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IS UNEMPLOYMENT HYSTERESIS VALID IN BRICS-T COUNTRIES? EVIDENCE FROM PANEL FOURIER LM APPROACH

BRICS-T Ülkelerinde İşsizlik Histerisi Geçerli Mi? Panel Fourier LM Yaklaşımından Kanıtlar

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ABSTRACT

Shocks in national economies and fluctuations in the labor market have negative effects on unemployment. High unemployment has negative consequences both economically and socially. Fluctuations in unemployment rates and being in rise are among the main targets that should be solved in the economies of the country. There are two basic approaches in the economics literature regarding whether to return to the natural level of increasing unemployment. These are natural unemployment rate approach that asserts that increasing unemployment will return to its natural level in the long run and unemployment hysteresis approaches that argue that it is not possible to return.

In this study, it was examined whether the natural unemployment rate or unemployment hysteresis approach is valid in BRICS-T country group consisting of Brazil, Russia, India, China, South Africa and Turkey. Empirically, Panel Fourier LM unit root test, one of the second-generation panel unit root tests proposed by Nazlıoğlu and Karul (2017), was applied. The findings show that the unemployment hysteresis approach is valid in the BRICS-T country group.

Key Words: Natural Unemployment, Unemployment Hysteresis, Panel Data Analysis

ÖZET

Ülke ekonomilerinde meydana gelen şoklar ile iş piyasındaki dalgalanmalar işsizlik üzerinde olumsuz etkilere yol açmaktadır. Yüksek işsizlik hem ekonomik hem de sosyal olarak olumsuz sonuçlar ortaya çıkarmaktadır. İşsizlik oranlarında yaşanan dalgalanmalar ve yüksek seyir, ülke ekonomilerinde çözülmesi gereken temel hedeflerdendir. Artan işsizliğin doğal seviyesine geri dönüp dönmeme konusunda iktisat literatüründe temel iki yaklaşım bulunmaktadır. Bunlar; artan işsizliğin uzun dönemde tekrar doğal seviyesine döneceğini ileri süren doğal işsizlik oranı yaklaşımı ile geri dönüşün mümkün olmadığını savunan işsizlik histerisi yaklaşımlarıdır.

Bu çalışmada, Brezilya, Rusya, Hindistan, Çin, Güney Afrika ve Türkiye'den oluşan BRICS-T ülke grubunda doğal işsizlik oranının mı yoksa işsizlik histerisi yaklaşımının mı geçerli olduğu incelenmiştir. Ampirik olarak, Nazlıoğlu ve Karul (2017) tarafından önerilen, ikinci nesil panel birim kök testlerinden Panel Fourier LM birim kök testi uygulanmıştır. Bulgular, BRICS-T ülke grubunda, işsizlik histerisi yaklaşımının geçerliliği olduğunu göstermektedir.

Anahtar Kelimeler: Doğal işsizlik, İşsizlik histerisi, Panel veri analizi

1. INTRODUCTION AND THEORETICAL FRAMEWORK

Low-level unemployment, in other words, high-level employment, is one of the main macroeconomic goals for policymakers. The fact of unemployment leads to social, political and psychological problems as well as economic (Tekin, 2018: 98). For policymakers, having other effects alongside their economic consequences distinguishes unemployment from other macroeconomic indicators. Unemployment economically refers to the exclusion of labor, which is one of the most basic factors of production. A decline in labor can lead to problems in the economy, both in the direction of supply and in the direction of

demand. In conjunction with low employment, the economy produces below-potential supply and added value. On the other hand, individuals (unemployed) who do not participate in production are also unable to spend because they cannot earn income. In this case, low demand for consumer goods arises through the spending channel. Therefore, due to the economic factors expressed and the fact that they lead to social and political problems, governments do not desire the state of unemployment and they struggle with various policies (or policylessness). The OPEC crisis in the 1970s caused stagflation (a combination of high inflation and high unemployment), and unemployment rates that reached high levels could not be reduced in some countries (Bozgeyik, 2020: 4318). Especially since these years, it has been investigated and debated whether the increase in unemployment rates in the country's economies is a temporary or permanent. There are many approaches in the economic literature about the dynamic trends of unemployment. Often preferred among these approaches are natural unemployment rate and unemployment hysteresis approaches.

