Suleymanli, Javid; Mammadov, Ilkin; Ahmadov, Fariz et al.

Article

Investigation of the relationship between fuel prices and fuel consumption in Turkey

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Suleymanli, Javid/Mammadov, Ilkin et. al. (2022). Investigation of the relationship between fuel prices and fuel consumption in Turkey. In: International Journal of Energy Economics and Policy 12 (6), S. 473 - 480. https://econjournals.com/index.php/ijeep/article/download/13755/7059/31694. doi:10.32479/ijeep.13755.

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2022, 12(6), 473-480.

Investigation of the Relationship Between Fuel Prices and Fuel Consumption in Turkey

Javid Suleymanli[1], Ilkin Mammadov[2], Fariz Ahmadov[1]*, Tabriz Aliyev[1]

[1]Azerbaijan State University of Economics, Baku, Azerbaijan, [2]Sustainable Development and Green Economy Research Center, Azerbaijan State University of Economics, Baku, Azerbaijan. *Email: f.ahmadov@unec.edu.az

Received: 25 August 2022 **Accepted:** 09 November 2022 **DOI:** https://doi.org/10.32479/ijeep.13755

ABSTRACT

This study investigates the impact of fuel price changes on fuel demand in Turkey. The rise in global oil prices since the fourth quarter of 2021 has resulted in considerable increases in oil prices in countries that rely on foreign oil consumption. With the devaluation of the Turkish lira beginning the fourth quarter of 2021, the rise in oil prices reached a historical high in a very short period of time. This situation necessitates the presentation of a recent empirical study to the literature on whether oil consumption changes as a result of oil price fluctuations. Weekly data from 2014 to 2022 were analyzed for this purpose. The fuel expenditures of households with bank and credit cards were utilized as the dependent variable in the study to indicate fuel demand. The average of unleaded gasoline and diesel prices, car sales, car rental charges, and the nominal USD/TL rate are all considered independent factors. According to the analysis, an increase in the exchange rate and gasoline costs lowers the fuel price. The increase in expenses connected to car sales and rental, on the other hand, increases fuel costs.

Keywords: Gasoline Price, Gasoline Demand, FMOLS, ARDL, CCR
JEL Classifications: Q41, B23, C32

1. INTRODUCTION

Energy is one of the most basic requirements for a country's social and economic development. Its primary purpose is to provide people's daily requirements, such as warmth, lighting, and transportation. On the other hand, it is recognized as a critical input in industrial output (Lehmann et al., 2019). In other words, it contributes positively to the country's investment levels. As a result, it is widely acknowledged that it plays an essential role in a country's long-term economic development (Johansson and Kriström, 2019). It is critical to determine a country's level of energy demand. This is especially important for countries that rely on other countries to meet their energy demands (Jin and McKelvey, 2019). Having relevant information about energy demand behavior allows these countries' policymakers to make more precise decisions concerning energy demand and import operations.

Gasoline plays an essential role in people's daily lives. It is mostly used in the transportation sector (Chen et al., 2019). Because all private cars, vehicles, and city buses run on gasoline, the cost for these parties is critical. People who own private vehicles, for example, spend a considerable portion of their salary on gasoline (Coglianese et al., 2017). As a result, every price increase might have a considerable impact on gasoline demand behavior. In other words, gasoline demand is extremely price sensitive (Kanjilal and Ghosh, 2018). From the perspective of economic players, today's existence can be viewed as a burden carried from the present to the future; the majority of gasoline is consumed. In this context, the planning of strategies to meet the daily requirement for gasoline is critical to a country's social and economic performance. As a result, it is obvious that estimating gasoline consumption is a critical issue for all countries.

Many distinct things can influence gasoline demand. To begin with, it is widely acknowledged that the price of gasoline has the

