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The Inflationary Effect of Price Increases in Oil Products in Turkey

Türkiye'de Petrol Ürünleri Fiyat Artışlarının Enflasyonist Etkisi

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ABSTRACT

In this study, the inflationary effect of price increases in oil products was investigated for Turkey's economy using monthly data for the period 1996 - 2009. According to the empirical evidence obtained from the study made with bounds testing approach developed by Pesaran et al. (2001), co-integration relationship between the variables have been determined. Accordingly, in the long-term analysis, inflationary effect of price increases of oil products was found positive and statistically significant in line with theoretical expectations. In its short-term analysis, coefficient of the error correction term was found statistically significant and negative. Therefore, deviations occured between the variables converge to long-term equilibrium level.

Keywords: Oil product prices, crude oil prices, bounds testing approach, Turkey.

ÖZET

Bu çalışmada, petrol ürünleri fiyat artışlarının enflasyonist etkisi 1996-2009 dönemi aylık verileri kullanılarak Türkiye ekonomisi için araştırılmıştır. Pesaran vd.'nin (2001) geliştirmiş olduğu Sınır Testi yaklaşımıyla yapılan çalışmadan elde edilen ampirik kanıtlara göre, değişkenler arasında eş-bütünleşmenin olduğu tespit edilmiştir. Buna göre, uzun dönem analizinde petrol ürünleri fiyat artışlarının enflasyonist etkisi teorik beklentilerle uyumlu bir şekilde pozitif ve istatistiki olarak anlamlı bulunmuştur. Kısa dönem analizinde ise hata düzeltme teriminin katsayısı istatistiki açıdan anlamlı ve negatif bulunmuştur. Dolayısıyla değişkenler arasında ortaya çıkan sapmalar uzun dönem denge düzeyine yakınsamaktadır.

Anahtar Kelimeler: Petrol ürünleri fiyatları, ham petrol fiyatları, sınır testi yaklaşımı, Türkiye.

1. INTRODUCTION

Sudden increases in the price of oil in the 1970s led many countries enter into the downturn. However, the reverse oil shock of 1986 has not contributed to a strengthening of economies (Hamilton and Herrera, 2004; Hooker, 1996; Hamilton, 1996; Mork, 1989 -1994; Bohiand Toman 1993; Mory, 1993; Bohi, 1991). Thus, there happens an asymmetric relationship between fluctuations in oil prices and the economy, and although price increases in the oil products result in economic recession, price decreases results in an impact in the opposite direction. That is, a vitality in the economy due to the decrease of prices does not occur. (Mork, 1989; Hamilton, 1983). This is due to the fact that increases in the price of oil immediately increase their costs, but price decreases are not passed on the costs in order to offset the profits (Brown and Yucel, 2002, Jones and Leiby, 1996).

The effect of oil shocks on inflation, when compared to the period before 1980, has considerably decreased in the period after 1980 (Barrel and Pomerantz, 2008; Barrell and Kirby, 2007; Blanchard and Gali 2007; Barrell and Hurst, 2006; Jones et al., 2003; Hooker, 2002; Taylor, 2000; Hooker, 1999). Blanchard and Gali (2007) explained reducing effect of oil shocks by more flexible labor market, the development of monetary policy, changes of the structure of oil shocks and less usage of oil in production. Anderton and Barrell (1995), explaining the effect of the shocks has changed since 1970 and 1980s, points that that there is a structural change in the labor market, the rigidity in real wages has decreased and unemployment and other factors have had a more decisive position in determining wages. Chen (2009) indicated that the decrease in the effect of shocks of the oil prices is due to more trade openness.

Empirical studies provide a large number of evidence that the sensitivity of inflation to the shocks of oil prices has gradually decreased in the period after 1980. Chen (2009), investigating data from nineteen

