Journal of International Management, Educational and Economics Perspectives

JIMEP

Gönderiliş Tarihi: 14/09/2022
Kabul Tarihi: 01/12/2022
ORCID 0000-0001-8790-9505
ORCID 0000-0001-7581-7590

A PANEL COINTEGRATION TEST WITH A FOURIER FUNCTION ON ECONOMIC POLICY UNCERTAINTY INDEX AND UNEMPLOYMENT RATES IN G-7 COUNTRIES[1]

Cihan USTA[2]
Türker ŞİMŞEK[3]

ABSTRACT

Uncertainty is a phenomenon that can be seen in almost every area of daily life. Decision units in the economy cannot predict the consequences of their decisions in case of increased uncertainty. Uncertainty situations that can be seen in economic life may cause an economic shock and unexpected consequences of this shock. Epidemics, wars and sanctions applied after or during the war in the globalizing world cause economic and political uncertainties. Decisions taken under uncertainty lead economic agents to act more cautiously, as future situations cannot be foreseen. These cautious behaviors cause problems in employment related to production and consumption, in other words, unemployment, decrease the incomes of the households and thus decrease the investment-savings ratios. Therefore, examining the effects of uncertainties on economic indicators is important in terms of ensuring efficiency and productivity in the market. The aim of this study is to test the existence of the long-term relationship between the economic policy uncertainty index and unemployment rate with quarterly data covering the 1996-2022 period for the G-7 countries. For this purpose, the panel fourier cointegration test, which is a new generation test that takes into account nonlinear structural breaks and cross-section dependency, was applied. As a result of the analysis, a long-term relationship was determined between the economic policy uncertainty index and the unemployment rate in each of the G-7 countries. Therefore, it is important for the unemployment rate not to experience uncertainty in economic policies.

Keywords: *Uncertainty, Covid-19, Pandemic, Unemployment*

Jel Code*: C50,D80,J64*

G-7 ÜLKELERİNDE EKONOMİ POLİTİKA BELİRSİZLİĞİ İNDEKSİ VE İŞSİZLİK ORANI ÜZERİNE FOURİER FONKSİYONLU BİR PANEL EŞBÜTÜNLEŞME TESTİ

ÖZ

Belirsizlik, günlük hayatın hemen her alanında görülebilen bir olgudur. Ekonomideki karar birimleri, belirsizliğin artması durumunda kararlarının sonuçlarını tahmin edemezler. Ekonomik hayatta görülebilecek belirsizlik durumları, ortaya çıkabilecek bir ekonomik şoka ve bu şokun beklenmeyen sonuçlarına neden olabilir. Küreselleşen Dünya'da gerçekleşen salgınlar, savaşlar ve savaş sonrasında veya esnasında uygulanan yaptırımlar ekonomik ve siyasi belirsizliklere sebep olmaktadır. Belirsizlik altında alınan kararlar, gelecekteki oluşacak durumlar öngörülemediği için ekonomik ajanları daha temkinli hareket etmeye yönlendirmektedir. Bu temkinli davranışlar, üretim ve tüketimi ilgilendiren istihdam konusunda sorunlara başka bir ifadeyle işsizlik problemine yol açmakta, hanehalklarının gelirlerinin azalmasına ve dolayısıyla yatırım-tasarruf oranlarının düşmesine sebebiyet vermektedir. Bu yüzden belirsizliklerin ekonomi göstergeler üzerindeki etkisinin incelenmesi piyasada etkinliğin ve verimliliğin sağlanması açısından önemlidir. Bu çalışmanın amacı da G-7 ülkeleri için 1996-2022 dönemini kapsayan çeyreklik verilerle ekonomi politika belirsizliği indeksi ve işsizlik oranı arasındaki uzun dönemli ilişkinin varlığının sınanmasıdır. Bu amaç doğrultusunda doğrusal olmayan, yapısal kırılmaları ve yatay kesit bağımlılığını dikkate alan yeni nesil bir test olan panel fourier eşbütünleşme testi uygulanmıştır. Analiz sonucunda G-7 ülkelerinin her birinde ekonomi politika belirsizliği indeksi ve işsizlik oranı arasında uzun dönemli bir ilişki tespit edilmiştir. Bu yüzden iktisat politikalarında belirsizliğin yaşanılmaması işsizlik oranı için de önem arz etmektedir.