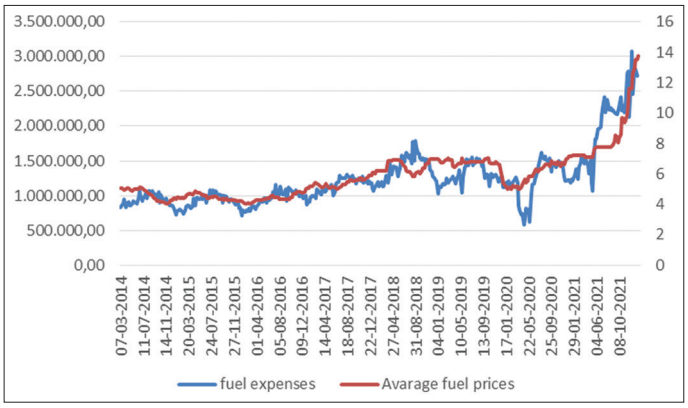
greatest influence on demand (Lim and Yoo, 2016). Some experts, on the other hand, suggest that there is a considerable association between people's income and gasoline demand (Saelim, 2019). Aside from these characteristics, it has been established that there is a link between economic growth and gasoline consumption (Wadud, 2016). Furthermore, the state's gasoline tax is viewed as a factor influencing gasoline demand (Alper and Torul, 2009). It suggests that when there is a high price on gasoline, individuals may choose not to consume it. Furthermore, market uncertainty may have a detrimental impact on gasoline demand (Chou and Tseng, 2016). Since a result, understanding the primary indicators of gasoline consumption is critical, as they play a significant impact in the country's economic success.

Oil is mostly used in transportation and industry in Turkey and many other countries. Fuel prices have risen dramatically in recent years, owing to currency swings. Turkey's overall number of gasoline-powered automobiles, estimated at 2.8 million in 2014, has continuously increased throughout the years. and 3.0 million by the end of March 2020, representing an annual rise of around 1%. 2020 (TURKSTAT) Similarly, fuel use shows a non-significant modest rising trend. 2020 (EMRA).

Graph 1 depicts Turkey's gasoline costs and expenditures during the 3rd week of March 2014 and the 2nd week of January 2022. The information in the chart is provided on a weekly basis. As can be seen, there is a drop in gasoline consumption expenditures, particularly during the COVID-19 epidemic. The reason for this is that fuel expenditures have fallen as a result of the pandemic-related closures. Fuel costs have recently risen as a result of the removal of closures and increased activity. However, the reasons for this increase, particularly recent increases in global oil prices and the impact of changes in the USD/TL exchange rate on pricing, are critical. This graph provides us with important information regarding the dynamics of Turkey's fuel expenditures. As the need for travel rises, notably during Ramadan, Eid, and other holidays, the demand for petroleum rises even more and even peaks during these times.

In Turkey, there have been very few research on fuel consumption. According to Melikoglu (2014), yearly gasoline consumption in Turkey may fall to 2.0 million m3 in 2023, in line with government aims and European directives. According to Hasanov (2015), there is no income or price elasticity in quarterly gasoline demand in Turkey. Using quarterly data, Mikayilov et al. (2020) show that short-term gasoline demand in Turkey is not responsive to changes in income, price, or vehicle stock, and that short-term swings may be influenced by other variables. Turkey studies the volatility dynamics of diesel consumption and finds that consumption volatility has grown in response to the pandemic, according to Güngör et al. (2020).

Graph 1: Depicts the evolution of fuel sales and prices throughout time



The purpose of this research is to determine how fuel prices affect fuel demand in Turkey. In general, most research on this topic attempt to estimate annual or quarterly gasoline/diesel/crude oil consumption using a variety of assumptions and independent factors. Unlike other research in the literature, the data in this study were analyzed on a weekly basis. At the same time, the study data demonstrates the significance of this study in terms of literature, as it includes the COVID-19 pandemic, which has had a significant impact on the global economy, as well as periods when oil prices began to rise, particularly in the USD/TL exchange rate in recent months. Another unique component of the study is that it will expose the outcomes of numerous distinct estimators in econometric analyses, which will contribute significantly to the literature on the issue.

2. LITERATURE REVIEW

When we look at the literature on the subject, we discover that the relationship between gasoline prices and the demand elasticity of such products needs more research. A great deal of study has been conducted on the basis of countries, both in terms of oil-rich and non-oil-rich countries, as well as from a geographical standpoint. There is a vast literature in which the price elasticity of gasoline demand is evaluated using several models, with seemingly large discrepancies in results. This discrepancy can be attributed to differences in functional form, model assumptions, variable specification and measurement, and econometric estimating technique.