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industrialized countries and inflationary effect of oil prices, has reached evidence in the direction that the said impact decreased in the 2000s compared to the 1970s. Gregorio et al. (2007), examined the inflationary effects of oil prices for thirty-four developed and developing countries with the help of Vector Autoregressive (VAR) method and obtained findings in the direction that this effect was less. Blanchard and Gali (2007), by using the data from six industrialized countries, investigated the effects of oil shocks in different periods including pre-1983 and post-1984 on inflation and economy with the help of VAR method. According to the empirical evidence, the dynamic effect of oil shocks significantly reduced. Barrell and Kirby (2007), and Barrell and Hurst (2006) studied the inflationary effect of oil prices with the calculating methods of different central banks also by taking into account the interest, and obtained findings that the effect will disappear from the beginning of 2010. In the study made by Barsky and Kilian (2004) the evidence of the relationship between the oil prices and the economy decreases over time, has been statistically stated. LeBlanc and Chinn (2004), in their study they made for the United States, Britain, France and Japan, have obtained findings that oil prices have non-linear effect on production. In these countries, the effect of a 10% increase in oil prices on inflation has occured between 0.1% and 0.8%.

In this study, inflationary effects of price increases in oil products in Turkey were investigated with the bounds testing approach developed by Pesaran et al. (2001), by using the 1996-2009 period data. The next part of the study consists of three chapters. In the second chapter, the inflationary effects of price increases of oil products in Turkey are discussed with the help of the table created by us. In the third chapter, the data and methods are explained; in chapter four, the empirical implementation and its results are discussed, and in the last chapter, conclusions and recommendations take place.

2. TO WHICH EXTENT DO THE PRICE INCREASES OF OIL PRODUCTS IN TURKEY HAVE INFLATIONARY EFFECT?

Retail price of oil products in Turkey, when compared with other countries, is known high by the public as well as economic management. Different opinions about the reasons of the retail prices being high are suggested. Increase in the world crude oil price is considered to be one of the reasons. However, in the studies made, evidence was obtained that this view could not be supported (Peker and Mercan, 2010; Berument and Taşçı, 2002; Kibritçioğlu and Kibritçioğlu, 1999). Another reason is the pricing policy in domestic markets. The fact that approximately two-thirds of the total tax revenues in Turkey are offsetted from indirect taxes and the remainder from the direct taxes causes a not healthy tax structure still to continue. It is examined that this process, leading to the reception of high taxes on oil products, has continued substantially depending on domestic pricing policy.

In Table 1, the crude oil import price index for the period 1993-2010 ($ / barrel), the crude oil price index (TL / barrel), the nominal exchange rate index (TL / $), the average price index of oil products (TL / liter) and the price index (PPI) were calculated on the basis of 1993. As can be observed from Table 1, while crude oil import price index in the named period increased by 4.9 times, the average price index of oil products increased by 590.8 times. During the same period, the average price index of oil products increased by 120.5 times more than crude oil import price index. It is also possible to see this in Figure 1. As a result, no matter which comparison is taken, the inflationary effects of oil price appear to have emerged more than its import price especially depending on the particular pricing in the national market. Therefore, in analyzing the inflationary effects of oil, as Huntington (1998) also points out, not crude oil prices but the changes in the prices of oil products and energy should be taken as a basis. Thus, in the study made by Peker and Mercan (2010), Berument and Taşçı (2002) and Kibritçioğlu and Kibritçioğlu (1999) for Turkey, inflationary effects of import price of crude oil were not found statistically significant.

Table 1: Price Index

Year	*Crude Oil Import Price Index($)*	*Crude Oil Price Index (TL)*	*Nominal Tl/$ Currency Index*	*Oil Product Avarage Price Index(*)*	*Price Index (PPI)*
	(1993=1.0)	(1993=1.0)	(1993=1.0)	(1993=1.0)	(1993=1.0)
1993	1	1	1	1	1
1994	1,0	2,7	2,7	2,7	1,6
1995	1,1	4,4	4,1	3,9	3,4
1996	1,3	9,2	7,3	6,3	6,4
1997	1,2	16,3	13,7	12,5	11,1
1998	0,8	17,7	23,5	26,9	19,8
1999	1,1	40,6	38,1	67,7	33,4
2000	1,7	95,0	56,2	87,0	48,0
2001	1,4	159,8	110,9	95,4	73,9
2002	1,4	185,1	128,5	201,7	116,2
2003	1,7	215,2	127,3	276,6	169,6
2004	2,2	263,5	120,2	280,6	209,9
2005	3,1	377,5	120,6	377,5	234,1
2006	3,8	470,5	123,2	445,7	247,6
2007	4,3	500,6	117,5	458,4	266,9
2008	5,9	662,0	111,3	521,5	290,1
2009	3,8	520,6	138,5	481,1	323,3
2010	4,9	672,2	135,9	590,8	327,1

Note: *When calculating the avarage price index for oil product, Aydın Trade Chamber's records were taken as a basis. In this calculation, premium gasoline, regular gasoline, kerosene and diesel fuel retail prices are based on pump price in Aydin for January.

