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Barışık, Salih and Cevik, Emrah Ismail

Gaziosmanpaşa University, Namık Kemal University

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# Hysteresis in Unemployment: Evidence from Sector-Specific Unemployment in Turkey

**Salih Barışık**

Faculty of Economics and Administrative Sciences, Gaziosmanpaşa University,  
Tokat, Turkey.

**Emrah İsmail Çevik\***

Faculty of Economics and Administrative Sciences, Zonguldak Karaelmas University,  
Zonguldak, Turkey.

**Abstract:** High levels of inflation and unemployment have been experienced together in the world after 1970's. Efforts of decreasing inflation have been achieved in the world after 1990's. The fact that there has been no evidence the unemployment rate beginning to decrease despite the increasing growth rates in the USA and Europe countries recalls hysteresis effect. This phenomenon observed in Turkey after 1994 and 2001 crises. This paper examines hysteresis effect in sector-specific unemployment in Turkey. We apply conventional unit root tests and Zivot-Andrews structural break test to determine the presence of hysteresis effect. Hysteresis effect is only found in Manufacturing and Finance sectors.

**Keywords:** Hysteresis, Structural Break, Unemployment

**JEL classification:** C12; C32; J64

## 1. Introduction

According to the hysteresis effect, which was first proposed by Phelps in 1967, unemployment rates does not tend to revert to its equilibrium in the long run. In a period of recession inflation will automatically stop rising when economy reaches higher unemployment rates. On the other hand, increased unemployment rate caused by recession will not automatically return to its equilibrium level despite economic growth. Economic shocks have the potential to increase the Non-Accelerating Inflation Rate of Unemployment (NAIRU) and this emerges the hysteresis effect that implies permanence in unemployment. In

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\* Corresponding author. Tel.: +90-372-2574010, e-mail address: [emrahic@yahoo.com](mailto:emrahic@yahoo.com)

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the presence of significant hysteresis, shock effect on unemployment rates will be permanent because of the factors that determine the natural unemployment rates.

In the last thirty years, increasing unemployment rates in USA and EU countries within every decade did not return to their equilibrium levels. This phenomenon has been observed in Turkey after 1994 and 2001 crises. Unemployment rate has increased subsequently the 6.5% contraction of GNP in 1994 and 9.5% contraction of GNP in 2001. Especially after the 2001 crisis, persistence in unemployment rate in the face of continuous growth for five years. Pazarlıoğlu and Çevik (2007a, 2007b), Barışık and Çevik (2007, 2008), have detected the presence of hysteresis effect in their studies regarding analysis of general unemployment rates in Turkey.

In this study, conventional unit root tests are used to investigate the presence of hysteresis effect on sector-specific unemployment in Turkey. However, a criticism against unit root tests is that the unit root property in data may be due to the presence of structural breaks. This is called “the spurious unit root process”. Therefore in this study, in addition to the hysteresis effect, presence of structural breaks in unemployment rates was investigated by Zivot-Andrews structural break test. Presence of hysteresis effect on the increasing unemployment rates, which were affected by the 1994 and 2001 crises, is formed based on nine sub sectors using unit root tests. Stressing on different growth rates in the Turkish sub sectors by sector-specific discrimination shows that hysteresis effect may not occur in parallel with the expectations. This study is composed of four sections. Section 2 briefly describes empirical methodology and Section 3 presents the econometric results. We report main conclusions in Section 4.

## **2. Empirical Methodology**

### **2.1. Unit Root Tests**

To determine the persistence of the unemployment rates or in other words, presence of hysteresis effect is to apply unit root test. According to the obtained unit root test outcomes, if unemployment rates have unit root this means that the rate of unemployment does not show tendency to return to its equilibrium value after the economic shocks, presence of hysteresis effect is approved. Primarily, in order to investigate the sector-specific unemployment hysteresis, we use both augmented Dickey-Fuller (hereafter ADF) and Phillips-Perron (hereafter PP) unit root tests.

In addition, conventional unit root tests were criticized since they have tendency to present spurious unit root in case of structural breaks in series and have less power towards local trend-stationarity alternatives. McCallum (1986), Diebold and Rudebusch (1991), Dejong et. al. (1992) studies are among the examples having these critics (Kousta and Veloce, 1996). Therefore, structural break tests have to be applied together with unit root test to examine presence of hysteresis effect.

