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THE RELATIONSHIP BETWEEN INFLATION AND UNEMPLOYMENT IN TURKEY: AN ARDL BOUNDS TESTING APPROACH

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Abstract

Inflation and unemployment are among the main problems of economies. It is necessary to understand the relationship between them in order to formulate the necessary policies against these problems. In this study it was aimed to determine the relationship between inflation and unemployment in Turkey. Autoregressive Distributed Lag (ARDL) Bound Test anaysis was conducted. After Augmented Dickey Fuller(ADF) and Phillips-Perron (PP) unit root tests cointegration relationship was investigated by ARDL bound test, then short term and long term coefficients were estimated. As a result of study cointegration relationship has been found between inflation and unemployment in Turkey for 1988-2017 period.

Keywords: Inflation, unemployment, ARDL bounds testing approach.

TÜRKİYE'DE ENFLASYON VE İŞSİZLİK ARASINDAKİ İLİŞKİ: ARDL SINIR TESTİ YAKLAŞIMI

Özet

Enflasyon ve işsizlik ekonomilerin temel sorunlarındandır. Bu iki ana sorunla mücadelede gereken politikaları oluşturmak için aralarındaki ilişkiyi anlamak gerekmektedir. Bu çalışmada Türkiye'de enflasyon ile işsizlik arasındaki ilişkiyi tespit etmek amaçlanmıştır. ARDL Sınır Testi yaklaşımı ile analiz gerçekleştirilmiştir. Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) birim kök testlerinden sonra ARDL sınır testi ile koentegrasyon ilişkisi araştırılmış, sonrasında kısa ve uzun dönem katsayı tahminleri yapılmıştır. Çalışma sonucunda Türkiye'de 1988-2017 dönemi enflasyon ve işsizlik arasında koentegrasyon ilişkisi tespit edilmiştir.

Anahtar Kelimeler: Enflasyon, işsizlik, ARDL sınır testi yaklaşımı.

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Introduction

Continuous increase in price levels and unemployment are main economic problems of many countries. Each country facing these problems follow different policies against inflation and unemployment. However, it is not possible to solve these economic problems at the same time due to the negative relationship between inflation and unemployment. In other words, high inflation rate leads to low unemployment rate and low inflation rate leads to high unemployment rate. It is possible to analyze the relationship between these two economic problems with the help of Phillips curve (Uysal and Erdoğan, 2003, p. 35).

Unemployment rate is an important indicator for economies and one of the leading reference sources in the policies that can be developed for labor markets. The unemployment rate needs to be defined and measured realistically in order to assess the overall economy and to determine the success of labor market policies. On the other hand in inflation, which is defined as continuous increases in the general level of prices, the important factor is to distinguish the difference between the price increase and inflation and what is meant by the concept of the general level of prices. The constant increase in prices of some goods or the increase in prices of all goods only once does not express inflation (Altay, et.al., 2011, p. 5).

The relationship between price changes and the level of unemployment and production has been discussed for many years. As a matter of fact, Hume, Thornton and Mill have worked on this subject, but they could not go beyond theoretical explanations. In 1926, I. Fisher analyzed the relationship between price changes and unemployment in his article "A Statistical Relationship Between Unemployment and Prices Changes". Later, in 1936, Tinbergen found a causality from unemployment to wage inflation, which was the first econometric study on this issue. Then A.J. Brown, in his study of unemployment and wage inflation, drew the first statistical distribution diagram, and in 1957 Paul Sultan's study, the relationship between annual change in price level and the trade-off relationship was determined by a curve. However, the relationship between unemployment and inflation is identified with Phillips (Büyükakın, 2008, p. 134-136; Gül, et.al., 2014, p. 1).

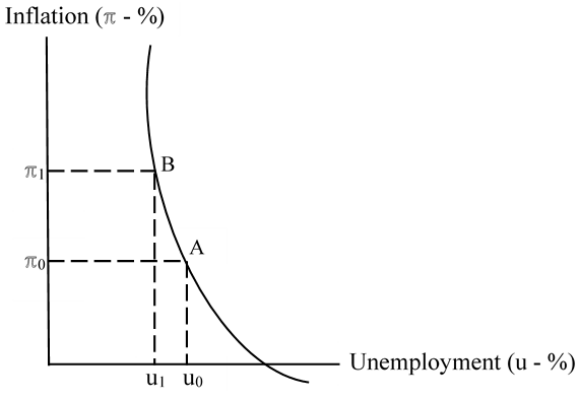
The debate on the validity of the Phillips curve has increased especially due to the stagflation crisis in the 1970s and by various criticisms new approaches have been proposed. Monetarists have argued that the curve is valid only in short term, whereas it is invalid in the long term. The rational expectations theory have suggested that the curve is invalid in both short and the long term (Tabar and Kırışkan Çetin, 2016, p. 80).