Anahtar Kelimeler*: Belirsizlik, Covid-19, Pandemi, İşsizlik*

Jel Kodu*: C50,D80,J64*

---

[1] Bu makale, Cihan USTA tarafından Doç. Dr. Türker ŞİMŞEK danışmanlığında hazırlanan doktora tez çalışmasından türetilmiştir.

2 Doktora Öğrencisi, Tokat Gaziosmanpaşa Üniversitesi, İİBF, İktisat Bölümü, cihnusta@gmail.com.
3 Doç. Dr., Tokat Gaziosmanpaşa Üniversitesi, İİBF, İktisat Bölümü, turker.simsek@gop.edu.tr.

INTRODUCTION

In the economic sense, uncertainty is expressed as a deviation in a perfectly working reasoning mechanism or a factor that breaks the rings in the cause-effect relationship (Alada, 2000: 47). Although the uncertainty factor was not taken into account in the economy at first, its existence was accepted and included in economic analysis in the following periods. It is stated that the reason why uncertainty is ignored is that decision units with full information, good foresight and rational behavior are based on the fact that the deviations in the markets will disappear in the long run. However, in a society with a large number of variables and a complex structure, an unpredictable effect may occur due to any variable. For this reason, these behaviors of individuals or decision units do not have a real life counterpart (Yalcinkaya, 2004: 5). When the history of economics is examined, the issue of uncertainty has been discussed by economic thinkers from many aspects.

The subject of uncertainty has been dealt with in many ways by economic thinkers when the history of economics is examined. Richard Cantillon stated that the uncertainty is that the profits of the traders who try to sell the products they buy from the farmers in the cities are uncertain due to the fluctuations in the prices (Alada, 1988: 184-185). On the other hand, Condillac stated that the decisions of countries in foreign trade may change and in this case, business people may encounter instability and uncertain situations in their commercial activities (Condillac, 1798: 310-316). Such approaches became more prominent in the economics literature in the following centuries and were included in the models.

In the first part of the study, the economic approaches of uncertainty that may arise in the economic process are discussed, and in the second part, a brief literature review on uncertainty and unemployment is made. Finally, in the third part, econometric analysis and its results are explained and the study is concluded with the conclusion part.

1. ECONOMIC APPROACHES TO UNCERTAINTY

Uncertainty in the field of economy, including the current developments, has not yet been fully clarified. The reason for this situation is both the inability to compress the subject of uncertainty in economic thought, which is considered abstractly, and the inability to achieve a common consensus as a result of the approaches put forward in the field of uncertainty. When the concept of uncertainty in the economy is examined, four main approaches are encountered. These approaches can be listed as follows:

a) In this approach, also referred to as Keynesian uncertainty, put forward by Keynes, uncertainty corresponds to a probability that cannot be calculated in a quantitative sense. Expressing that there is no knowledge based on probability, Keynes states that probability is equal to the design and expectation in the minds of individuals and has a separate place from the concept of uncertainty.
b) Another economist who deals with uncertainty in economics is Knight. He divided this concept into two as calculated and uncomputable uncertainty. It refers to the calculated uncertainty as risk, and to the uncalculated uncertainty as the situation in which probability or coincidence cannot be applied.
c) The approach led by M. Friedman and L. J. Savage is based on the Expected Utility Maximization assumption. It has been stated that uncertainty is a concept based on quantifiable probability calculations. Probability is not seen as a tool for acquiring knowledge that other societies have, but as an equal design and expectation in the minds of individuals.
d) This approach, which adopts the Rational Expectations Theory led by John F. Muth and Robert E. Lucas, expresses the uncertainty equal to the probability value that can be calculated quantitatively. This approach sees the concept of probability as a tool used to obtain information or new information owned by other societies outside the society they live in (Lawson, 1988: 47-49).

Table 1: Economic Approaches to Uncertainty

	The existence of science or belief is probability	**The existence of external reality is probability**
Uncertainty equal to the probability value that can be calculated quantitatively	Economists defending the expected utility theory (as M. Friedman, L. J. Savage)	Economists defending the Rational Expectation theory (as John F. Muth, Robert E. Lucas)
Uncertainty equal to probability value that cannot be calculated quantitatively	J. M. Keynes	F. H. Knight

Source: Lawson, 1988: 48.

Table 1 shows the economic approaches to uncertainty. While the economists advocating the Expected Utility and Rational Utility Theories in Table 1 accept uncertainty as an external factor; Economists such as J. M. Keynes and F. H. Knight accept uncertainty as an internal factor. The reason why these approaches are divided into four main headings is stated as the lack of consensus on the assumptions made about the concept of probability (Lawson, 1988: 49).