## 2.2. Zivot-Andrews Structural Break Test

Perron (1989) argued that if there is a structural break, the power to reject a unit root decreases when the stationary alternative is true and structural break is ignored. Therefore Perron proposed three alternative models which consider structural breaks: Model A (the crash model), which allows for a one-time change in the level of the series; Model B (changing growth model), which allows for one-time change in the slope of trend function, and Model C (the crash-cum-growth model), which allows for one-time change in the level and slope of trend function. Perron treatment of the structural break was exogenous. Zivot and Andrews (1992) propose a variation of Perron's original test in which they assume that exact of the break-point is unknown. We used the following two alternative models to investigate unemployment hysteresis:

Model A:

$$\Delta y_t = \mu + \theta DU_t(\lambda) + \beta t + \alpha y_{t-1} + \sum_{j=1}^k c_j \Delta y_{t-j} + e_t \quad (1)$$

Model C:

$$\Delta y_t = \mu + \theta DU_t(\lambda) + \beta t + \gamma DT_t(\lambda) + \alpha y_{t-1} + \sum_{j=1}^k c_j \Delta y_{t-j} + e_t \quad (2)$$

where  $DU_t$  is an indicator dummy variable for a mean shift occurring at each possible break-date (TB) while  $DT_t$  is corresponding trend shift variable, where:

$$DU_t = \begin{cases} 1 & \text{if } t > TB \\ 0 & \text{otherwise} \end{cases} \quad DT_t = \begin{cases} t - TB & \text{if } t > TB \\ 0 & \text{otherwise} \end{cases}$$

The null hypothesis in Equations 1 and 2 is that  $\alpha=0$ , which implies there is a unit root in  $y_t$ . The alternative hypothesis is that  $\alpha<0$ , which implies that  $y_t$  is breakpoint stationarity. The ZA method regards every point as a potential break date (TB) and runs a regression for every possible break-date sequentially. From amongst all possible break-points, the procedure selects as its choice of break date which minimizes the one-sided t-statistic for testing  $\alpha=0$ .

## 3. Empirical Results

Unit root tests and ZA structural break test are applied in order to investigate the presence of hysteresis effect on sector-specific unemployment in Turkey. According to the classification of Turkish Statistical Institute (TSI), data regarding the nine sectors were obtained from the web site of TSI. The quarterly seasonally adjusted data cover the period between 1988Q3 and 2007Q2.

Results of the ADF and PP unit root tests shown in Table 1. Both tests results show that for unemployment rates of Manufacturing, Construction, Finance, Wholesale and Transportation sectors, we fail to reject the null hypothesis of a unit root. For unemployment rates of Electricity, Public Services, Mining and Agriculture sectors, the null hypothesis of unit root can be rejected at the 5% level. This result indicates the presence of unemployment hysteresis for Manufacturing, Construction, Finance, Wholesale and Transportation sectors unemployment rates.

**Table 1: Unit Root Tests Results**

Sectors	Level Values		First Differences	
	ADF Test	PP Test	ADF Test	PP Test
Electricity, Gas and Water	-3.923*	-3.966*	-9.778*	-16.032*
Public Services, Social and Individual Services	-2.702***	2.995**	-11.363*	-11.352*
Manufacturing Industry	-2.217	-2.306	-8.309*	-8.343*
Construction and Development Business	-2.291	-2.291	-9.912*	-10.051*
Mining and Quarrying	-6.177*	-6.170*	-13.011*	-27.924*
Finance Institutes, Insurance, Fixed Assets Business and Institutes, Auxiliary Business Services	-1.925	-1.928	-10.580*	-10.392*
Wholesale and Retail Trade, Restaurant and Hotels	-1.483	-1.589	-7.460*	-7.500*
Agriculture, Forestry, Hunting and Fishery	-2.974**	-3.001**	-9.804*	-9.804*
Transportation, Communication and Storing	-2.393	-2.359	-8.659*	-8.659*

1) \*, \*\* and \*\*\* indicates the rejection of the hypothesis that the variable does not contain unit root at the 1%, 5% and 10% level of significance respectively. 2) Lag length is determined according to the Schwarz information criteria. Maximum lag is 11

Because of the unit root tests are being criticized for having a weak power for rejecting the null hypothesis in the case of existence of structural break, unemployment rates of Manufacturing, Construction, Finance, Wholesale and Transportation sectors requires the searching of existence of structural break. The results of the ZA structural break test performed for this reason are given at Table 2.

**Table 2: Zivot-Andrews Structural Break Test Results**

Sectors	Test Statistics		Break Periods	
	Model A	Model C	Model A	Model C
Manufacturing Industry	-4.338	-4.437	2001Q1	2001Q1
Construction and Development Business	-5.317**	-6.368*	2001Q3	2001Q3
Finance Institutes, Insurance, Fixed Assets Business and Institutes, Auxiliary Business Services	-4.487	-4.542	2001Q1	2001Q1
Wholesale and Retail Trade, Restaurant and Hotels	-4.728***	-4.625	2001Q1	2001Q1
Transportation, Communication and Storing	-4.729***	-4.935***	2001Q3	2002Q1

1), -4.58, -4.80 and -5.43 indicates critical values for Model A at 10%, 5% and 1% significance levels respectively. -4.820, -5.08 and -5.57 indicates critical values for Model c at 10%, 5% and 1% significance levels respectively. 2) \*, \*\* and \*\*\* indicates presence of break stationarity at 1%, 5% and 10% significance levels respectively.

