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Tradeoff between Inflation and Unemployment in Turkey

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Abstract: This paper aims to investigate the relationship between unemployment and inflation in the Turkish Economy. We employed the Autoregressive Distributed Lag (ARDL) Bounds Testing procedure on monthly inflation and unemployment rate data for the period adopting the Explicit Inflation Targeting Regime from 2006 to 2011 in Turkey. Empirical results reveal that unemployment negatively affects inflation in the short run but there is no causation between them in the long run. These findings provide significant implications for not only the literature focuses on trade-off between inflation and unemployment but also the efficiency of inflation targeting commitment implemented in Turkey.

Key words: Unemployment, Inflation, Monetary Policy, ARDL Model

JEL Classification Number: E24, E31, E52, E32

1. Introduction

Over the years there have been a number of economists trying to interpret the relationship between unemployment and inflation. Most popular formulation of this connection has been empirically indicated in the framework of Phillip's curve arguing an adverse relation between the change in wage inflation and unemployment rate. Although Phillips curve phenomenon has confronted several and severe criticisms, it is still an intensively debated issue among the economists. Considering important theoretical and political inferences of the Phillips curve hypothesis, the objective of this paper is to examine the trade-off between inflation and unemployment in Turkey.

The rest of the article is organized as follows. Section 1 defines the theoretical background and indicates the results of some empirical studies recently done. Section 2 presents the data, methodological procedure and empirical results. Final section concludes some theoretical specification and policy implication.

2. Literature Review

A. W. Phillips (1958) initially provided the first formal statistical analysis of the relationship between wage inflation and the unemployment rate. He fit a curve showing a persistent negative relationship between the changes in the wage inflation and the rate of unemployment. Paul Samuelson and Robert Solow (1960) provided significant contributions to Phillips curve. They have restated the Phillip's view by expressing the relationship between unemployment and price inflation rate. Secondly, they also indicated the alternative policy chooses concerning with the combinations of unemployment and inflation rates for policy-makers.

During the 1970s Phillips curve began to be questioned on both empirical and theoretical grounds. In the late sixties, Edmund Phelps (1967) and Milton Friedman (1968) rejected the idea of a long-run trade-off between inflation and unemployment. Friedman and Phelps incorporated two new independent variables into the Phillips curve equation; the inflation expectation and the natural rate of unemployment. It is assumed that inflation expectation is generated adoptively in terms of past inflation, called adaptive expectation while natural rate of unemployment is determined by real economic factors. Phelps and Friedman showed that, in the long run, the actual unemployment rate could not be below the natural rate, even this is possible in the short run, whatever the inflation rate is. Thus, they pointed out that the Phillips curve trade-off in the short run arises from the inability of economic agents to adjust their expectations to anticipated inflation level quickly.

In the framework of New Classical Approach, this possibility has been realized by setting up a powerful theoretical explanation under the rational expectation assumption. Lucas (1972) argued that people in reality are more forward looking and understand easily what the policymakers want to do. Thus, economic agents may adjust their expectations more quickly in the face of any unanticipated change in economic life. According to rational expectation approach of Lucas, Phillips curve is always vertical line on the level where actual rate of unemployment equal to natural rate, since rational expectation and actual inflation is equal each other in both short and long terms.

Against to New Classical Approach, New Keynesian Phillips Curve (NKPC) has recently attracted a great deal of interest. NKPC argued that there might be an inflation-unemployment trade-off in the short run, even the assumption of rational expectation exists. NKPC actually includes different matters from determination of price level by optimizing behavior of firms to dynamics effects of monetary policy depending on microeconomic arguments. As most popular arguments of New Keynesians, Price-Setting Model links inflation to real marginal cost and to future expected inflation and thus provides a significant device for explaining the behavior of economies with a short-run

Phillips curve. The real cost of production business will rise when the aggregate use of labor increase since rising demand for labor pushes up real wages. The ultimate result is a short run conventional Phillips curve stating that current inflation rises as current unemployment falls relative to its natural rate (Lacker and Weinberg, 2007, 215-216).

Looking at the empirical studies done recently, it can be argued that most of the researchers have found the significant trade-off relationship between unemployment rate and inflation rates in the short run while econometric estimations have shown the confusing results in the long run. Ribba (2003) confirmed the existence of a short-run trade-off between inflation and unemployment in the US economy for the monthly data from 1971 to 2001 using a cointegrated structural VAR model. Employing non-linear least squares, Pallis (2006) estimated the Phillips curve for the new European Union member-states for the period from 1994 to 2005. He concludes that the Phillips curve framework is suitable for the task of estimating the trade-off between inflation and unemployment rates in the new EU member states in the short run. Karanassou et al. (2005) provide theoretical foundation and empirical support concerning with the persistent inflation-unemployment trade-off for The United States using ARDL Model between 1966 and 2000 and for 11 EU countries employing a dynamic panel from 1977 to 1998.