The approaches of Muth-Lucas and Friedman-Savage, which are explained in the field of uncertainty, take their place in the literature as the most popular and researched approaches. The reasons for the interest in these approaches are stated as being in harmony with the calculations made during the efficient evaluation of the available resources and not being in conflict with the estimation methods in econometric analysis. The concept of uncertainty drawn to computable probability levels is based on an ergodic basis. The ergodic approach is defined as making inferences about future events based on current and past statistical data. Decision units shape their future expectations with the averages of the statistically generated data by estimating certain margins of error based on the universe with this structure (Alada, 2000: 12).

Today, many indices have been developed to measure uncertainty in different fields. Examples of these indices are World Uncertainty Index (WUI), World Trade Uncertainty Index (WTUI), World Pandemic Uncertainty Index (WPUI), Geopolitical Risk Index (GRI), Climate Policy Uncertainty Index (CPUI) and Economic Policy Uncertainty Index (EPU). Economic policy uncertainty, which is among these indices, has been shown as the basis of uncertainty in the economy in recent years and has been the subject of many studies.

The Covid-19 pandemic, the Russia-Ukraine war and the policies implemented after it, the tensions between the United States and Russia, and the embargoes applied during this period have increased the economic and political uncertainty globally. In recent years, situations such as the technological developments and globalization that have taken place in the world and the increase in polarization between countries, unexpected epidemics in the field of health and the increase in the public expenditures of the countries increase the economic and political uncertainty. Increasing uncertainty can affect the policy decisions of countries in economic terms. This increasing political uncertainty causes many macroeconomic indicators to be affected.

Policy uncertainty in national economies may cause investments to be negatively affected by the increase in credit risk premiums and borrowing costs. This situation, which causes a decrease in production and therefore an increase in unemployment, causes positive expectations in the economy to be replaced by negative expectations. Therefore, it turns out that economic policy uncertainty (EPU) has an effect on unemployment (Caggaiano et al. 2014: 78-91). The increase in the unemployment rate directly affects the consumption habits of individuals. The uncertainty of the future income of individuals may cause them not to prefer or postpone products other than essential goods. It can also increase its savings as a precautionary measure. As a result, the decrease in the production and profits

of the firms may cause a decrease in the income of the individuals, decrease in the consumption expenditures, and thus negatively affect the economic growth (Bernanke, 1983; Bloom, 2009).

2. LITERATURE REVIEW

Guglielminetti (2013) examined how uncertainties (three uncertainty indices, including the EPU index) affect the hiring and investment decisions of firms, both theoretically and empirically with SVAR analysis. As a result of the study, it is argued that the presence of uncertainty in the periods when companies will recruit and invest makes companies more cautious.

Caggiano et al. (2017) examined the effect of the EPU index on unemployment during recession and growth periods in the United States (USA) after the Second World War, using smooth transition VAR modeling. They concluded that the contribution of EPU shocks to unemployment volatility at business cycle frequencies is significantly greater during recessions.

Fontaine et al. (2018) examined how a change in China's EPU affected European Countries, USA, Japan, South Korea, Russia and Brazil. They concluded that the increase in China's EPU or at the time of crisis caused a decrease in trade, an increase in unemployment in other countries in the study except South Korea.

Al-Thaqeb et al. (2020) reviewed the literature on the negative effects of the economic policy uncertainty index (EPU) on individuals, businesses, governments and economies at local and international levels. As a result of the study, they revealed that the increase in the EPU index affects the economy negatively, delays financial decisions during periods of uncertainty, and in this case causes lower consumption, investment and more unemployment.

Caggiano et al. (2020) estimated how the changes in the US EPU affected Canada's unemployment rates by non-linear VAR analysis. As a result of the study, it has been concluded that the increase in uncertainty that may be experienced in the USA due to commercial interactions between the two states, Canada feeds the uncertainty that may be experienced and an increase in the US EPU is among the driving forces of Canadian unemployment.

Polat (2020) aimed to measure the effect of economic and political uncertainty on youth unemployment in Greece between 1998 and 2019 with 10 different uncertainty indices. According to the results of the study, it is stated that the increase in youth unemployment is caused by economic and political uncertainty.

3. ECONOMETRIC METHODOLOGY AND DATA

One of the first studies suggesting that structural breaks should be taken into account in both unit root tests and cointegration and causality tests is Perron (1989). In this study, it is emphasized that the probability of rejection of the null hypothesis is low in tests where structural breaks are not taken into account. Therefore, panel techniques that allow multiple structural changes by incorporating a Fourier function were used in this study.