There are numerous research in the literature that attempt to identify the factors influencing gasoline demand. The researchers emphasized various elements in these experiments. According to a significant group of studies, the price of gasoline has the greatest impact on gasoline demand. Park and Zhao (2010), for example, investigated gasoline demand in the United States. In this regard, data from 1976 to 2008 were examined. As a consequence of the research, it has been discovered that volatility in gasoline prices has the largest impact on gasoline consumption. Similarly, Baranzini and Weber (2013), Brons et al. (2008), Lin and Prince (2013), and Lim and Yoo (2016) analyzed several countries, including Korea, Switzerland, and the Netherlands, and obtained similar conclusions. Other research, such as Zhu et al. (2018) and Algunaibet and Matar (2018), show that gasoline costs are one of the primary drivers of gasoline consumption.

However, several research suggest that the price of gasoline has little effect on demand. Cheung and Thomson (2004), for example, examined gasoline demand in China between 1980 and 1999. As

a result, gasoline has been found to be relatively inelastic to price fluctuations. This topic has been discussed in various ways by Eltony and Al-Mutairi (1995), Hughes et al. (2008), Arzaghi and Squalli (2015), and Atalla et al. (2018). According to these studies, gasoline demand is not extremely responsive to price fluctuations. Ewing and Thompson (2018) and Dash et al. (2018) also found the same outcome in their research.

Because Turkey is reliant on foreign sources of energy, numerous scholars have examined the topic of gasoline demand in Turkey in the literature. Mesutoğlu (2001) evaluated the price elasticity of gasoline demand for Turkey using the OLS method for monthly data from 1990 to 1999. He stated that gasoline demand is inelastic (−0.41) in relation to price. Dahl (2012) estimates that the average price elasticity of gasoline demand in Turkey is −0.19. Gasoline demand's average income elasticity is determined to be 1.10. According to Melikoglu (2014), the demand for gasoline in Turkey has dropped in recent years, owing primarily to the Turkish government's high gasoline taxation. In their studies, Alper and Torul (2009) and Bor and Ismihan (2013) came to the same conclusion. Erdogdu (2014) used OLS to examine fuel demand (gasoline, diesel, and LPG) in Turkey. Both the short-run and long-run income elasticities of gasoline demand are statistically insignificant, according to the findings. Although statistically small, Erdogdu (2014) suggested that gasoline demand has income elasticity. Otherwise, the price elasticities of gasoline demand in the short and long term are −0.213 and −0.481, respectively. Furthermore, Erdogdu (2014) discovered that the cross price elasticity of gasoline demand vs diesel and LPG was 0.64 and −1.22, respectively, and was statistically significant.

Hasanov (2015) investigated gasoline affecting factors in Turkey from 2003Q1 to 2014Q4 using partial fit model (PAM), distributed lag (DL), and autoregressive distributed lag (ARDL) approaches. According to the findings of the study, there is no long-run relationship between gasoline demand, income, and price. Hasanov (2015) calculates price elasticity in the short run to be −0.427 and finds that income has no effect on gasoline demand in the short run. Yalta and Yalta (2016), on the other hand, used the highest density region (HDR) technique to explore the determinants of gasoline demand in Turkey. The short-run price elasticity of gasoline demand, according to them, is −0.19. Furthermore, the short-run income elasticity is 0.12, which is statistically negligible. The predicted long-run price and income elasticities of gasoline demand, on the other hand, are −0.18 and 0.11, respectively. Furthermore, Keskin (2017) analyzed gasoline demand behavior and determined that, in the case of Turkey, there is a relationship between economic growth and gasoline consumption.

3. EMPIRICAL ANALYSIS

The influence of changes in fuel prices on fuel consumption was investigated using time series methods at this stage of the study. The study tries to answer the question of whether increases in fuel prices reduce family fuel consumption. Turkish Economy has been discussed as a research object for this reason. Turkey, the research subject, is a country that is heavily reliant on foreign fuel supplies. Because of this reliance on foreign sources, the consequences of changes in worldwide energy and fuel costs, as well as the dynamics of international oil and natural gas supply, are quickly reflected in fuel prices. Given that Turkey has been experiencing chronic inflation, particularly since 2018, and that per capita income has declined significantly, an increase in fuel prices in Turkey is projected to have an influence on household car utilization requirements. As a result, "Does the increase in gasoline prices reduce household fuel use?" In terms of seeking a solution to the issue, Turkey can be deemed a suitable country.