In this study, firstly, the approaches explaining the relationship between inflation and unemployment are discussed in a theoretical frame and the contributions to the theory are explained. Then national and international empirical literature is shared which consist of studies analysing the relationship between inflation and unempoyment. While different results were obtained with the effect of the differences in the periods discussed, this study differs from previous studies conducted for Turkish economy by the long period it covers. Indeed, Turkey has experience both high inflation and high unemployment throughout the historical process.

1. The Relationship Between Inflation and Unemployment

Many studies have been conducted to explain the relationship between inflation and unemployment theoretically. One of the leading studies, published by W. Philips in 1958 is "The Relation Between Unemployment and the Rate of Money Wage Rates" in the United Kingdom: 1861-1957 " in which a non-linear reverse and stable relationship between the change in unemployment rate and monetary wages is demonstrated. A change in monetary wages at any level of unemployment occurs faster as unemployment falls and slower as unemployment increases. (Büyükakın, 2008, p. 136-137).

Figure 1: Original Phillips Curve



The original Phillips curve showing the trade-off relationship between monetary wages and the unemployment rate has been transformed by Samuelson and Solow into a structure that shows the relationship between wages and unemployment. According to Samuelson and Solow analysis, rising unemployment rate to 3% leads to inflation at 4.5% (Samuelon and Solow, 1960, p. 192). Not Phillips but Samuelson and Solow claimed Phillips curve as a policy tool and instead of focusing the relationship between the rate of change in nominal wages and unemployment, they estimated the relationship between inflation and unemployment for 1934-1958 period. By the statistical Phillips curve the structure representing different options of inflation and unemployment is interpreted (Hall and Hart, 2012, p. 63).

In time, it has been questioned whether the relationship between inflation and unemployment revealed by Phillips curve is stable and whether the relationship between these two variables is valid in the long run. In response to the interpretation of the Phillips curve, which does not take into account the effects of inflationary expectations, when the changes in inflation expectations are taken into account it is argued that Phillips curve will not be stable over time and the inflation rate determined by selecting a point on the curve will cause a new expected inflation rate and a shift in Phillips curve. Due to the differences in expectations in short and long term Phillips's analysis has been developed by the contribution of some other economists (Yıldırım, Karaman, 2003, p. 340; Uysal and Erdoğan, 2003, p. 38).

Milton Friedman evaluated the relationship between inflation and unemployment in short and long term separately. Friedman stressed that Phillips curve reflect the reality only in the short term and there will be no trade of between in the long term. According to Monetarists Phillips curve is parallel to the horizontal axis in long term at the rate of natural unemployent rate which means long term unemployment rate is assumed to be at the natural rate level independently from inflation rate. (Friedman, 1977, p. 451; Altay, et.al., 2011, p. 7). The Natural Rate of Unemployment (NRU) is a concept introduced by Friedman and adapted to the Phillips Curve. Friedman and Phelps also objected to the long term exchange relationship between unemployment and inflation rates through NRU. According to Phelps and Friedman, there is always a trade-off between unemployment and inflation, but it is not in longterm. In the long run, the natural unemployment rate is determined entirely by real factors (Rodenburg, 2007, p. 5; Sancar Özkök and Atay Polat, 2017, p. 5).