Second-generation unit root tests, which take into account cross-sectional dependence, may yield unreliable results in the presence of structural breaks. Lee, Wu, and Yang (2016) tried to catch their cards by including single-frequency Fourier clusters in the search multi-factor error structure model by Pesaran (2007). Enders and Lee (2012) state that the Fourier form approach increases the power of the test.

The model used for the Fourier CIPS panel unit root test is shown in equation (1).

$$\Delta y_{i,t} = c_{i,0} + c_{i,1} sin\left(\frac{2\pi kt}{T}\right) + c_{i,2} cos\left(\frac{2\pi kt}{T}\right) + c'_{i,3}\bar{z}_{t-1} + c'_{i,4}\Delta\bar{z} + \sum_{j=1}^{p} + c'_{i,5}\bar{z}_{t-j} + \sum_{j=1}^{p} + c'_{i,6} y_{i,t-j} + c_{i,7} y_{i,t-1} + e_{it} \quad (1)$$

While π shows the number of pi, the parameters t and T show the trend term and sample size. The k parameter represents the number of frequencies in the Fourier functions. To determine the optimal values of k, the value that gives the minimum residual sum of squares is chosen. $c_{i,1}$ and $c_{i,2}$ measure

the amplitude and displacement of the Fourier component, while *x* represents the vector of the common factors.

Lee, Wu and Yang (2016) developed a version of the Im, Pesaran, and Shin (2003) test with breaks and cross-section dependence augmented as in equation (2). Critical values for testing the null hypothesis Lee et al. (2016) are shown in their work.

$$\text{BCIPS (N,T)} = \frac{1}{N}\sum_{i=1}^{N} t_i(N,T) \quad (2)$$

There are few panel cointegration tests that capture structural breaks using dummy variables in panel data analysis. In addition, Olayeni, Tiwari, and Wohar (2020) tried to capture structural breaks with trigonometric ranges instead of dummy variables. Olayeni, Tiwari, and Wohar (2020) propose a Fourier panel cointegration test that takes into account both cross-section dependence and soft changes. In the first stage of the test, equation (3) is estimated.

$$\tilde{v}_{i,t} = \hat{v}_{i,t} - \hat{\alpha}_i - \hat{\omega}_i \sin\left(\frac{2\pi kt}{T}\right) - \hat{\varphi}_i \cos\left(\frac{2\pi kt}{T}\right) \quad (3)$$

Required critical values are obtained by bootstrapping simulations and the null hypothesis of no cointegration is tested with the model in equation (4).

$$\tilde{v}_{i,t} = \rho_i \tilde{v}_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

Quarterly data for the period 1996-2022 were used to investigate the existence of a long-term relationship between economic policy uncertainty and unemployment rate in The Group of Seven (G7 Countries- Canada, France, Germany, Italy, Japan, United Kingdom, United States). Unemployment rate data were obtained from the Thomson datastream database, and economic policy uncertainty data are obtained from the website www.policyuncertainty.com. Descriptive statistics for the variables included in the analysis are given in Table 2.

Tablo 2: Descriptive Statistics

Series	Mean	Median	Max.	Min.	Std.Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
u_can	7.327	7.133	12.866	5.566	1.142	1.448	7.164	112.604	0.000
u_fra	9.470	9.170	12.500	7.130	1.353	0.756	2.935	10.043	0.006
u_ger	6.782	7.170	11.200	2.900	2.560	-0.033	1.572	8.936	0.011
u_ita	9.680	9.770	12.900	6.000	1.825	-0.140	1.964	5.042	0.080
u_jap	15.933	15.470	26.370	7.970	5.165	0.321	2.092	5.408	0.066
u_uk	5.792	5.300	8.400	3.800	1.348	0.521	2.034	8.838	0.012
u_usa	5.793	5.310	14.700	3.500	1.937	1.595	6.219	89.913	0.000
epu_can	156.147	122.817	551.530	0.000	103.814	1.109	3.995	25.870	0.000
epu_fra	512.499	487.767	1363.956	60.114	296.267	0.419	2.305	5.191	0.074

epu_ger	427.418	354.921	1297.734	2.700	223.785	1.375	5.201	54.332	0.000
epu_ita	331.041	310.058	610.505	0.300	106.461	0.360	3.397	2.962	0.227
epu_jap	313.389	301.627	717.552	0.224	1117.559	0.676	3.979	12.201	0.002
epu_uk	560.902	453.263	1979.455	23.980	430.938	1.194	3.797	27.751	0.000
epu_usa	113.697	103.748	247.294	0.000	45.213	0.778	3.492	11.657	0.002

The first technique to be applied in panel data analysis is the test of whether there is a cross-section dependency in the panel. For this purpose, Breusch-Pagan LM, Pesaran LM and Bias-corrected LM tests were applied. Table 3 shows the cross-section dependence test results.