The study's data set spans the 3rd week of March 2014 through the 2nd week of January 2022. There are 412 observations in the weekly frequency data collection. The variable of gasoline expenditures made at gas stations using bank and credit cards was accepted as the dependent variable in the study. The data set collected from the Central Bank of the Republic of Turkey's Electron Data Distribution Center (EVDS) is in the natural logarithmic format. The main goal of the empirical analysis is to look at how the average price of unleaded gasoline and diesel affects the dependent variable. Table 1 provides explanatory data for all independent variables. Because determining only the price of the product as an independent variable in explaining the dependent variable may result in significant measurement and specification errors, the model includes 1-period (week) delayed values of weekly car rentals and weekly car sales, as well as exchange rate variables, to explain the quantity of the product. ANNEX-2 contains a graphical depiction of all the modifications.

$$LNFEXP_t = \beta_0 + \beta_1 BP_t + \beta_2 LNRC_t + \beta_3 LNCS_t + \beta_4 NERT_t + U_t \quad (1)$$

For all variables, unit root tests were used in the first stage of the investigation. In addition to the usual unit root tests, Augmented Dickey-Fuller (1981) and Phillips-Perron (1988), Ziwot-Anders (1992), and Lee and Strazicich (2003, 2004) tests that account for structural fractures were used. The long-term relationship between the variables was examined using the Johansen (1988) cointegration test, as well as the Gregory-Hansen (1996) test with structural break and Maki (2012) test with structural break. Estimation was performed using the ARDL and CCR estimators, as well as the FMOLS estimator, to check if the signs and statistical significance of the coefficients produced changed under different estimators.

4. ANALYSIS OUTCOMES

Unit root tests were used in the first stage of the analysis. Stationarity tests are critical for ensuring the consistency of regression estimation findings. Because the regression established without taking into account the degree of stationarity of the variables may produce conflicting findings. The term "stationarity" refers to the fact that the mean, variance, and covariance of a time series do not change over time (Göktaş, 2005). Augmented Dickey-Fuller (1981) and Phillips-Perron (1988) tests, which are still the most commonly used basic stability tests in the literature, have an autoregressive structure and include the lagged values of the dependent variable as an independent variable in the model. These tests, which are determined by the T statistic results, are carried out by taking into account the fixed and trendless, non-stationary and trending, stable and trending structures. The delayed values

Table 1: Explanatory ınformation about the variables

Variables	Description	Min.	Max.	Mean	Source
LNFEXP	Fuel expenditures made from bank and credit cards (diesel+unleaded gasoline)	13.27891	14.94006	13.98529	EDDS
BP	Average of unleaded gasoline and diesel prices (gasoline+diesel/2)	4.010000	14.24000	5.877330	Turkish Petroleum Inc.
LNRC*+	Car rental expenses-TL	9.384042	11.80056	10.47316	EDDS
LNCS*+	Vehicle sales-TL	11.82244	14.47110	13.14300	EDDS
NERT	Nominal US dollar exchange rate-Level	2.078000	18.44644	4.890274	EDDS

BP variable refers to Turkish Petroleum Company pump prices at petrol stations on Istanbul's European side. There is almost no difference in price between the relevant station and the rest of the country. LN denotes that the variable belongs to the natural logarithmic forum. *Indicates that it has been seasonally adjusted using the Census - X-12 approach; + indicates that it is trend-free.

of both tests are estimated using the Akaike Information Criteria (AIC), the Schwartz Bayesian Criterion (SBC), and the Hannan-Quinn Criterion (HQC). The PP test differs from the ADF test in that it assumes that the error terms are heterogeneously distributed.

Unit root tests under structural breaks are critical for determining whether the series' stationarity level changes as a result of the structural break occurrence, which typical unit root tests disregard. Zivot and Andrews (1992) devised a unit root test for determining the internal structural break date. The ZA test is a unit root test that allows for a single break under three separate models, namely the break at the constant, the break at the constant and the trend, and the break in the trend, denoted by the A, B, and C models. Lee and Strazicich's minimal Langrange Multiplier unit root test was also employed in the analysis (2003, 2004). The LS test differs from other structural break unit root tests in that it allows for structural break, whereas other structural break unit root tests do not. All unit root tests used in the study assume that the series contains a unit root. Table 2 displays the results of unit root tests.

According to the unit root tests, all variables have a unit root in their level values, and when their first difference is taken, they become I(1) stationary. Because the variables are stationary in the same order, the prospect of a long-term relationship, i.e. a cointegrated relationship, between the variables exists. Johansen (1988), a typical cointegration test, Gregory-Hansen (1996) with structural breaks, and Maki (2012) tests, which enable three structural breaks, were used to examine the existence of a cointegration relationship between the variables.