In the 1980s, New Keynesian economists used Non-Accelerating Rate of Unemployment (NAIRU) instead of Friedman's Unemployment Rate. The concept of NAIRU is actually close to the concept of NRU. First, Modigliani and Papademos (1975) stated it as Non-Inflationary Rate of Unemployment. Later, this concept was converted to NAIRU by Tobin (1980). NAIRU is a stable unemployment rate that is compatible with inflation and which does not increase inflation (Sancar Özkök and Atay Polat, 2017, p. 7). New Keynesgians accept the existence of a convex Phillips curve in short term and perpendicular to the horizontal axis in long term. In terms of existence and slope of Phillips curve, Monetarist view and New Keynesian view reach to the same cunculusion. However, the interpretations and assumptions behind the result are very different. According to Monetaist view the long term disappearance of the Phillips relationship is due to the correction of errors in expectations. According to Keynesian view the reasons lying behind are flexible wage and prices (Bayrak and Kanca, 2013, p. 101).

2. Literature Review

There are many studies in the literature examining the relationship between inflation and unemployment. Some studies have concluded that the Phillips curve is valid, while some have concluded that there is no relationship between inflation and unemployment. The main empirical studies in the literature and their results are given in Table 1.

Table 1: Studies Examining Relationship Between Inflation and Unemployment

Autors and Year	Term	Method	Results
Erdil Şahin (2019)	2005:1-2018:4	VAR Anaysis	Mutual casuality relationship between inflation and unemployment in long term in Turkey.
Sancar Özkök and Atay Polat (2017)	1998:1-2016:1	Panel Data Analysis	Mutual causality relationship between inflation and unemployment in G7 countries in long term.
Petek and Aysu (2017)	1980-2015	Cointegration Test, Granger Causality Test, VAR Analysis	Mutual casuality relationship between inflation and unemployment in long term in Turkey.
Öztürk and Emek (2016)	1997-2006 (April-October)	Cointegration Analysis	Reverse Relationship between inflation and unemployment in Turkey.
Yılancı and Aydın (2016)	2005-2015	Cointegration Analysis	Long term relationship is determined between inflation and unemployment in Turkey.
Samanhyia (2014)	1970-2012	Panel Causality Analysis	Negative ralationship between inflation and unemployment in Ghana.
Gül, et.al (2014)	1996-2012	Panel Cointegration and Casuality Analysis	One-sided causality relationship between inflation an unempoyment in Turkey, Azerbaijan, Kazakhstan and Macedonia.
Bayrak and Kanca (2013)	1970-2010	Cointegration Test	Relationship between inflation and unemployment only in short term in Turkey.
Arabacı and Eryiğit (2012)	1991:1-2010:4	Regression Analysis	Phillips curve is valid in Turkey.
Çatık, et.al (2011)	1996:1-2007:5	ARDL Model	Phillips curve is not valid in Turkey.
Altay, et.al. (2011)	2000:1-2009:4	Cointegration Test and Causality test	Cointegration relationship between inflation and unemployment and causality relationship from inflation to unemployment in short term, causality relationship from unemployment to inflation in long term in G8 countries.

Herman (2010)	1990-2009	Correlation	No statistically significant relationship between inflation and unemployment in Romania.
Hepsağ (2009)	2000:1-2007:3	Bound Test	Trade-off relationship between inflation and unemployment in long term, no relationship between variables in short term in Turkey.
Furuoka (2007)	1973-2004	VEC Model	Causality Relationship between inflation and unemployment in short term in Malaysia.
Martin and Milas (2007)	1992:4-2007:1	Hodrick-Prescott Filter	Trade-off relationship between inflation and unemployment in England.
Kuştepeli (2005)	1980-2003	Regression Analysis	Rejected Phillips Hypotesis for Turkey.
Bhattarai (2004)	1970-2002	Panel Data Analysis	Phillips Hypotesis is valid in England, Italy, Norway, Holland, New Zeland and USA.
Uysal and Erdoğan (2003)	1980-2002	Regression Analysis and Causality Test	Positive relationship between inflation an unemployment between 1920-1990 sub-period and negative relationship between inflation and unemployment between 1990-2002 sub-period in Turkey.
Ewing and Seyfried (2003)	1954-1999	Garch Model	Phillips curve is valid in short term.
Eliasson (2001)	1977:1-1997:2	Regression Analysis	Determined a linear Phillps curve in Australia and Sweden and non-linear Phillips curve in United States of America.
Vredin and Warne (2000)	1959:1-1988:12	VAR Analysis	Short term relationship between inflation and unemployment in Australia, Sweden and United States of America.