The natural unemployment rate approach was developed by Friedman (1968) and Phelps (1968). According to this approach, the actual unemployment rate will be equal to the natural unemployment rate in the long run, and there will be no swap relationship between wage inflation and unemployment on this rate. In other words, the Philips Curve will occur vertically over the natural ratio over a long period of time. On the other hand, the barter relationship in question will continue to be valid in the short term. In other words, in the short term, the Philips Curve will be negative sloped. The econometric meaning of this process is that the unemployment series does not contain unit root processes. In other words, it is that the unemployment series is stationary (trend stationary) on average. In this way, the unemployment series will return to the natural level of unemployment, which is the equilibrium value in the long run.

The Unemployment Hysteresis Approach is Blanchard and Summers (1986, 1987), Layard et al. It was developed with contributions from (1991) and Barro (1988). The concept of hysteria, used by the authors, is more commonly used in Physical Science and refers to the fact that when force is applied to an object for a long time, it will be difficult to return to its former state in relation to the measure of force applied. Blanchard and Summers, took advantage of the concept of hysteria to express the difficulty of returning from these levels to the natural level of unemployment if high unemployment persists for a long time (bent, 2013). According to this approach, due to the current rigidity in the labour market, shocks cause permanent effects on the unemployment level (Guloglu and Ispir, 2011:205). As with the natural unemployment rate approach, shocks on unemployment are not temporary. In other words, in the face of a shock in the job market, the unemployment rate will rise and will not return to its previous level. In this way, the unemployment rate that occurs in the new equilibrium state will be much higher than the natural unemployment level. In econometric analyses, this means that the unemployment series contains a unit root. In other words, the unemployment series does not tend to return to average.

In the study of Blanchard and Summers (1987), they very clearly stated the distinction between the natural unemployment approach and the unemployment hysteresis approach in the face of a shock in the labor market. The authors attribute two basic reasons that the natural unemployment rate approach would not apply. The first is membership theory and the other is duration theory. According to membership theory, in other words, the insiders-outsiders approach; trade unions (insiders) who have the power to negotiate wages prevent the nominal wage level from falling in the face of negative shocks and prevent outsiders from finding work (Taş and Uğur, 2017:31). Duration theory, on the other hand, goes to the distinction between short and long term unemployment. According to this theory, he argues that long-term unemployment is ineffective in determining the level of wages in the labor market. Thus, economic units experiencing long-term unemployment are discouraged from finding work. Therefore, those who are inside (employed) become stronger. Other views suggesting the validity of unemployment hysteria are explained by the depreciation of human capital and stigma mechanisms. (Mike and Alper, 2020: 2).

In this study, it will be examined whether the natural unemployment rate or unemployment hysteresis approach is valid in the BRICS-T (Brazil, Russia, India, China, South Africa and Turkey) Country group using unemployment data for the period 1991-2020. In the following section, the selected literature related to the subject will be discussed. After that, empirical analysis findings will be included. Finally, the results and evaluation part will be given and the work will be completed. When the literature is examined, it is seen that many studies have been done on the subject. However, the absence of a study examining the BRICS-T country group and the application of current data and current econometric tests distinguish this

study from other studies. In these aspects expressed, it is considered to contribute to the literature on the subject with this study.

2. SELECTED LITERATURE

There are many studies in the economic literature that examine whether fluctuations in the unemployment rate are temporary. Consensus has not been reached in empirical studies on the subject. It is believed that this result is related to the country/group of countries, the period and the methods used. In this section, current studies on country groups are mentioned in order to compare the results in a healthier way.