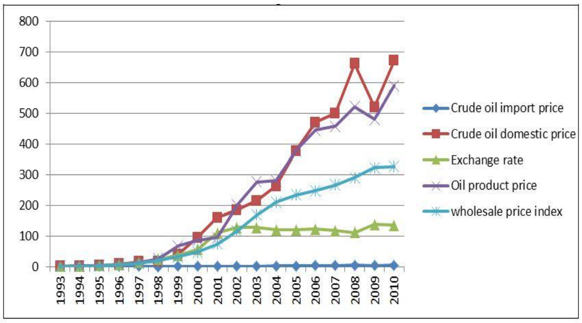

Figure 1: Price Index

3. DATA AND METHODS

In this study covering the period 1996: M1-2009: M12, a total of five variables were used. In the letter symbols used for the variables, *p* shows producer price index (1968 = 100), oil shows average sales price of *oil* products, *i* shows government domestic borrowing interest rate, *exr* shows the nominal exchange rate (Exchange sale for TL / $), *m2* shows the money supply (Thousand TL). All variables, except the variable interest, were analyzed after logarithmic transformation. Variables *oil* and *i* were obtained from the State Planning Organization website (http://www.dpt.gov.tr/), while other variables were obtained from the Central Bank of the Republic of Turkey web site (http://evds.tcmb.gov.tr/).

In this study, in order to investigate the inflationary effect of oil products, the bounds testing approach developed by Pesaran et al. (2001) was used. This approach, when compared to the co-integration methods developed by Engle-Granger (1987), Johansen (1988) and Johansen-Juselius (1990), is considered to be more useful. In these methods, the series included to the analysis should have unit root in the level and when the difference is taken, should integrate at the same order. Therefore, when one or part of the series is stationary at the level, co-integration relationship is unsearchable. However, there is no such restriction in bounds testing approach. Although the stability level of the series is different, the presence of co-integration relationship can be tested. However, another advantage of the bounds testing approach is that estimating of model is possible with the data containing a low number of observations. (Narayan and Narayan, 2004: 25).

4. ANALYSIS AND EMPIRICAL RESULTS

Before starting the analysis, stationarity degrees of the series related to the variables used in the study were investigated with the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP), and unit root test was made. Stationarity levels of variables were first analyzed by using Dickey-Fuller (1979) test; and then, in order to compare the results of this test, Phillips-Perron (1988) test was used. According to the Table 2 where ADF test results are shown, in 5% significance, except for variable *i*, all the variables are not static in level value. When the first order difference of the series has been taken, they became stationary. So, serie *i* was determined as I(0), and the other series as I(1). As can be observed in Table 2, these results obtained with the ADF test, are supported with the results obtained with the PP test.

Table 2: Unit Root Test Results ADF and PP

Variable s	ADF Test	PP Test	Critical Values		
			%1	%5	%10
p	-1,46[3]	-1,56[3]	-4.01	-3.43	-3.14
Δp	-5,34[2]	-7,13[2]	-4.01	-3.43	-3.14
oil	-1,17[7]	-1,38[7]	-4.01	-3.43	-3.14
Δoil	-5,20[6]	-10,86[6]	-4.01	-3.43	-3.14
i	-3,92[2]	-5,13[2]	-4.01	-3.43	-3.14
Δi	-10,80[1]	-12,83[1]	-4.01	-3.43	-3.14
exr	-1,81[1]	-1,83[1]	-4.01	-3.43	-3.14
Δexr	-9,45[0]	-9,45[0]	-4.01	-3.43	-3.14
m2	-2,91[13]	-3,12[13]	-4.01	-3.43	-3.14
Δm2	-4,61[5]	-15,55[5]	-4.01	-3.43	-3.14

Note: Δ symbol indicates that the first differences of the variables were taken. The values in [ ] point out the optimal lag lenght which determined to Akaike information criterion (AIC) for ADF test, Newey-West Criterion for PP test.