The rank of the π matrix must be known in order to do the Johansen cointegration analysis. In this case, Π coefficients is a (NxN) dimensional matrix. The symbol for matrix is $\pi = \alpha\beta$. β denotes the cointegration matrix, and α represents the weights of each cointegration vector's parameters. If $r(\pi) = 0$, there is no cointegration; if $r(\pi) = 1$, there is one cointegration; if $r(\pi) = 2$, there are two cointegration relations; and if $r(\pi) = r$, there are r cointegration relations (Bierens, 1997).

The Gregory-Hansen cointegration test is another cointegration test that will be used in our investigation. The Gregory-Hansen cointegration test, which performs the analysis while taking structural breaks into account, asserts that the vector can change at the break time set internally. They suggested an alternate hypothesis to the Gregory-Hansen alternative hypothesis based on the notion that the break could be in cointegration (Kilic and

Table 2: Results of unit root tests

Varıables	Unıt root tests			
	ADF	PP	ZA	LS
LNFEXP	−0.8478	−1.6749	−4.1271 (2015:34)	−3.0482 (2018:41; 2019:13)
BP	0.1582	−3.8160	−3.0341 (2017:41)	−2.4019 (2016:15; 2018:03)
LNRC	2.0196	2.2459	−2.9041 (2021:22)	−1.9042 (2017:47; 2019:18)
LNCS	1.6604	3.5278	−4.0021 (2016:39)	−4.8402 (2021:51; 2019:31)
NERT	2.9144	4.9781	−1.0314 (2019:06)	−0.0193 (2017:37: 2019:11)
ΔLNFEXP	−18.4958***	−26.4806***	3.02157***	4.50127***
ΔBP	−12.0212***	−90.7239***	2.04916***	6.74102***
ΔLNRC	−17.2234***	−17.2343***	3.91294***	8.30391***
ΔLNCS	−2.8516***	−17.5535***	−0.3981***	6.03192***
ΔNERT	−1.9463***	−17.8087***	2.30941***	5.09391***

In parentheses, the date of the structural rupture is shown. *** - Indicates that the variable lacks a unit root at the 5% significance level. The akaike information criteria was used to calculate the T statistical values of the ADF and PP tests in the unstable and trend-free states. The findings of the ZA and LS tests are reported based on the break in the constant and the trend

Cutcu, 2018). This test employs three models that allow for a break in the constant-trend constant and a regime change:

Model 1: Break in Constant:

$$Y_t t = \mu_1 + \mu_2 \phi\pi + a^T y_2 t + e_t \quad (2)$$

Model 2: Break in Consistent and Trend:

$$Y_t t = \mu_1 + \mu_2\ \phi\pi + \beta_t a^T\ y_2 t + e_t \quad (3)$$

Model 3: Regime shift:

$$Y_t t = \mu_1 + \mu_2 \vartheta\pi + a^T y_2 t + a^T y_2 t \phi 1 t + e_t \quad (4)$$

Maki's (2012) cointegration test was also used, which allows for up to five structural breakdowns in the analysis. That is, in the presence of five structural fractures, it predicts the long-run relationship. This approach, which calculates the structural break dates internally, finds the probable break point for each period and selects the points where the T statistic is the smallest among

the T statistic values generated for those periods as the structural break dates (Süleymanlı, 2012). In terms of analyzing the break in constant term, slope, and trend, the Maki cointegration test includes four alternative specifications:

Model 0: The model in which a break in the constant phrase is permitted:

$$Y_t = a + \sum_{i=1}^{k} a_i + D_{i,t} + \beta X_t + e_t \quad (5)$$

Model 1: The model in which a break in the constant term and slope is permitted:

$$Y_t = a + \sum_{i=1}^{k} a_i + D_{i,t} + \beta X_t + \sum_{i=1}^{k} \beta_i X_i D_{i,t} + e_t \quad (6)$$

Model 2: The model with a trend that allows for a break in the constant term and slope:

$$Y_t = a + \sum_{i=1}^{k} a_i + D_{i,t} + \gamma t + \beta X_t + \sum_{i=1}^{k} \beta_i X_i D_{i,t} + e_t \quad (7)$$

Model 3: The model in which a break in the constant term, slope, and trend is permitted:

$$Y_t = a + \sum_{i=1}^{k} a_i + D_{i,t} + \gamma t + \sum_{i=1}^{k} \gamma_i t D_{i,t} + \beta X_t + \sum_{i=1}^{k} \beta_i X_i D_{i,t} + e_t \quad (8)$$

Table 3 displays the results of cointegration tests. According to the results of the Johansen, Gregory-Hansen, and Maki cointegration tests, there is a cointegration link between the variables that change. The fact that the results of three different tests with varied specifications largely overlap demonstrates the presence of a long-term link between the variables.