3. Data and Methodology

In this study the relationship between inflation and unemployment in Turkey is examined for 1988-2017 period by ARDL Bound test approach. Inflation (INF) and unemployment (UNE) data are obtained from World Bank and the analysis is carried out by using Ewievs 10.0. The model where the relationship between inflation and unemployment has been investigated, is as follows:

$$INF_t = \alpha_0 + \alpha_1 UNE_t + u_t \qquad (1)$$

To avoid from false regression issue in the estimation of the model the stationarity of series should be tested. Dickey and Fuller (1981) designed three models with no constant, with constant and with constant and trend by including the lagged values of independent variable in the model. If the null hypothesis is rejected, the

series do not contain a unit root and are stationary. In case the alternative hypothesis is rejected, the series contains a unit root and are not stationary. In the study of Philips and Perron (1988), the problem of randomness and co-variance of error terms is solved by making a nonparametric addition to the model, which includes correction of error terms. The critical values used in ADF is used in PP Unit root test and the hypothesis is established as in ADF unit root test. In case null hypothesis is accepted, the series are not stationary and when the alternative hypothesis is accepted, the series are stationary.

$$\Delta INF_t = \alpha_0 + \sum_{i=1}^{m} \beta_{1i}\, \Delta INF_{t-i} + \sum_{i=0}^{n} \beta_{2i}\, \Delta UNE_{t-i} + \delta_1\, INF_{t-1} + \delta_2 UNE_{t-1} + \varepsilon_i \qquad (2)$$

The lag lengths of dependent and independent variables are determined according to the information criteria of Akaike (AIC), Schwartz (SHC) and Hannan Quinn (HQ). The long term relationship is investigated by comparing the calculated F statistic value by two asymptotic critical bounds. The unrestricted error correction model for ARDL Bounds test is indicated in equation (2). F statistic value is calculated by ward test and the hypotheses related to this test are as follows:

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0 \text{ (No cointegration exists)} \qquad (3)$$

$$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0 \text{ (Cointegration exists)} \qquad (4)$$

If F statistic value is higher than upper bound, null hypothesis is rejected and long term relationship between variables is accepted. If F statistic value is under lower bound no cointegration relation exist between variables. If F statistic value is between upper and lower bound no decision can be made by using bound test. While determining short term relationship between variables, Error Correction Model (ECM) is used which determines how much of the imbalance in the short term will be corrected in the long term. The coefficient of ECM should be significant and the sign of coefficient should be negative (Demirgil and Türkay, 2017, p. 919).The ARDL model, which was established to estimate long-term coefficients, is shown in equation (5). The short-term relationship between the variables is investigated with an error correction model based on the ARDL approach and is shown in equation (6).

$$INF_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i}\, INF_{t-i} + \sum_{i=0}^{n} \alpha_{2i}\, UNE_{t-i} + \varepsilon_i \qquad (5)$$

$$\Delta INF_t = \alpha_0 + \sum_{i=1}^{m} \lambda_{1i}\, \Delta INF_{t-i} + \sum_{i=0}^{n} \lambda_{2i}\, \Delta UNE_{t-i} + \lambda_5 ECM_{t-1} + \varepsilon_i \qquad (6)$$

ARDL bound test approach has several advantages when compared with other cointegration methods such as Engle and Granger (1987), Johansen (1988) and Johansen and Juselius (1990). In ARDL approach variables in the system do not need to be equally integrated, series can be either I(0) or I(1). Even in small sample and interval variables, effective estimations can be obtained. ARDL approach also allows the variables to have different lag lengths and by using a single reduced equation it is possible to make short and long term estimations. Another advantage of ARDL bounds test approach is that it has better statistical properties than Engle-Granger method since it uses unrestricted error correction model. The ARDL approach consists of three stages. In the first stage, long term relationship between the variables is examined. In case there is a cointegration relationship between variables, long and short term elasticities are estimated respectively in

the following stages (Narayan and Smyth, 2006, p. 337, 429; Pamuk and Bektaş, 2014, p. 82; Kılıç, et.al., 2018, p. 117).

CUSUM (Cumulative Sum) and CUSUM-Squares tests were used to investigate the stability of the predicted ARDL model, in other words, to determine whether there is structural break. The CUSUM-Squares test is based on the cumulative sum of squares of consecutive errors, while the CUSUM test is based on the cumulative sum of consecutive errors. The parameters in the model are considered to be stable when the cumulative sum of consecutive errors is within 95% confidence intervals. If total of cumulative errors exceed 95% confidence intervals, the effects of structural breaks can be eliminated by using dummy variables (Kılıç, et.al., 2018, p. 120).