4.1. Co-Integration Test

The level values of many macroeconomic variables are not stationary. If there is a co-integration relationship between series in other words if series move together in the long term, a fake regretion trouble will not be faced in an analysis to be carried out with level values (Pesaran etc, 2001:290; Gujarati 1999). However, the dynamic behaviors of variables moving together in the long term cause some deviations in the balance equation (Enders, 1996:151). This is one of the basic characteristic of co-integration variables and plays an important part in the short term dynamic. The dynamic model appearing along with this process is called error correction model (Enders, 1995: 365).

As can be seen from Table 2, because the series *p, oil, exr* and *m2* which will be used in the analysis, are stationary when the first difference is taken according to 5% significance level, and *i* series is stationary in the level, it is not possible to make the co-integration analysis of these series with the Engle-Granger or the Johansen co-integration methods. Because, in the Engle-Granger and Johansen co-integration methods, all the series need to have unit-root in the level and should integrate at the same degree when the difference is taken. However, in the bounds testing approach developed by Pesaran et al. (2001), though the stability degrees are different, co-integration relationship between the series is possible to be tested.

An unrestricted error correction model is setup so that bounds testing approach can be applied. (Unrestricted error correction model: UECM) This model can be applied to our survey as fallows:

$$\Delta p_{t=}\alpha_0 + \sum_{i=1}^{m}\alpha_{1i}\Delta p_{t-i} + \sum_{i=0}^{m}\alpha_{2i}\Delta oil_{t-i} + \sum_{i=0}^{m}\alpha_{3i}\Delta i_{t-i} + \sum_{i=0}^{m}\alpha_{4i}\Delta exr_{t-i} + \sum_{i=0}^{m}\alpha_{5i}\Delta m2_{t-i} + \alpha_6 p_{t-1} + \alpha_7 oil_{t-1} + \alpha_8 i_{t-1} + \alpha_9 exr_{t-1} + \alpha_{10} m2_{t-1} + u_t \quad (1)$$

Here, m; stands for optimum lag length, Δ stands for difference operator, u_t stands for error term, those which are given with other letter abbreviation stands for the meanings in variable definitions. In this survey optimum lag lenght has been determined by means of Akaike Criterion. According to Kamas ve Joyce (1993) there musn't be autocorelation between error terms of model's optimum lag length so that the test can give healthy result. If there is autcorolation in the lag lenght in which Akaike Criteria is the lowest, lag lenght, in which there is one big AIC value, is taken as optimum lag lenght.

The test results of lag lenght are presented in Table 3. In the table where maximum lag lenght is taken as 8, optimum lag lenght for the bounds testing was determined as 2 and it was observed that there is no autocorelation in this lag lenght.

Table 3: The lag length test for bounds testing

m	AIC	LM Test
1	-6,28	0,41
2*	**-6,30**	**0,92**
3	-6,26	0,96
4	-6,20	0,78
5	-6,20	0,55
6	-6,19	0,52
7	-6,22	0,99
8	-6,20	0,83

After determining the laag length, it was passed two co-integration testing process between the variables. In bounds testing approach, co-integration relationship between the variables is made by means of testing the zero (H_0:α4=α5=α6=0) hypotesis. Accepting or rejecting the zero hypotesis is determined with F test. Caltulated F statistical value is compared to table lower and upper critical values in Pesaran et al. (2001). In the first case, if the calculated F statistical value is smaller than lower critical value, it is decided that there is no co-integration relationship between the series. In the second case, if the calculated F statistical value is smaller than lower critical value is between lower and upper critical value, no definite comment can be made, in other words it stays undecided. In this case, alternative co-integration methods must be tried. Finally, if the calculated F statistical value is more than table upper critical level, it is decided that there exists a co-integration relationship between the series. According to this, in order to test the H_0 hypotesis, calculated F statistical value is compared with critical values obtained from Pesaran et al. (2001) in table 4. These critical values are given for 4 independent variables and %1 level of significance. Thus, because co-integration relationship is determined, in order to search long and short term relationships between the variables, it was passed to estimating process of the autoregressive distributed lag (ARDL) models.

Table 4: Bounds Testing Results

k	**Calculated F**	**Lower Bound**	**Upper Bound**
4	24,41	3,74	5,06

Note: k stands for variable number. Critical values are extracted from Table CI (iii) in Pesaran etc.