Tablo 3: Cross-Sectional Dependence Test

Tests	**u**	**epu**
Breusch-Pagan LM	1057.472 (0.000)	1044.592 (0.000)
Pesaran LM	106.724 (0.000)	105.366 (0.000)
Bias-corrected LM	106.675 (0.000)	105.318 (0.000)

According to the results of Breusch-Pagan LM, Pesaran LM and Bias-corrected LM tests, there is a cross-section dependence in the economic policy uncertainty index (epu) and unemployment rate (u) variables. The null hypothesis that there is no cross-sectional dependence is not accepted because the p probability values are less than 0.05.

Since there is a cross-sectional dependence between units, second generation unit root tests should be applied. Breaks And Cross-Sectional Dependence Augmented Version of The Im, Pesaran, And Shin (BCIPS) Test was used as the panel unit root test. The results of this test are given in Table 4.

Table 4: Breaks And Cross-Sectional Dependence Augmented Version of

The Im, Pesaran, And Shin (BCIPS) Test

Variable	**Level**		
	lag	**Frequency**	**Test Statistics**
u	4	2	-1.138
epu	2	2	-0.676

	First Differences		
Δu	4	2	-11.503 ***
Δepu	2	2	-10.218***

Note: *** indicates the significance at the 1% level.

According to the BCIPS panel unit root test results in Table 4, while the u and epu variables are not stationary at the level, they become stationary when the first degree difference is taken. Therefore, it is concluded that both series are I(1). Panel Fourier cointegration test can now be used to test the existence of a long-run relationship between the variables included in the analysis. Table 4 shows the results of the Fractional-Frequency-Flexible-Fourier-Form (FFFFF) cointegration test based on bootstrap.

Table 5: Bootstrap for the FFFFF-Cointegration Test with Nonlinearity

	k	GLS				PP			
		Statistic	**1%**	**5%**	**10%**	**Statistic**	**1%**	**5%**	**10%**
Individual Statistics									
CAN	1.9	-7.299	-3,102	-1,844	-0,322	-8,522	-3,926	-2,83	-1,187
FRA	1.4	-9.971	-3,28	-2,056	-0,207	-10,009	-4,195	-2,865	0.181
GER	1.3	-9.121	-3,139	-1,758	-0,73	-9,04	-3,746	-2,648	-1,01
ITA	1.4	-9.906	-2,124	-1,2	1.349	-9,9	-2,907	-1,78	1.039
JAP	1.6	-3.574	-2,943	-1,807	-0,394	-10,515	-3,722	-2,768	-0,341
UK	1.4	-7.098	-2,581	-1,374	0.199	-7,126	-3,001	-2,288	0.564
USA	1.6	-8.951	-2,195	-1,109	1.138	-9,374	-2,695	-1,724	0.440
Group Statistics									
Mean		-7,988	0.000			-9,212	0.000		
Max		-9,971	0.000			-10,515	0.000		
Median		-8,951	0.000			-9,374	0.000		

Table 5 shows the results of the Generalized Least Squares and Philips Perron panel unit root test. The statistical significance of group statistics shows that there is a long-term relationship between u and epu variables. Because statistical values are less than critical values. The sequential panel selection method (SPSM) was used to more clearly reveal that there is at least one cointegrating vector between the unemployment rate and the economic policy uncertainty index. This method separates cross sections into stationary and non-stationary sections. If the p values of the countries are less than 0.05, it indicates that there is cointegration. Table 6 shows SPSM Fourier cointegration test results.

Table 6: SPSM for the FFFFF-Cointegration Test with Nonlinearity.