4. Emprical Results

In ARDL test there is no need for series to be stationary at same level but they should at least be stationary at the first differences. According to study of Pesaran et al. (2001) if one or more of series are stationary at second differences, ARDL model can not be used. Stationarity of variables are investigated by Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) unit root tests and the test results show that all variables are stationary in the first differences (Table 2). In this case ADRL test can be used to examine the existance of relationship between variables.

Table 2: ADF and PP Test Results

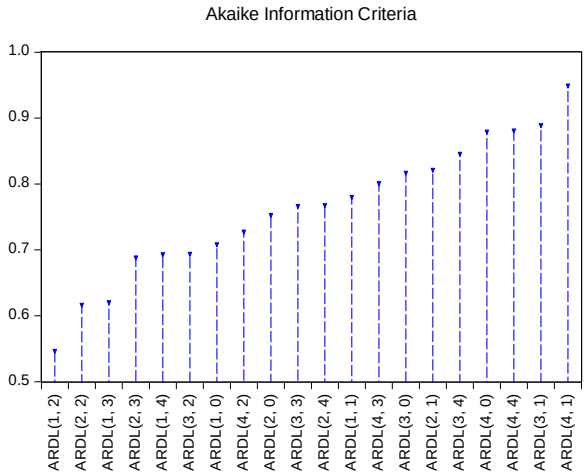
ADF	**Variable**	**None**		**Constant**		**Constant, Linear Trend**	
		t-statistics	**Critical Value (5%)**	**t-statistics**	**Critical Value (5%)**	**t-statistics**	**Critical Value (5%)**
Level	INF	-1.352192	-1.952910 (0.1595)	-0.850887	-2.967767 (0.7891)	-1.387636	-3.574244 (0.8432)
	UNE	0.328545	-1.952910 (0.7736)	-1.840117	-2.967767 (0.3546)	-3.230367	-3.580622 (0.0991)
First Difference	INF	-4.592602	-1.953381 (0.0000)	-4.677500	-2.971853 (0.0009)	-4.577137	-3.580622 (0.0056)
	UNE	-4.567901	-1.953381 (0.0001)	-4.507429	-2.971853 (0.0013)	-4.437086	-3.580622 (0.0077)
PP	**Variable**	**None**		**Constant**		**Constant, Linear Trend**	
		t-statistics	**Critical Value (5%)**	**t-statistics**	**Critical Value (5%)**	**t-statistics**	**Critical Value (5%)**
Level	INF	-1.352192	-1.952910 (0.1595)	-0.850887	-2.967767 (0.7891)	-1.471721	-3.574244 (0.8162)
	UNE	1.327363	-1.952910 (0.9499)	-1.735198	-2.967767 (0.4037)	-2.087026	-3.574244 (0.5311)

First Difference	INF	-4.592602	-1.953381 (0.0000)	-4.674675	-2.971853 (0.0009)	-4.573674	-3.580622 (0.0056)
	UNE	-5.533189	-1.953381 (0.0000)	-6.797437	-2.971853 (0.0000)	-6.963670	-3.580622 (0.0000)

*Values in parenthesis show probability values.

Automatic lag selection has been preferred and twenty alternative models designated for the lag length is given in Figure 1. Model (1.2) with the lowest value has been selected as adequate model within the framework of the Akaike information criterion.

Figure 1: Lag Length According to the AIC Criterion



ARDL bound test has been conducted and cointegration relationship between inflation and unemployment has been investigated. The F statistic value has been calculated higher than upper bound and long term relationship between variables has been identified (Table 3).

Table 3: ARDL Bound Test Results

F-Statistics	10.74	
k*	1	
Asymptotic Ciritcal Values	Lower Bound	Upper Bound
10%	3.02	3.51
5%	3.62	4.16
1%	4.94	5.58
Diagnostic Test Results		
Breusch-Godfrey LM	0.1583 (0.8546)	
Jarque-Bera	0.0816 (0.9599)	

Breusch-Pagan	1.7957 (0.1657)

* k demonstrates the number of independent variable in equation (1).