4.2. Long Term Analysis

ARDL model which is found in order to analyse long term relations is formulated as:

$$\Delta p_{t=}\alpha_0 + \sum_{i=1}^{m}\alpha_{1i}p_{t-i} + \sum_{i=0}^{n}\alpha_{2i}oil_{t-i} + \sum_{i=0}^{p}\alpha_{3i}i_{t-i} + \sum_{i=0}^{p}\alpha_{3i}i_{t-i} + \sum_{i=0}^{r}\alpha_{4i}exr_{t-i} + \sum_{i=0}^{k}\alpha_{5i}m2_{t-i} + u_t \quad (2)$$

Here m, n, p, r and k are lag lengths and determined with AIC. This transaction has been carried out with the method that Kamas and Joyce (1993) proposed in their causality analyses so as to determine lag length. According to this, first of all, regression of the dependent variable is made according to its own regressive values, and the lag length of without autocorrelation model, which gives the lowest AIC value, is found. Then, by keeping the identified lag length of dependent variable stationary, regression models were formed with all possible regressions of the first independent variable, and by taking

AIC value into consideration, regression number of this independent variable is identified. Optimum regression number was obtained by repeating similar transactions for other variables. The results of these transactions are presented in Table 5 and long term ARDL (4.1.2.1.8) model was estimated accordingly.

Table 5: Determination of Lag Length for Long Term Bounds Testing

	AIC	*LM Test*	*AIC*	*LM Test*	*AIC*	*LM Test*
m (p)			*n(oil)*		*p(i)*	
0	-	-	-5,93	0,15	-6,10	0,05
1	-5,56	0,00	**-5,95**	**0,23***	-6,14	0,03
2	-5,89	0,23	-5,94	0,29	**-6,22**	**0,88***
3	-5,90	0,29	-5,94	0,29	-6,21	0,89
4	**-5,91**	**0,69***	-5,92	0,22	-6,20	0,88
5	-5,90	0,20	-5,91	0,10	-6,18	0,51
6	-5,89	0,15	-5,93	0,20	-6,17	0,13
7	-5,91	0,66	-5,94	0,13	-6,21	0,76
8	-5,90	0,35	-5,93	0,05	-6,19	0,39
r (exr)			*k(m2)*			
0	-6,27	0,60	-6,33	0,81		
1	**-6,34**	**0,83***	-6,32	0,80		
2	-6,33	0,86	-6,32	0,81		
3	-6,34	0,94	-6,31	0,83		
4	-6,33	0,93	-6,31	0,81		
5	-6,32	0,90	-6,30	0,94		
6	-6,31	0,72	-6,30	0,89		
7	-6,34	0,88	-6,34	0,99		
8	-6,34	0,90	**-6,38**	**0,98***		

The estimated results of long term ARDL (4.1.2.1.8) model and long term coefficients calculated based on these results are available in Table 6. Long-term coefficients were calculated by dividing the sum of coefficient or coefficients of the independent variables (for example, if there is a regression, both its own value's and the lagged value's) to 1 difference from the sum of the coefficients of the dependent variables (Johnston and Dinardo, 1997: 245). Diagnostic test results of the model show that the estimation is successful. Breusch-Godfrey autocorrelation test, the White heteroscedasticity test, Jarque-Bera normality test and Ramsey's model establishing error in regression statistics are in an ac-

Table 6: The Results of Calculated Long Term Coefficient of ARDL (4.1.2.1.8) Model