In order to ensure the consistency of regression results in time series estimations, various assumptions must be made. We will make a large econometric error if one of these assumptions is violated, which typically manifests as autocorrelation, changing variance, linearity, structural break, multicollinearity, and specification form. In the context of these issues, various econometric and statistical approaches, particularly resistant estimators, are employed. The tests used to determine the validity of the aforementioned assumptions, as well as their findings, are listed in the table. According to the data in Table 4, there is no condition that would cause the regression results to be biased. Furthermore, the assumptions that there is no structural break and that the polymonol inverse roots are in a circle have been confirmed (Appendix 1-3).

It is critical to re-test the outcomes of the analysis with multiple tests to ensure consistency. Table 5 shows the results of three different regression methods: Fully modified ordinary least squares (FMOLS), Autoregressive Distributed Lag (ARDL), and Correlated Component Regression (CCR) to see if the signs and statistical significance of the estimated coefficients changed under different regression methods.

According to the results of all three regression estimators, it is critical for the econometric model's consistency that the F statistic, which indicates the model's general significance, is statistically significant and that the explanatory coefficient R^2 value is fairly high. The fact that the Durbin-Watson statistic ranges between 1.5 and 2.0 suggests that there is no autocorrelation. When the results of all three tests are compared, we notice that the statistical significance of all variables and the signs of the coefficients remain unchanged. This demonstrates that there is no risk in interpreting the derived economic and statistical conclusions. Because the FMOLS estimator took the lowest value according to the Akaike (AIC) and Bayesian-Schwartz (BSC) information criterion, the results of the FMOLS estimator were used as the basis.

According to the statistics, there is a 0.56 increase in fuel sales for every 10% increase in car sales, and a 0.94 increase in car rentals for every 10% increase in car sales. However, there is a 0.18 fall in fuel sales in response to a 10% increase in the exchange rate, and a 0.25 decrease in response to a 10% increase in fuel costs. All of the results achieved fulfill the expectations. The negative impact of rising fuel costs on fuel sales demonstrates that there is price elasticity of fuel in Turkey, even if it is in very tiny volumes.

Table 3: Cointegration test results

Cointegration tests	Calculated value (λ_{trace} λ_{max}, F, T)		Compared value (0.05 critical value)		Probality		Decision
Johansen cointegration tests							
r=0	0.117486	0.117486	69.81889	33.87687	0.0000	0.0002	There are at least two cointegrating relationships
r>1	0.081126	0.081126	47.85613	27.58434	0.0004	0.0061	
r>2	0.055982	0.055982	29.79707	21.13162	0.0253	0.0246	
r>3	0.013912	0.013912	15.49471	14.26460	0.3642	0.6572	
Gregory-Hansen Cointegration Tests							
	−5.80 (2009)		−4.04		0.0000		There is cointegration
Maki Cointegration Tests							
Model 0	−7.143		−6.132		0.0000		There is cointegration
Model 1	−7.067		−6.494		0.0000		There is cointegration
Model 2	-9.490		−8.869		0.0000		There is cointegration
Model 3	−11.043		−9.482		0.0000		There is cointegration

The optimal lag length for the Johansen cointegration test was identified as the sixth lag length based on the LR, FPE, and AIC information requirements

Table 4: Results of assumption tests

Test	Assumption	T or F stat	Probality
Ramsey reset	No specification errors	0.765827	0.4549
Breusch-pagan-godfrey	No heteroscadacity problems	2.766311	0.1526
White LM	No heteroscadacity problems	2.644832	0.2989
ARCH	No heteroscadacity problems	1.601685	0.2202
Autocorelattion LM	No serial correlation	1.177623	0.3349
Jarque-bera	The error terms of the regression are normally distributed.	1.05412	0.5901
Variance İnfluence factor (VIF)	Multiple linear connection	8.094823	