Concerning with the studies specially focusing on Turkey, Çatık et al. (2011) estimated the Phillips curve relationship between inflation and unemployment using ARDL model for monthly data from 1996 to 2006. They did not find any evidence for long run but the trade-off was obtained in the short run. Önder (2009) employed the multiple structural break and the Markow-switching models for the period of 1987 to 2004. Empirical evidence showed the instability of the Turkish Phillips curve and also indicated that the low-inflation regime strongly supports for the existence of Phillips curve whereas for the high-inflation regime statistical significance declines. Finally, Kuştepe (2005) investigated the existence of a Phillips curve in Turkey for annual (1980-2001) and semiannual (1988-2003) data sets by using OLS Method. The results indicated no evidence of a Phillips curve for all specifications and both data sets.

3. Data, Methodology and Empirical Results

Our aim in this section is to investigate the cointegration between inflation and unemployment using monthly data for the period of 2006:1-2011:10 when Inflation Targeting Regime has explicitly been in force. Time series of inflation and unemployment rate are monthly and cover 70 observations. Inflation data is obtained by taking the percentage change of the Consumer Price Index (CPI) which is sourced from the Central Bank of the Republic of Turkey. Time series for unemployment is collected from the labour force statistics of Turkish Statistic Office (TURKSTAT).

Before proceeding to the cointegration analysis, the time series of inflation and unemployment are checked for the stationary. Table 1 displays the Phillips-Perron (PP) unit root test for the both series. Accordingly, the series of inflation is stationary at level, I(0) while the series of unemployment becomes stationary only when it is differenced, I(1).

Table 1: Unit Root Test Results

	inf_t		unp_t	
	Level	1st Difference.	Level	1st Difference
PP-Statistics	-5.8183*	-17.1342*	-1.9804	-2.9525**

Note: * and **represent significance at 1% and 5% levels respectively.

After detecting the stationary of variables by different orders, we run the Autoregressive Distributed Lag (ARDL) Bounds Testing procedure developed by Pesaran and Shin (1995) and Peseran et al. (2001). The advantage of this procedure is that the bounds test approach is applicable irrespective of whether the underlying regressors are purely I(0) or I(1) or mutually cointegrated. Our general model concerning with the cointegration between inflation (inf) and unemployment (unp) is written in the following form:

$$\inf_t = \beta_0 + \beta_1 unp_t + \varepsilon_t \quad (1)$$

The ARDL bound test approach to cointegration involves two stages. The first stage is to establish an unrestricted error correction model (UECM). Secondly, after a cointegration relationship is observed between the series, ARDL models are set up to long-run and short-run relationship. Checking for the presence of the cointegration in Equation 1 is done by estimating the following UECM:

$$\Delta \inf_t = \alpha_0 + \sum_{i=1}^{n} b_{i\inf} \Delta \inf_{t-i} + \sum_{i=0}^{n} c_{i\inf} \Delta unp_{t-i} + \beta_{1\inf} \inf_{t-1} + \beta_{2\inf} unp_{t-1} + \varepsilon_{1t} \quad (2)$$

The null hypothesis of no cointegration amidst the variables in Equation 2 is $H_0 : \beta_{1\inf} = \beta_{2\inf} = 0$ while alternative hypothesis for this cointegration relationship is $H_a : \beta_{1\inf} \neq \beta_{2\inf} \neq 0$. Pesaran et al. (2001) developed two sets of critical values for F-test in which upper and lower bounds are provided for purely I(1), purely I(0) or mutually cointegrated regressors. If the calculated F statistics exceeds upper bound, then the variables are cointegrated and null hypothesis of no cointegration amidst the variables are rejected while the variables fall below the lower bound then null hypothesis of no cointegration is accepted. On the other hand, if the variables fall between upper and lower bounds then no conclusive decision can be made whether variables are cointegrated or not.

We proceed to the cointegration relationship and presented the results in terms of F-statistics in Table 2 after optimal lag length is selected to be 3 at which there is no autocorrelation by yielding the minimum AIC, which is represented as "n"in Equation 2. Accordingly, our calculated F-statistics is 19.4190 which exceeds upper bound critical value at all significance level. This result indicates that the null hypothesis of no cointegration amidst the variables is rejected.

Table 2: Results of Cointegration Relationship

k*	F-Statistics	99% Level		95% Level	
		I(0)	I(1)	I(0)	I(1)
1	19.4190	6.84	7.84	4.94	5.73

Note: * k represents the no of regressors in Eq. 2. Critical values obtained from Peseran et al. (2001), Table CI (iii).