Critical values are taken from Table CI(ii) at Peresan et al.(2001, p. 300).

Breusch-Godfrey LM, Jarque-Bera and Breusch-Pagan diagonistic test results showed that there is no autocorrelation between the series, the error term is normally distributed and there is no variable variance problem (Table 3). Diagonistic test results indicated that the model is consistent.

Table 4: Estimated Results of the Long-Term Coefficients of ARDL (1,2)

Variable	Coefficient	t-Statistic	Probability
UNE	-2.156849	-2.605565	0.0161
C	-0.041596	-0.764227	0.4529

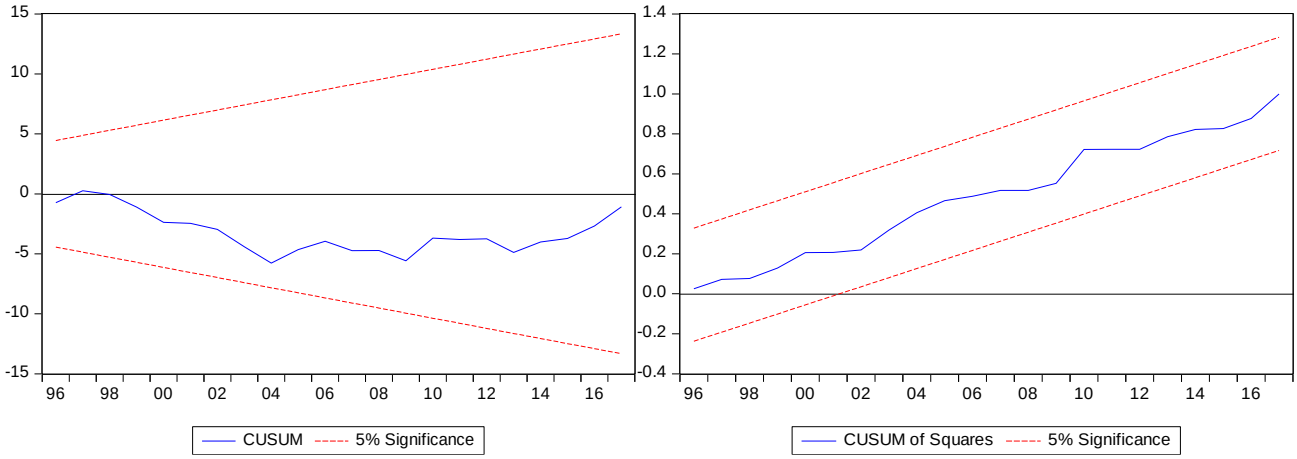
After the determination of long term relationship long term and short term coefficients has been estimated. According to long term coefficient estimation results the unemployment variable is statistically significant and negative (Table 4). Long term unemployment coefficient is estimated as -2.15 which means %1 increase in unemployment leads to %2.15 decrease in inflation. This result mentions a reverse relation between unemployment and inflation.

Table 5: The Error Correction Model Results

Variable	Coefficient	t-Statistic	Probability
UNE	-0.814198	-2.357751	0.0277
UNE (-1)	1.305561	3.529586	0.0019
ECM(-1)	-1.010901	-5.931281	0.0000

In short term evaluation the estimated error correction term is statistically significant and negative, estimated as -1.01. This result demonstrates that short term imbalances occured in the model have been eliminated in long term (Table 5). As Narayan and Smyth (2006) stated in their studies, that the coefficient of error correction variable is greater than 1 indicates that the system fluctuates to equilibrium and this fluctuation decreases each time and provides returning to equilibrium in long term.

Graph 1: CUSUM Statistic Test and CUSUM-Squares Test Results



The stability of model is also evaluated by CUSUM and CUSUM-Squares statistics. CUSUM and CUSUM-Square statistics indicate that the coefficients in the ARDL model are stable as they are within the confidence intervals at 5% significance level.

Conclusion

In economic literature the relationship between inflation and unemployment is explained by Phillips curve introduced by A.W.Phillips (1958) and the theory is developed by contribution of other economists. Phillips curve shows the trade-off relationship between inflation and unemployment and the validity of Phillips curve is important in order to determine economy policies against inflation and high employment rate. To evaluate the relationship between inflation and unemployment emprically different studies were carried out including different countries/country groups for periods and different results were achieved.

