S.D. dependent var		0.094022
S.E. of regression	0.092397	Akaike info criterion		-1.645451
Sum squared resid	0.128058	Schwarz criterion		-1.203681
Log likelihood	28.74541	Durbin-Watson stat		**1.704220**
χ^2 White	22,2(0,17)	χ^2 BG(2)		2,49 (0.28)
χ^2 JB	0,54 (0,75)			
***, ** , *and* *** *denote significance at 1%, 5% and 10% respectively.*				

In the model, just two coefficients are significant. First of them is ect, which is significant at 5% as the probability value is smaller than 5%. Its coefficient is negative, and its value is 0.195497. Long-term causality and equilibrium of the model are determined by *ect,* which is the one period lagged of the residual derived from the long-term model and symbolizes the process of transition from disequilibrium to equilibrium. In the probability column, *ect* is significant at 5% (0.0469), and its sign is negative. Coefficient of ect (-0.19) means that in each period, 19 % of the disequilibrium will be eliminated.

The dummy variable is another significant variable, which represents the periods of expansion. Because the coefficient of D_1 is negative, which shows the direction of the relation, this means that unemployment will decrease as GDP increases. If the present year is accepted as D_1 (it means that if there is an increase in the current year), unemployment rate will decrease by 0.12%.

The rest of the variable is insignificant in the short-term as their probability values are greater than 1%, 5% and 10%. According to the table, only 37% of the changes in the unemployment can be explained by the independent variable. In terms of diagnostic test, there is no serial correlation problem as “Durbin Watson statistic” and “LM serial correlation test.” The Jarque-Bera test also indicates that residuals are distributed normally, and there is no heteroskedasticity problem as well.

6. Conclusion

This study shows that there is a cointegration in the long-term between unemployment, gross capital formation, final consumption expenditures, and periods of expansion according to the findings of Johansen Cointegration analyses carried out for the data set of Turkey from 1980 to 2009. Results of VECM indicate short and long-term causality. In the case of the latter, operating ***ect*** mechanism assures that a transition process from disequilibrium (in the short run) to equilibrium (toward the long run) is established. The model goes toward the equation every period by 19% as ***ect*** is significant, and its coefficient is negative. Another finding of the VECM is about the dummy variable, which represents the periods of expansion in GDP. According to the VECM test, expansion of the GDP will decrease the unemployment rate by 0.12% in the short term.

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