Variables	**Coefficient**	**t-statistic**
c	0,7926	3,9119
p_{t-1}	1,3630	17,2847
p_{t-2}	-0,4609	-3,5783
p_{t-3}	0,0907	0,7244
p_{t-4}	-0,0436	-0,6465
oil_t	0,0587	2,8868
oil_{t-1}	-0,0357	-1,6813
i_t	-0,0001	-1,8207
i_{t-1}	0,0004	4,4556
i_{t-2}	-0,0002	-3,2482
exr_t	0,0856	4,3536
exr_{t-1}	-0,0722	-3,5384
$m2_t$	0,0208	0,7037
$m2_{t-1}$	0,0430	1,1397
$m2_{t-2}$	-0,0872	0,7037
$m2_{t-3}$	-0,0021	-0,0583
$m2_{t-4}$	0,0001	0,0036
$m2_{t-5}$	0,0539	1,5440
$m2_{t-6}$	-0,0843	-2,3670
$m2_{t-7}$	-0,0157	-0,4356
$m2_{t-8}$	0,0760	2,6889
Long Term Coefficients		
oil	0,452	3,414*
i	0,001	1,463**
exr	0,262	3,307*
m2	0,088	1,082
c	15,579	10,679
Diagnosis Tests		
R^2=0.99	$\chi^2_{BGAB}(2)$ =0.20(0.81)	
$\bar{R}^2$=0.99	χ^2_{WDV}=1.12(0.31)	
F.ist.=86258,3(0,00)	χ^2_{JBN}=1,06(0.58)	
DW=1,99	$\chi^2_{RRMKH}(2)$=0,41(0.66)	

Note: Here, $\chi 2_{BGAB}$, $\chi 2_{WDV}$, $\chi 2_{JBN}$ and $\chi 2_{RRMKH}$ are respectively Breusch-Godfrey successive dependence, White changing variance, Jarque-Bera normality test and Ramsey model establishment error statistics in regression. The figures in parentheses reflect p-probability values. The figures in parentheses reflect p-probability values. (*) means 1% significance level, (**) means for 10% significance level.

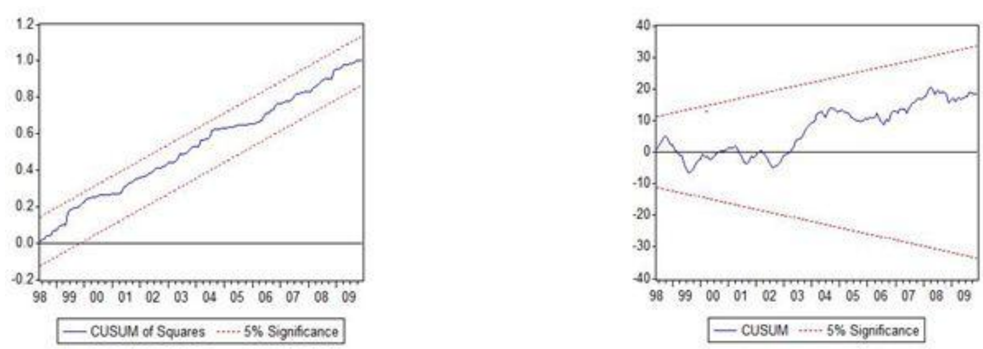

Figure 2: CUSUM and CUSUMQ

ceptable level. In addition, the Cusum and CusumQ graphs shown in Figure 2, also show that the regression coefficients are stationary.

According to Table 6, coefficient of the average price of oil products is in a statistically significant and interpretable level, and had a positive effect on inflation in line with the teoretical expectations. A 1% increase in the average price of oil products increases the inflation in a 0.45% rate. This result can be interpreted as major evidence that oil products have inflationary effects. In Table 6, although money supply does not affect inflation, statistically insignificant. it is another remarkable result that exchange rate affects on inflation in line with the theoretical expectations.

4.3. Short Term Analysis

Short term relationship between variables was investigated by means of ARDL Error Correction Model based on bounds testing approach. According to this, adapted version of the model to our study is formulated as:

$$\Delta p_{t}=\alpha_0+\alpha_1 ec_{t-1}+\sum_{i=1}^{m}\alpha_{2i}\Delta p_{t-i}+\sum_{i=0}^{n}\alpha_{3i}\Delta oil_{t-i}+\sum_{i=0}^{p}\alpha_{4i}\Delta i_{t-i}+\sum_{i=0}^{r}\alpha_{5i}\Delta exr_{t-i}+\sum_{i=0}^{s}\alpha_{6i}\Delta m2_{t-i}+u_t \qquad (3)$$

Here, ec_{t-1} is error correction terms and it stands for one term lagged series of error terms series which is obtained from long term relationship. The coefficient of this variable point out how many of the deviations in short period will improve after one term. If the sign of this coefficient is negative, deviations occuring in the series will converge to the long term balance value; if it is positive, it will diverge from the long term balance value.