In this study ARDL model is used to evaluate the relationship between inflation and unemployment in Turkish economy for 1988-2017 period. The stationary of series have been observed in the first differences of the series by ADF and PP unit root tests. After ARDL bound test has been conducted the long term and short term coefficeints have been estimated by ARDL(1,2) model. By CUSUM and CUSUM-Squares tests the stability of the estimated ARDL model is investigated. Results of the study showed that %1 increase in unemployment leads to %2.15 decrease in inflation and short term imbalances are eliminated in long term. According to study results the validity of Phillips curve should be considered while establishing monetary policies to maintain price stability and to decrease unemployment in Turkey. The long term policies should include the preventions to manage both inflation and unemployment and structural reforms which are necessary should be carried out.

References

Altay, B., Tuğcu, C.T., Topçu, M. (2011). İşsizlik ve enflasyon oranları arasındaki nedensellik ilişkisi: G8 ülkeleri örneği. *Afyon Kocatepe Üniversitesi İİBF Dergisi*, *8*(2), 1-26.

Arabacı, Ö., Eryiğit, K. Y. (2012). A thresold regression estimation of Phillips curve: Turkey case. *Eskişehir Osmangazi Üniversitesi İİBF Dergisi*, 7, 29-47.

Bayrak, M., Kanca, O.C. (2013). Türkiye'de Phillips eğrisi üzerine bir uygulama. *Eskişehir Osmangazi Üniversitesi İİBF Dergisi*, *8*(3), 97-115.

Bhattarai, R.K. (2004). Unemployment-inflation trade-offs in OECD countries: Lessons from panel data and theories of unemployment. *Research Memorandum*, 48, 1-33.

Büyükakın, T. (2008). Phillips eğrisi: Yarım yüzyıldır bitmeyen tartışma. *İ.Ü. Siyasal Bilgiler Fakültesi Dergisi*, 39, 133-159.

Demirgil, B., Türkay, H. (2017). Türkiye'de faiz oranlarını etkileyen faktörler: Bir ARDL/Sınır testi uygulaması. *Gazi Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *19*(3), 907-928.

Dickey, D., Fuller, W.A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, *49*(4), 1057-1072.

Çatık, A. N., Martin, C., Önder, A. Ö. (2011). Relative price variability and the Phillips curve: evidence from Turkey. *Journal of Economic Studies*, *38*(5), 546-561.

Engle, R. F., Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 251-276.

Eliasson, A. (2001). Is the short-run Phillips curve nonlinear? Empirical evidence for Australia, Sweden and The United States. *Sveriges Riksbank Working Paper Series*, No: 124.

Erdil Şahin, B. (2019). Türkiye'de enflasyon ve işsizlik arasındaki ilişkinin vektör hata düzeltme modeli ile analizi. *Mali Çözüm*, *29*(152), 63-75.

Ewing, B. T., Seyfried, W. (2003). Modeling The Philips curve: A time-varying volatility approach. *Applied Econometrics and International Development, 3*(2), 7-24.

Friedman, M. (1977). Inflation and unemployment. *The Journal of Political Economy*, *85*(3), 451-472.

Furuoka, F. (2007). Does the "Phillps curve" really exist? New empirical evidence from Malaysia. *Economics Bulletin*, *5*(16), 1-14.

Gül, E. Kamacı, A., Konya, S. (2014). Enflasyon ile işsizlik arasındaki nedensellik ilişkisinin test edilmesi: Panel eşbütünleşme ve nedensellik analizi. *International Conference on Euroasian Economies*, 1-6.

Hall, T.E., Hart W.R. (2012). The samuelson-solow "Phillips Curve" and the great inflation. *History of Economics Review*, 62-72.

Hepsağ, A. (2009). Türkiye'de enflasyon ile işsizlik arasındaki ilişkinin analizi: Sınır testi yaklaşımı. *İktisat Fakültesi Mecmuası*, *59*(1), 169-190.

Herman, E. (2010). Inflation and unemployment in the Romanian economy, annals of the University of Petroşani. *Economics*, *10*(2), 157-170.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics And Control*, *12*(2-3), 231-254.

Johansen, S., Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration-with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, *52*(2), 169-210.