Arestis and Mariscal (1999) investigated the validity of unemployment hysteria in a group of 26 OECD countries. 1960: Q1-1997: Q3 period quarter data was used in the study, structural fracture unit root test was used. The analysis findings only revealed the validity of unemployment hysteria in Canada, the United States, Japan and Austria. Similar result was obtained by using panel unit root test method in the study of León- Ledesma (2002) with quarterly data for the period 1985: Q1-1999: Q4. In the study it's found that the unemployment hysteria approach applies to 12 European Union countries. On the other hand, the validity of the natural rate approach has been established for 51 US states. Again, Chang, Lee, Nieh and Wei (2005), who tested the validity of unemployment hysteria by performing a panel unit root test, suggested that the natural unemployment rate approach is valid for 8 European countries with annual data for the period 1961-1999. A similar result was achieved in Christopoulos and León-Ledesma (2007) for 12 EU countries through the panel unit root test with quarter data for the period 1988: Q1-1999: Q4. Investigating the validity of unemployment hysteria through the non-linear panel unit root test, Lee (2010) showed that the unemployment hysteria hypothesis is valid in other countries except 6 countries using annual data from 29 OECD countries from 1960 to 2008. Ener and Arica (2011), investigated the validity of unemployment hysteria for a group of countries consisting of 15 EU countries and Turkey using data from the period 1985-2005, through the panel unit root tests with breaks. The results showed that the natural unemployment rate approach is valid, that is, the long-term unemployment rate has returned to the natural unemployment rate. Chang (2011) found it for 6 of 17 OECD countries with annual data for the period 1960-2009 by using the Fourier unit Root Test. Using the same econometric method, Furuoka (2014) stated that unemployment hysteresis does not apply to China and Japan as a result of his analysis for 5 Asia-Pacific countries with annual data for the period 1980-2009. Bolat et al. (2014) in their study, they investigated the validity of unemployment hysteresis for 17 Eurozone countries through non-linear and heterogeneous panel unit root tests. Analysis findings for the period 2000-2013 showed that unemployment hysteria is valid. But the Fourier unit root test results showed that unemployment hysteresis is valid in only 6 countries, while in other countries, the natural unemployment rate approach is valid. Yalçinkaya and Kaya (2017) tested the validity of unemployment hysteresis using OECD country data for the period 1980-2015 through panel unit root tests with structural breaks and no breaks. Although there was no effect of hysteresis in unemployment in test with structural breaks, the validity of unemployment hysteria was obtained in tests with no breaks. Meng, Strazicich and Lee (2017), who investigated the validity of unemployment hysteresis with quarterly data from 14 OECD countries for the period 1983: Q1-2013:Q3, used linear, nonlinear and Fourier unit root tests as a method. The findings only pointed to the presence of hysteria in unemployment in 4 countries. Yaya, Ogbonna and Mudida (2019), obtained a similar result in their study of 42 African countries for the period 1991-2017. In the study that using the Fourier unit root test concluded that unemployment hysteresis is valid in only 7 African countries. Bozgeyik (2020) investigated a similar study in the E7 group of countries. In the study in which unit root tests were performed by parsing linear and nonlinear series that conducted with annual data for the period 1991-2018, it was found that the natural unemployment rate approach is valid in other countries other than China. Mike and Alper (2020) investigated the validity of unemployment hysteresis for the economies of 52 selected developed and developing countries. In the study that using the Fourier ADF unit root test proposed by Enders and Lee (2012), the findings showed the validity of the unemployment hysteresis approach for all countries. Pata (2020), which tested the validity of unemployment hysteresis in 15 OECD countries, used the Fourier panel stationarity test proposed by Bahmani-Oskooee, Chang and Wu (2014). the results of the analysis that using quarter data of 1991:Q1-2019: Q2 period showed that the unemployment hysteresis for the panel was invalid. However, when examining the individual results for countries, it was obtained the validity of unemployment hysteresis in Germany, Turkey and Spain.

3. ECONOMETRIC ANALYSIS

3.1. Data Set

Descriptive information for the data set and country group is included in Table 1. In empirical analyses, Gauss 19 package program was used.