Table 7: Determination of Lag Length for Short Term Bounds testing

	AIC	*LM Test*	*AIC*	*LM Test*	*AIC*	*LM Test*
m (p)			*n(oil)*		*p(i)*	
0	-	-	**5,96**	**0,25***	-5,95	0,15
1	-5,84	0,00	-5,95	0,26	-6,22	0,02
2	-5,86	0,00	-5,93	0,19	**-6,23**	**0,05***
3	**-5,93**	**0,07***	-5,92	0,15	-6,22	0,02
4	-5,93	0,14	-5,91	0,15	-6,21	0,02
5	-5,92	0,19	-5,95	0,71	-6,20	0,03
6	-5,94	0,89	-5,94	0,74	-6,19	0,03
7	-5,93	0,88	-5,94	0,27	-6,18	0,06
8	-5,92	0,50	-5,94	0,43	-6,19	0,02
r(exr)			*k(m2)*			
0	**-6,34**	**0,41***	-6,33	0,52		
1	-6,33	0,84	-6,34	0,39		
2	-6,34	0,36	-6,33	0,48		
3	-6,33	0,46	-6,32	0,62		
4	-6,32	0,26	-6,32	0,17		
5	-6,31	0,24	-6,33	0,00		
6	-6,32	0,50	**-6,36**	**0,21***		
7	-6,34	0,37	-6,35	0,02		
8	-6,33	0,37	-6,35	0,05		

In this model, while the lag lengths of the variables are determinated, the process in determining the long term ARDL model is repeated. The results showing the lag lengths for the short term bounds testing are presented in Table 7, and short term ARDL (3.0.2.0.6) model is determinated.

In Table 8, estimation results of the short-term ARDL (3.0.2.0.6) model are presented. Diagnostic test results of the model show that the the prediction was successful. Statistics of Breusch-Godfrey autocorrelation test, White heteroscedasticity test, Jarque-Bera normality test and Ramsey's model establishing error in regression are in an acceptable level. However, Cusum and CusumQ graphs shown in Figure 3 indicate that the regression coefficients are steady.

As can be observed in Table 8, inflationary effect of the average price increases of oil products in

Table 8: The Results of ARDL (3.0.2.0.6) Model

Variables	**Coefficient**	**t-statistic**
c	0,0009	0,5825
Δp_{t-1}	1,0044	7,6205
Δp_{t-2}	-0,3113	-2,9917
Δp_{t-3}	0,1259	1,8994
Δoil_{t}	0,0468	2,3283
Δi_{t}	-0,00009	-1,3077
Δi_{t-1}	0,0003	4,8751
Δi_{t-2}	-0,0001	-1,9813
Δexr_{t}	0,0813	4,1364
$\Delta m2_{t}$	0,0428	1,5368
$\Delta m2_{t-1}$	0,0569	2,1724
$\Delta m2_{t-2}$	-0,0425	-1,4650
$\Delta m2_{t-3}$	-0,0142	-0,5141
$\Delta m2_{t-4}$	-0,0173	-0,6184
$\Delta m2_{t-5}$	0,0473	1,7974
$\Delta m2_{t-6}$	-0,0654	-2,2706
ec_{t-1}	-0,6215	-4,0118
Diagnosis Tests		
R^2=0,81	$\chi^2_{BGAB}(2)$=1,56(0,21)	
$\bar{R}^2$=0,79	χ^2_{WDV}=1,14(0,29)	
DW=1,89	χ^2_{JBN}=1,27(0,52)	
F=38,52(0,00)	$\chi^2_{RRMKH}(6)$=2,10(0,05)	

Note: Here, $\chi 2_{BGAB}$, $\chi 2_{WDV}$, $\chi 2_{JBN}$ and $\chi 2_{RRMKH}$ are respectivel Breusch-Godfrey successive dependence, White changin variance, Jarque-Bera normality test and Ramsey mode establishment error statistics in regression. The figures i parentheses reflect p-probability values