Countries	UO Statistics	p value	Min. KSS	k
GER	-3,935	0.000	-7,171	1.300
CAN	-3,396	0.000	-6,76	0.100
USA	-2,723	0.000	-4,849	1.900
ITA	-2,192	0.000	-3,323	1.300
UK	-1,815	0.000	-2,237	1.400
JAP	-1,604	0.000	-1,997	1.700
FRA	-1,211	0.000	-1,211	1.400

Considering the bootstrap p values of the countries in Table 5, the null hypothesis of no cointegration is not accepted. In other words, there is a long-term relationship between unemployment rate and economic policy uncertainty index for the G-7 countries included in the analysis.

CONCLUSION

This article aims to determine whether the unemployment rate in the G-7 countries moves together in the long run in the face of an unexpected change in the level of economic policy uncertainty. For this purpose, the panel fourier cointegration test, which is a new generation test that takes into account nonlinear, structural breaks and cross-section dependence, was applied with quarterly data covering the period 1996-2022. As a result of the analysis, a long-term relationship was determined between the economic policy uncertainty index and the unemployment rate in each of the G-7 countries. This shows that there may be a significant relationship between economic policy uncertainty and unemployment, and that uncertainty is an important factor in the policies to be followed against unemployment.

REFERENCES

Alada, A. D. (2000). Economic Philosophy and Uncertainty. Istanbul: Context Publications.

Alada, A. D. (1988). İktisatta Belirsizlik Anlayışı Üzerine Notlar. ODTÜ Gelişme Dergisi, 184-185.

Al-Thaqeb, S. A., Algharabali, B. G. and Alabdulghafour, K. T. (2020). The Pandemic and Economic Policy Uncertainty. International Journal of Finance & Economics.

Bernanke, B. S. (1983). Irreversibility, Uncertainty, and Cyclical Investment. The Quarterly Journal of Economics, 98(1), 85-106.

Bloom, N. (2009). The Impact of Uncertainty Shocks. Econometrica, 77(3), 623-685.

Caggiano, G., Castelnuovo, E., and Groshenny, N. (2014). Uncertainty Shocks and Unemployment Dynamics in US Recessions. Journal of Monetary Economics, 67, 78-92.

Caggiano, G., Castelnuovo, E., and Figueres, J. M. (2017). Economic Policy Uncertainty and Unemployment in the United States: A Nonlinear Approach. Economics Letters, 151, 31-34.

Caggiano, G., Castelnuovo, E., and Figueres, J. M. (2020). Economic Policy Uncertainty Spillovers in Booms and Busts. Oxford Bulletin of Economics and Statistics, 82(1), 125-155.

Condillac, A. (1798). Le Commerce Et Le Gouvernement. Paris: C. Honel, an vi.

Enders, W. and Lee, J. (2012). The flexible Fourier form and Dickey–Fuller Type Unit Root Tests, Economics Letters, Vol. 117, pp. 196-199.

Fontaine, I., Razafindravaosolonirina, J., and Didier, L. (2018). Chinese Policy Uncertainty Shocks and The World Macroeconomy: Evidence from STVAR. China Economic Review, 51, 1-19.

Guglielminetti, E. (2013). The Effects of Uncertainty Shocks on the Labor Market: A Search Approach. http://econ. sciences-po. fr/sites/default/files/Elisa. pdf.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for Unit Roots in Heterogeneous Panels. Journal of Econometrics, 115(1), 53-74.

Lawson, T. (1988). Probability And Uncertainty In Economic Analysis. Journal Of Post Keynesian Economics, 6(1), 38-65.

Lee, C.,Wu, J. L., veYang, L. (2016). A Simple Panel Unit-Root Test With Smooth Breaks in the Presence of a Multi factor Error Structure. Oxford Bulletin of Economics and Statistics, 78(3), 365–393.

Olayeni, O. R., Tiwari, A. K., & Wohar, M. E. (2020). Global Economic Activity, Crude Oil Price and Production, Stock Market Behaviour and the Nigeria-US Exchange Rate. Energy Economics, 92, 104938.

Perron, P. (1989). The Great Crash, The Oil Price Shock, and The Unit Root Hypothesis. Econometrica: journal of the Econometric Society, 1361-1401.

Pesaran, M. H. (2007). A Simple Panel Unit Root Test in The Presence of Cross-Section Dependence. Journal of Applied Econometrics, 22(2), 265–312.

Polat, M. A. (2020). The Effects of Economic and Political Uncertainties on Youth Unemployment in Greece: An Empirical Analysis. Journal of Management and Economics Research, 18(2), 128-148.

Yalçınkaya, T. (2004). The Perception of Risk and Uncertainty to Economic Behaviors. Mugla University FEAS Discussion Papers (p. 5-10). Mugla: Mugla University.