Tablo 1: Data Set

Variable	Explanation	Period	Source
LUN	Logarithmic unemployment rate (%of total labor force)	1991-2020	World Bank Data, World Development Indicators
Ülkeler			
1	Brazil	4	China
2	India	5	South Africa
3	Russia	6	Turkey

3.2. Method

In this study, panel unit root analysis is applied with BRICS-T countries data sets. In order to test whether unemployment hysteresis is valid in this country group, it was used the panel Fourier LM (Nazlioglu & Karul, 2017) Unit Root Test that is the second-generation panel unit root test.

One of the preliminary tests that needs to be done is to investigate whether the variable coefficient is homogeneous or heterogeneous. If, as a result of the test, it is determined that the variable coefficient is heterogeneous, panel unit root analyses that considering heterogeneity are required. In this study, whether the coefficient is homogeneous is examined by the slope homogeneity test developed by Pesaran & Yamagata (2008). In the homogeneity test, the zero hypothesis is" H_0: slope coefficients are homogeneous "and the alternative hypothesis is" H_1: slope coefficients are heterogeneous". The homogeneity test tests whether other countries are affected at the same level as the change taking place in one of the countries.

The delta test was developed by Pesaran and Yamagata (2008) to test whether the slope coefficients are homogeneous (Pesaran and Yamagata, 2008: 67-69):

$$\tilde{\Delta} = \sqrt{N}\left(\frac{N^{-1}\tilde{S}-k}{\sqrt{2k}}\right) \quad (1)$$

(N,T)→ ∞ under the null hypothesis, the error term shows normal distribution. The Delta test has asymptotic normal distribution. Delta test statistics are calculated as follows:

$$\tilde{\Delta}\Delta_{adj} = \sqrt{N}\left(\frac{N^{-1}\tilde{S}-E(\tilde{Z}_{iT})}{\sqrt{Var(\tilde{Z}_{iT})}}\right) \quad (2)$$

Mean in the above equation $E(\tilde{Z}_{iT}) = k$ and variance $Var(\tilde{Z}_{iT}) = \left(\frac{2k(T-k-1)}{T+1}\right)$

Another of the preliminary tests is to investigate whether there is dependence between sections. Various tests are used to test horizontal cross-section dependence (Breusch and Pagan, 1980; Pesaran, 2004; Pesaran et al., 2008). In the Breusch and Pagan (1980) study, where horizontal cross-section dependence was tested, the test statistic is expressed as follows (Pesaran et al., 2008):

$$\text{LM} = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{P}_{ij}^{2}, \quad \sim X^2 N(N-1)/2 \quad (3)$$

Under the null hypothesis, the LM test has an asymptotic chi square distribution of n(n-1)/2 degrees of freedom. The LM test is valid when N is small and T is large enough. The test statistic developed by Pesaran (2004) is expressed as follows:

$$\text{CD} = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{P}_{ij}\right) \quad (4)$$

Under the null H_0 hypothesis, while T is of sufficient size CD → $N(0,1)$ limit of function N → ∞'dur. In addition, unlike the LM test, the average is zero at constant and T and N values.

Pesaran (2004) states that as long as the unconditional averages of dependent and independent variables do not change over time and their innovations have symmetrical distributions, the CD test has zero mean for

fixed T and N and shows that is strong for heterogeneous dynamic models including multiple breaks in slope coefficients and / or error variances.

For large panels, where is first T → ∞ and then N → ∞ in that case, Pesaran et al. (2008) proposes a corrected test, a modified version of the LM test, using the exact mean and variance of the LM statistic. The corrected LM test is expressed as:

$$LM_{adj} = \sqrt{\left(\frac{2}{N(N-1)}\right)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{(T-k)\tilde{\rho}^2{}_{ij} - \mu_{Tij}}{\sqrt{v2_{Tij}}} \sim N(0,1) \qquad (5)$$

Where k, is the number of regressors, μ_{Tij} and v^2_{ij} Provided by Pesaran and others $(T\text{-}k)\ \tilde{\rho}^2_{ij}$ mean and variance, respectively. (Pesaran et al., 2008: 108).