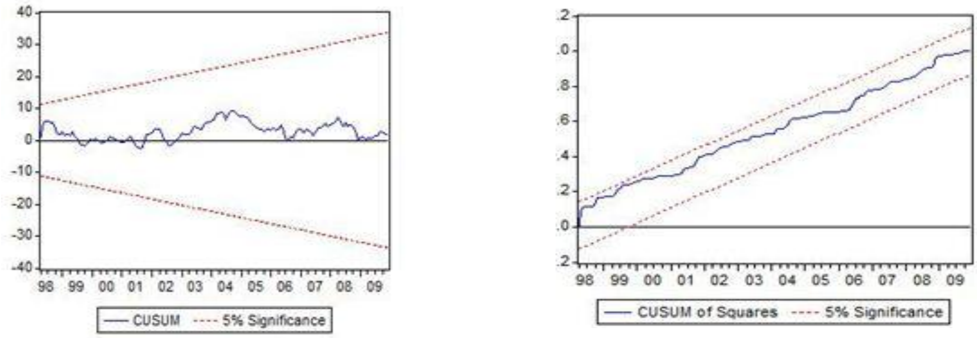

Figure 3: CUSUM and CUSUMQ

a short term is statistically significant in at the 0.05 level and are in line with theoretical expectations, and when compared to the long term, it remained quite small. This result is important in terms of defining that inflation is sensitive to the changes in the average price of oil products in Turkey's economy. The coefficient of error correction term is statistically significant and negative as expected. The coefficient of this term (-0.62) is smaller than one in absolute value. In this case, according to Narayan and Smyth (2006), the model converges to the long term equilibrium level in a fluctuating manner. Therefore, error correction term of the model works. That is, the deviations occuring in a short term between the series moving along together in long term disappear, and the series converge again to the long term equilibrium value.

5. RESULTS

In this study, the inflationary effects of oil products in Turkey are investigated using 1996-2009 period monthly data with the bounds testing approach developed by Pesaran et al. (2001). As a result of ADF and PP test, i series were determined as I(0), and the other series were determined as I(1). The findings related to the presence of co-integration among the variables were obtained, and long and short term ARDL models were established on this basis.

According to empirical evidence derived from long-term estimation of ARDL model, the effect of price increases of oil products on inflation occured statistically significant and in line with the theoretical expectations. A 10% increase in the price of oil products increases the inflation in a rate of 4.52%. This result is in line with the comparison in Table 1, and an important finding to be dealt with. In this table, in the period 1993-2010, while crude oil import price index increased by 4.9 times, the average price index of oil products increased by 590.8 times. Inflationary effects of price increases of oil products, more than the import price, appear to have emerged particularly depending on the pricing in the national market. Therefore, in analyzing the inflationary effects of oil, as Huntington (1998) also pointed out, the reality of taking not the import price of crude oil, but the sales price of oil products as a basis is supported. Indeed, in the study made by Peker and Mercan (2010), Berument and Taşçı (2002) and Kibritçioğlu and Kibritçioğlu (1999), inflationary effects of crude oil import price were not found statistically significant.

The inflationary effect of oil products, althought were significant and positive as in the long term, were rather in a small value in the short-term analysis. Error correction coefficient of the model was negative and significant as expected. Therefore, deviations appear in the short term converge to the

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long-term equilibrium level in a fluctuating manner.

i. In the last 30 years, policy-makers in the oil exporting and importing countries have faced certain difficulties in monetary and fiscal policy formation over against hard fluctuations in the price of oil (Cashin et al, 2000; Tato, 1988; Daniel, 1997; Hooker, 1996; Caruth, Hooker and Oswald, 1996; Hamilton, 1996; Mork, 1994; Kim and Loughani, 1992). In eleminating the recession caused by oil shocks, some concerns about the effectiveness of monetary policy have emerged (Hamilton and Herrera, 2004; Bernanke et al. 1997). For example, Bernanke, Gertler, and Watson (1997) who analyzed the possible reasons of the recession in the United States in 1974, stated that the policy of the Central Bank which wanted to keep inflation initiated by the price of oil under control may have caused the recession. Therefore, in the case of knowing the the inflationary effect of oil prices, struggle with inflation becomes easier (Bohi, 1989).

ii. When determining an unrestricted error correction model, in which order the variables will be included in the analysis was determined with Granger causality test. According to the results of the test, there is either a direct or indirect relationship between all variables in the system. Inflation and oil products variables are in a two-way relationship both among themselves and with other variables in the system. Money supply variable, while in a a two-way relationship with the inflation, affects all the other variables in the system. Therefore, the money supply has been recognized as the most exogenous variable.

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