Table 5: Regression results

Variables	Estimation method		
	FMOLS	ARDL	CCR
LNFEXP(-1)	0.7610	0.6307***	0.8206***
	(0.0342)***	(0.0550)	(0.0397)
LNCS	0.0560	0.0767***	0.0282
	(0.0207) ***	(0.0207)	(0.0259)
LNCR	0.0946	0.1427***	0.0722***
	(0.0187) ***	(0.0263)	(0.0216)
NERT	−0.0187	−0.0230***	−0.0123***
	(0.0045)***	(0.0064)	(0.0051)
BP	−0.0255	−0.0351***	−0.0204***
	(0.0062) ***	(0.0082)	(0.0066)
Constant	1.5536 ***	2.5683***	1.3197***
	(0.4332)	(0.5266)	(0.4769)
DW	1.816957	1.669817	1.738291
F-stat	21.71949	23.72933	21.34183
	(0.000)	(0.0000)	(0.0000)
AIC	−3.209002	−3.907518	−3.357283
BSC	−2.863417	−3.312404	−3.528234
R2	0.94	0.95	0.96

5. CONCLUSION

More detailed research on the factors influencing textile demand is required, particularly in nations that import gasoline. In this perspective, it would be important to evaluate the reactions to the primary driving causes of gasoline consumption, particularly Turkey, which is one of such economies and has the highest gasoline costs. Although there have been a few recent studies analyzing gasoline demand in Turkey, no extensive research on the consequences of gasoline demand has been conducted. Furthermore, in prior studies, the data was evaluated using annual and quarterly data. In this paper, weekly data (covering the COVID-19 period and the period of severe depreciation in the Turkish lira since September 2021) were discussed in order to contribute to the literature and provide uniqueness, and analyses were carried out utilizing FMOLS, ARDL, and CCR estimate methods.

First, the stationarity of the variables was explored in the time series analysis, which was used to analyze the effect of fuel prices on fuel use in Turkey. According to the findings of the ADF, PP, ZA, and LS tests, all of the variables included a unit root in their level values and became stationary when the first differences were taken into account. Cointegration tests were then used to determine the long-term link between the variables. The results of the Johansen, Gregory-Hansen, and Maki Cointegration tests revealed that the variables have a long-term relationship. The long-run relationship between the variables was estimated using FMOLS, ARDL, and CCR estimators once the long-run relationship was determined. Various tests have also demonstrated that there are no issues such as autocorrelation, fluctuating variance, structural break, or multicollinearity that would cause the results to be biased. All three regression estimator types had no effect on the statistical significance of the variables or the signs of the coefficients. According to the data, there is a decline in fuel demand as a result of rising fuel prices and currency rates. The demand for fuel has increased in response to an increase in vehicle sales and car rentals. The findings are all statistically, econometrically, and economically significant.

The research findings also overlap with the findings of prior studies published in the literature. Park and Zhao (2010), Baranzini and Weber (2013), Brons et al. (2008), Lin and Prince (2013), and Lim and Yoo (2013) are some of the authors (2016) The findings of their investigations in nations such as the United States, Korea, Sweden, and the Netherlands are mutually exclusive of the findings of our study. constitutes suitable At the same time, the study's findings are similar to those of Hasanov (2015) and Yalta and Yalta (2016), who investigated the factors influencing gasoline demand in Turkey.

REFERENCES

Algunaibet, I.M., Matar, W. (2018), The responsiveness of fuel demand to gasoline price change in passenger transport: A case study of Saudi Arabia. Energy Efficiency, 11, 1341-1358.

Alper, C.E., Torul, O. (2009), Asymmetric adjustment of retail gasoline prices in turkey to world crude oil price changes: The role of taxes. Economics Bulletin, 29(2), 775-787.

Arzaghi, M., Squalli, J. (2015), How price inelastic is demand for gasoline in fuel-subsidizing economies? Energy Economics, 50, 117-124.

Atalla, T., Gasim, A., Hunt, L. (2018), Gasoline demand, pricing policy and social welfare in Saudi Arabia (No. ks-2017-dp04). Energy Policy, 114, 123-133.

Baranzini, A., Weber, S. (2013), Elasticities of gasoline demand in Switzerland. Energy Policy, 63, 674-680.

Bierens, H.J. (1997), Testing the unit root with drift hypothesis against nonlinear trend stationarity, with an application to the US price level and interest rate. Journal of Econometrics, 81(1), 29-64.