Hypotheses in cross-section dependency tests are formed in the following form:

H_0: There is no cross-sectional dependency.

H_1: There is cross-sectional dependency.

According to the test results, if the H_o hypothesis is accepted, the analysis is continued with first-generation panel unit root tests. However, when the H_o hypothesis is rejected and cross-section dependence is found between countries, the analysis is continued with second-generation panel unit root tests (Baltagi, 2008: 84).

As a result of the analysis, the panel Fourier LM (Nazlioglu & Karul, 2017) unit Root Test, which is one of the second-generation panel unit root tests and takes into account structural breaks, is used. The most important aspect for the reliability of structural fracture unit root tests is that fracture dates, numbers and forms can be accurately determined in advance. Here, the difficulties that may occur are tried to be overcome by Fourier unit root tests. Because these types of tests allow not only hard breaks, but also gradual (gradual) breaks (soft transitions), and at the modeling stage of the test, the form and dates of breakage do not need to be known in advance.

Panel Fourier LM (Nazlioglu & Karul, 2017) the distribution of the individual statistic in the unit root test depends only on the Fourier frequency, and the panel statistic has a standard normal distribution. The small sample characteristics of the test were studied with Monte Carlo simulations for different data generation processes (Nazlioglu and Karul, 2017: 3).

Under the assumption of this null hypothesis of unit root mentioned, the test procedure is explained as follows;

$$y_{it} = \alpha_{i\lambda}(t) + r_{it} + \lambda_i F_t + \varepsilon_{it} \qquad (6)$$

$$r_{it} = R_{i,t-1} + \mu_{it} \qquad (7)$$

In equations numbered (6) and (7), r_{it}, random walking process F_t, unobservable common factor, λ_i, it represents weights, and the deterministic term of the equation is, which is a function of time $\alpha_{i\lambda}(t)$ is defined as. If equation number (8) is κ fourier frequency, $b_i \neq 0$ while it will also occur in a fixed term and trend, its form shows the fourier process of previously unknown structural breaks.

$$\alpha_{i,t} = a_i + b_i t + \sum_{k=1}^{n} \gamma_{ki} \sin\left(\frac{2\pi\kappa t}{T}\right) + \sum_{k=1}^{n} \gamma_{ki} \cos\left(\frac{2\pi\kappa t}{T}\right), \quad n \leq T/2 \qquad (8)$$

In case of cross-sectional dependence, the equation,

$Z_t = \left[1, \sin\left(\frac{2\pi\kappa t}{T}\right), cos\left(\frac{2\pi\kappa t}{T}\right)\right]', \delta_i = [a_i b_i \gamma_{1i} \gamma_{2i}]', \widetilde{\delta_i} = \delta_i - \bar{\delta}\tilde{\lambda}_i$ and $\tilde{\lambda}_i = \frac{\lambda_i}{\lambda}$ by replacing the common factor (F_t) with the cross-sectional mean $(\bar{y}_t)$ of the dependent variable, it turns into the following form (Nazlioglu and Karul, 2017: 189-190);

$$y_{it} = \alpha_r(t) + \lambda_r \bar{y}_t + \varepsilon_{it} \qquad (9)$$

LM statistic proposed by Enders and Lee (2012a);

$\tilde{\tau}(k) = \phi''/se(\phi'')$

$P_{LM}(k)$ the panel statistic is obtained by the average of individual statistics in K and

$P_{LM}(k)= N^{-1} \sum_{k=1}^{n} \tilde{\tau}i(k)$ in the form of calculated.

$T \to \infty$ and $N \to \infty$ in the case where, from the Lindberg-Levy Central Limit Theorem, $P_{LM}(k)$, average $\xi\, k$ and variance $\zeta 7\,(k)$ with can converge to the standard normal distribution.

$$So;Z_{LM}(\kappa) = \frac{\sqrt{N}(Pt(K)-\xi(\kappa)))}{\zeta(\kappa)} \sim N(0,1) \qquad (10)$$

the equation is obtained. Where; $\xi(\kappa)$ and $\zeta(\kappa)$, κ. it refers to the average and variance of individual statistics in frequency, respectively, and these values can be obtained by performing a Monte Carlo simulation of the limiting distribution of test statistics, if the closed form expression does not exist (Westerlund, 2012).