After finding cointegration relationship amidst the variables, long-run relationship is estimated by the following ARDL (m, n) model:

$$\inf_t = \alpha_0 + \sum_{i=1}^{m} \alpha_1 \inf_{t-i} + \sum_{i=0}^{n} \alpha_2 unp_{t-i} + \omega_t \qquad (3)$$

The estimated ARDL model is ARDL (4, 3) for the long-run relationship and computed long-run coefficient is reported in Table 3. According to Table 3, long-run coefficient estimation of unemployment variable is -0.075303 statistically insignificant. Hence, this result indicates that unemployment rate does not affect inflation rate in the long-run horizon. Diagnostic test results display that our model is correctly specified and estimation results are robust.

Table 3: Long-Run Estimation Results (Dependent Variable: INF_t)

Variable	**Long-Run Coefficient**	**t-statistics**	
UNP_t	-0.075303	1.659	
Diagnostic Test Results			
R^2	0.38	$\chi^2_{WHITE}(2)$	18.66701 (0.286292)
F-statistics	2.8361 (0.010101)	$\chi^2_{RESET}(2)$	2.482824 (0.288976)
$\chi^2_{BG}(2)$	1.080811 (0. 582512)	$\chi^2_{NORM}(2)$	0.670980 (0.714988)

Note: $\chi^2_{BG}(2)$ is the Breusch-Godfrey LM test for autocorrelation; $\chi^2_{WHITE}(2)$ is the White Test for heteroskedasticity; $\chi^2_{RESET}(2)$ is the Ramsey-Reset test for the model specification; $\chi^2_{NORM}(2)$ is the Jarque-Bera normality test. Parentheses indicate probability values.
Source: authors' calculations.

After detecting no long-run relationship between inflation and unemployment, the short run relationship can also be established by constructing the following error correction model (ECM) in the presence of cointegration relationship:

$$\Delta \inf_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i} \Delta \inf_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta unp_{t-i} + \psi ECM_{t-1} + \vartheta_t \quad (4)$$

In Equation 4, Δ represents the first difference operator whereas β's are the short-run coefficients of the model, and ψ measures the speed of adjustment for ECM term. Accordingly, the results of estimated ARDL (4, 12) for the short-run relationship are shown in Table 4.

Table: 4: Short-Run Estimation Results (Dependent Variable: ΔINF_t)

Variables	**Coefficients**	**t-statistics**
Constant	-0.042593	-0.447147 (0.6573)
ECM_{t-1}	-0.879713	-3.834153 (0.0005)
ΔUNP_t	-0.562942	-1.784482 (0.0823)
ΔUNP_{t-7}	-1.051347	-2.243997 (0.0307)
ΔUNP_{t-9}	1.536090	3.382218 (0.0017)
ΔUNP_{t-10}	-1.065876	-2.709432 (0.0101)
ΔUNP_{t-12}	1.058026	3.173089 (0.0030)
Wald Test Statistics	32.27404 (0.0022)	
R^2 =0.72	F-stat.=5.618652 (0.000004)	
χ^2_{BG} (2)	2.492452 (0.287588)	
χ^2_{WHITE} (2)	35. 45417 (0.494369)	
χ^2_{RESET} (2)	0.069846 (0.791560)	
χ^2_{NORM} (2)	0.710947 (0.700842)	

Note: χ^2_{BG} (2) is the Breusch-Godfrey LM test for autocorrelation; χ^2_{WHITE} (2) is the White Test for heteroskedasticity; χ^2_{RESET} (2) is the Ramsey-Reset test for the model specification; χ^2_{NORM} (2) is the Jarque-Bera normality test. Parentheses indicate probability values.

The sign of ECM term is negative and statistically significant indicates that the coefficient of adjustment speed to the shock comes from unemployment rate is -0.87 which suggests that convergence to equilibrium after a shock from unemployment rate to the inflation rate in Turkey takes over 1. 15 months. In addition, Wald test statistics is statistically significant and reveal that unemployment rate effects inflation rate in the short-run. The

significant coefficients of unemployment rate are reported as well and total effect is negative as we sum up the significant coefficients mentioned.

4. Conclusion

Employing ARDL, this paper has estimated the cointegration between inflation and unemployment for the period adopting the Explicit Inflation Targeting Regime from 2006 to 2011 in Turkey. Empirical results show that inflation-unemployment trade-off exist in the short run but not in the long run, supporting the views of Friedman-Phelps and some New Keynesian Economists. These findings also provide significant implication for the credibility and performance of Inflation Targeting Regime adopted by the Central Bank of Turkey. As per the views of Friedman-Phelps, short run inflation-unemployment trade-off can exist if only an unanticipated increase in actual inflation is not expected by public. Therefore, it can be argued that Central Bank of Turkey cannot manage enough to direction of the inflation expectation of public although basic aim of its Explicit Inflation Targeting Regime is to inform the public about all aspects of monetary policy and cause them to estimate future inflation more correctly.

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