ZA structural break test results indicate that null hypothesis can be rejected at 1% level for the Construction sector unemployment rates. According to this result, it was determined that the Construction sector is breakpoint stationary and change in the level and slope of trend function was observed for the period of 2001Q3. For the Wholesale and Transportation sectors unemployment rates, the null hypothesis can be rejected at 5% and 10% level respectively. Unemployment rates of these sectors are determined breakpoint stationarity. The break periods for the Wholesale and Transportation sectors are determined as 2001Q1, 2002Q1. On the other hand, for the Manufacturing and Financial sectors we fail to reject null hypothesis of a unit root. Unit root tests and ZA structural break test results indicates presence of hysteresis effect for Manufacturing and Finance sectors unemployment rates.

#### **4. Conclusion**

This study examines hysteresis effect in sector-specific unemployment in Turkey. A particular focus is given to the sector-specific unemployment rates because of different growth rates were observed in the Turkish sub sectors after 2001 crises. We apply conventional unit root tests and Zivot-Andrews structural break test to determine the presence of hysteresis effect. According to the unit root tests results; for the Manufacturing, Construction, Finance, Wholesale and Transportation sectors unemployment rates, the existence of unit root is determined. However Turkey's economy has been experienced two economic crises at 1994 and 2001. In the case of existence of structural break, the unit root analysis is being criticized for having a weak power for rejecting null hypothesis. For this reason, when the hysteresis effect is investigated, the structural break test is also applied. According to the ZA structural break tests, the existence of break is determined at the Construction, Wholesale and Transportation sectors. In the end, it is found that the unemployment rates of these sectors are breakpoint stationary. Besides, for the unemployment rates belonging to Manufacturing and Finance sectors, break is not determined and the existence of the unit root is verified. According to both the results of the unit root tests and the ZA structural break test, that the growth rates belonging to these sectors include unit root is an indication of existence of hysteresis effect. Although a strong growth was observed in the Manufacturing and Finance sectors after the 2001 crisis, the rise in technology-based production, jobless growth and self-service banking resulted in hysteresis effect in the sectors.

#### **Reference**

Barıřık, S. and E.İ. evik, 2007, The Fractional Stationarity Test of Hysteresis Effect in Unemployment in Turkey, The 8<sup>th</sup> Econometrics and Statistics Congress of Turkey.

- Barıřık, S. and E.İ. evik, 2008, Analysis of Unemployment Hysteresis in Turkey Using Structural Breaks Tests: The Period of 1923-2006, Journal of Faculty of Karaman Economics and Administrative Sciences (Forthcoming).
- Dejong, D.N., J.C. Nankervis, N.E. Savin and C.H. Whiteman, 1992, Integration Versus Trend Stationarity in the Time Series, *Econometrica*, 60, 423-433.
- Dickey, D.A. and W.A. Fuller, 1979, Distribution of the Estimators for Autoregressive Time Series with a Unit Root, *Journal of the American Statistical Association* 74, 427-431.
- Diebold, F.X. and G.D. Rudebusch, 1991, On the Power of Dickey-Fuller Tests against Fractional Alternatives, *Economics Letters* 35, 155-160.
- Kousta, Z. and W. Veloce, 1996, Unemployment Hysteresis in Canada: An Approach Based on Long-Memory Time Series Models, *Applied Economics* 28, 823-831.
- McCallum, B.T., 1986, On 'Real' and 'Sticky Price' Theories of the Business Cycle", *Journal of Money, Credit and Banking* 18, 397-414.
- Pazarlıođlu, M.V. and E.İ. evik, 2007a, Application of Ratchet Model: Evidence from Turkey, *Süleyman Demirel University Journal of Economics and Administrative Sciences*, 12, 41-51.
- Pazarlıođlu, M.V. ve E.İ. evik, 2007b, Ratchet Model Empirical Evidence from Turkey, 1939-2005, *Trakya University Journal of Social Science* 9, 17-34.
- Perron, P., 1989, The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis, *Econometrica* 57, 1631-1401.
- Phelps, E.S., 1967, Phillips Curves, Expectations of Inflation and Optimal Unemployment Over Time, *Economica* 34, 254-281.
- Phillips, P. C. and P. Perron, 1988, Testing for a Unit Root in Time Series Regression, *Biometrika*, 75, 335-46.
- Turkish Statistical Institute, 2007, Laborforce Statistics, Turkey, <http://www.turkstat.gov.tr> (accessed September 12, 2007).
- Zivot, E. and W.K.D. Andrews, 1992, Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis, *Journal of Business and Economic Statistics* 10, 251-270.