3.3. Analysis and Findings

Cross-section dependency tests help determine that it is correct to test with first-generation or second-generation tests whether the series contains unit roots and homogeneity tests help determine whether the coefficients are homogeneous or heterogeneous. Table 2 contains the results of preliminary tests for BRICS-T countries.

Table 2: Results for Cross-Section Dependency and Homogeneity Tests.

Cross-Section Dependency Test Results				
	Constant		**Constant and Trend**	
Tests	**Statistical Value**	**Probability Value**	**Statistical Value**	**Probability Value**
CD_{lm1} (BP,1980)	29.508**	0.014	37.898***	0.001
CD_{lm2} (Pesaran, 2004)	2.649***	0.004	4.181***	0.000
CD_{lm3} (Pesaran, 2004)	-3.100***	0.001	-3.140***	0.001
LM_{adj} (PUY, 2008)	9.773***	0.000	9.019***	0.000
Homogeneity Test Results				
Tests	**Statistical Value**		**Probability Value**	
$\tilde{\Delta}$	3.366***		0.000	
$\tilde{\Delta}_{adj}$	3.548***		0.000	

*** and ** Indicates rejection of the null hypothesis at 1 and 5 percent level of significance.

According to the results of the cross-section dependency test in Table 2, it was found that there is cross-section dependency at the 1% significance level and that the variable coefficient is heterogeneous. According to the result, it can be said that a macroeconomic shock in one country effects other countries as well.

Cross-section dependency test results allow the application of the Panel Fourier LM unit root test, which is proposed by Nazlıoğlu & Karul (2017), one of the second-generation panel unit root tests, takes into account structural breaks and allows cross-section dependence. Table 3 contains the Panel Fourier LM unit root test results of the unemployment variable.

Table 3: Results for Panel Unit Root Test.

	LUN		
Countries	**Fourier tau LM_1 k=1**	**Fourier tau LM_2 k=2**	**Fourier tau LM_3 k=3**
Brazil	-1.092	-1.917	-1.134
India	-2.164	-0.683	-2.375
Russia	-2.337	-2.246	-2.525
China	-1.727	-1.501	-1.304
South Africa	-1.423	-1.884	-1.901
Turkey	-0.159	-1.596	0.249
Panel Results			
Z_{LM}	5.848	1.951	2.142
p- value	1.000	0.974	0.983

In the results of the panel Fourier LM unit root test, it was found that the unemployment variable in BRICS-T countries contains a unit root at the level. Accordingly, it was concluded that the unemployment

rate in these countries could not survive the incoming macroeconomic shocks and did not return to its natural level, so the shocks were permanent.

4. CONCLUSION AND EVALUATION

The fact of unemployment, as well as economic, brings with it social problems. Therefore, it stands out as a macroeconomic problem that needs to be solved. With its growing share in world trade volume, high population and recent technological breakthroughs, BRICS-T countries come to the fore in developing countries. In these countries, it is important to determine the current course of unemployment and the course it will follow in possible negative shocks. In this context, it is necessary to determine whether the natural unemployment rate approach or the unemployment hysteria approach is valid in the BRICS-T countries.

In this study, the panel Fourier LM unit root test proposed by Nazlioglu and Karul (2017) from the second generation unit root tests was applied using annual data from the period 1991-2020. The findings reveal the validity of unemployment hysteresis. This result shows that a negative shock in the labour market in existing countries cannot return to the level of the natural unemployment rate in the long term. Therefore, BRICS-T countries, which also stand out with their especially high populations, need to take important steps in the field of unemployment. It is considered appropriate to give government incentives to increase employment, as it is difficult for rising unemployment to come back to its natural balance. In addition, in this group of countries, it is believed that it is appropriate to design the education system for employment, given that its young population is high compared to developed countries.

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