Kılıç, R., Özbek, R.İ., Çifçi, İ. (2018). Türkiye için J-Eğrisi hipotezinin geçerliliği: ARDL Sınır Testi Yaklaşımı. *International Journal of Diciplines Economics & Administrative Sciences Studies*, *4*(7), 112-128.

Kuştepeli, Yeşim (2005). A comprehensive short-run analysis of a (Possible) Turkish Phillips curve. *Applied Economics*, 37, 581-591.

Martin, C., Costas, M. (2007). Monetary policy and the hybrid Phillips curve. *Rimini, Italy: The Rimini Centre for Economic Analysis*, WP 36-07, 1-10

Modigliani, F., Papademos, L. (1975). Monetary policy for the coming quarters: The conflicting views. *The New England Review,* 3, 2-35.

Narayan, P. K., Smyth, R. (2006). What determines migration flows from low-income to high-income countries? An empirical investigation of Fiji-U.S. Migration 1972-2001. *Contemporary Economic Policy*, *24*(2), 332-342.

Öztürk, S., Emek, M. L. (2016). 1996-2006 yılları nisan ve ekim ayları verileriyle Türkiye için Phillips eğrisi analiz. *Balkan Journal of Social Sciences***,** 5, 64-74.

Pamuk, M., Bektaş, H. (2014). Türkiye'de eğitim harcamaları ve ekonomik büyüme arasındaki ilişki: ARDL sınır testi yaklaşımı. *Siyaset, Ekonomi ve Yönetim Araştırmaları Dergisi*, *2*(2), 77-90.

Pesaran, M. H., Shin, Y., Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships, Journal of Applied Econometrics, 16(3), 289-326.

Petek, A., Aysu, Y. (2017). Phillips eğrisi: Türkiye örneği (1980- 2015). *Journal of Current Researches on Business and Economics*, 7, 53-64.

Phillips, A.W. (1958). The Relation between unemployment and the rate of change of money wage rates in the United Kingdom: 1861-1957. *Economica*, 25, 283-299.

Phillips, P.C.B., Peron, P. (1988). Testing for an unit root in time series regression. *Biomètrika*, *75*(2), 336-346.

Rodernburg, P. (2007). Derived measurement in macroeconomics: Two approaches for measuring the NAIRU considered. *Tinbergen Institute Discussion Paper* 017.

Samanhyia, S. (2014). The Expectations - Augmented Philips curve evidence from Ghana, International Journal of Economics. *Commerce and Management***,** *II*(11), 1-21.

Samuelson, P. A., Solow, R.M. (1960). Problem of achieving and maintaining a stable price level: Analytical aspects of anti-inflation policy. *American Economic Review*, *50*(2), 177-194.

Sancar Özkök, C., Atay Polat, M. (2017). Enflasyon ve işsizlik ilişkisi üzerine ampirik bir uygulama (G7 Ülkeleri Örneği). *Küresel İktisat ve İşletme Çalışmaları Dergisi*, *6*(12), 1-14.

Tabar, Ç., Kırışkan Çetin, I. (2016). Türkiye ekonomisi özelinde Phillips eğrisi analizi. *Journal Life of Economics*, 4, 79-100.

Tobin, J. (1997). Supply constraints on employment and output: NAIRU versus natural rate. *Cowles Foundation Paper 1150*. https://core.ac.uk/download/pdf/6957551.pdf Erişim tarihi: 11.04.2019

Uysal, D., Erdoğan, S. (2003). Enflasyon ile işsizlik oranı arasındaki ilişki ve Türkiye örneği (1980-2002). *SU İİBF Sosyal ve Ekonomik Araştırmalar Dergisi*, 6, 35-47.

Vredin, A., Warne, A. (2000). Unemployment and inflation regimes. *Econometric Society World Congress 2000 Contributed Papers 0984*.

Yılancı, V., Aydın, M. (2016). Enflasyon ile işsizlik arasındaki ilişkinin varlığının sınanması. *International Congress on European Unions Relations, Economics, Finance and Econometrics (EUREFE'16)*, 1454-1464.

Yıldırım, K., Karaman, D. (2003). *Makroekonomi*. Eskişehir: Eğitim Sağlık ve Bilimsel Araştırmalar Vakfı Yay.