Bor, Ö., ˙Ismihan, M. (2013), Gasoline Pricing, Taxation and Asymmetry: The Case of Turkey, Discussion Paper. Available from: https://www.tek.org.tr/dosyalar/BOR-ISMIHAN-oil.pdf [Last accessed on 2022 06 Feb].

Brons, M., Nijkamp, P., Pels, E., Rietveld, P. (2008), A meta-analysis of the price elasticity of gasoline demand. A SUR approach. Energy Economics, 30, 2105-2122.

Chen, C., Polemis, M., Stengos, T. (2019), Can exchange rate pass-through explain the asymmetric gasoline puzzle? Evidence from a pooled panel threshold analysis of the EU. Energy Economics, 81, 1-12.

Cheung, K.Y., Thomson, E. (2004), The demand for gasoline in China:

A cointegration analysis. Journal of Applied Statistics, 31(5), 533-544.

Chou, K.W., Tseng, Y.H. (2016), Oil prices, exchange rate, and the price asymmetry in the Taiwanese retail gasoline market. Economic Modelling, 52, 733-741.

Coglianese, J., Davis, L.W., Kilian, L., Stock, J.H. (2017), Anticipation, tax avoidance, and the price elasticity of gasoline demand. Journal of Applied Econometrics, 32, 1-15.

Dahl, C.A. (2012), Measuring global gasoline and diesel price and income elasticities. Energy Policy, 41, 2-13.

Dash, D.P., Sethi, N., Bal, D.P. (2018), Is the demand for crude oil inelastic for India? Evidence from structural VAR analysis. Energy Policy, 118, 552-558.

Eltony, M.N., Al-Mutairi, N.H. (1995), Demand for gasoline in Kuwait: An empirical analysis using cointegration techniques. Energy Economics, 17(3), 249-253.

Erdogdu, E. (2014), Motor fuel prices in Turkey. Energy Policy, 69, 143-153.

Ewing, B.T., Thompson, M.A. (2018), Modeling the response of gasoline-crude oil price crack spread macroeconomic shocks. Atlantic Economic Journal, 46(2), 203-213.

Göktaş, Ö. (2005), Teorik ve Uygulamalı Zaman Serileri Analizi. İstanbul: Beşir Kitabevi.

Güngör, B.O., Ertugrul, H.M., Soytas, U. (2020), The effect of the COVID-19 outbreak on the Turkish diesel consumption volatility dynamics. Energy Research Letters, 1(3), 17496.

Hasanov, M. (2015), The demand for transport fuels in Turkey. Energy Economics, 51, 125-134.

Hughes, J.E., Knittel, C.R., Sperling, D. (2008), Evidence of a shift in the short-run price elasticity of gasoline demand (No. w12530). National Bureau of Economic Research, 29, 113-134.

Jin, J., McKelvey, M. (2019), Building a sectoral innovation system for new energy vehicles in Hangzhou, China: Insights from evolutionary economics and strategic niche management. Journal of Cleaner Production, 224, 1-9.

Johansson, P.O., Kriström, B. (2019), Welfare evaluation of subsidies to renewable energy in general equilibrium: Theory and application. Energy Economics, 83, 144-155.

Kanjilal, K., Ghosh, S. (2018), Revisiting income and price elasticity of gasoline demand in India: New evidence from cointegration tests. Empirical Economics, 55(4), 1869-1888.

Keskin, R. (2017), Yapısal kırılmalar altında türkiye'de ekonomik büyüme ve petrol tüketimi arasındaki ilişki. Yönetim ve Ekonomi Celal Bayar Üniversitesi İktisadi ve İdari Bilimler Dergisi, 24, 877-892.

Lehmann, P., Gawel, E., Strunz, S. (2019), EU Climate and Energy policy beyond 2020: Are Additional Targets and İnstruments for Renewables Economically Reasonable? In The European Dimension of Germany's Energy Transition. Switzerland: Springer. p.11-26.

Lim, K.M., Yoo, S.H. (2016), Short-run and long-run elasticities of gasoline demand: The case of Korea. Energy Sources Part B Economics, Planning and Policy, 11, 391-395.

Lin, C.Y.C., Prince, L. (2013), Gasoline price volatility and the elasticity of demand for gasoline. Energy Economics, 38, 111-117.

Melikoglu, M. (2014), Demand forecast for road transportation fuels including gasoline, diesel, LPG, bioethanol and biodiesel for Turkey between 2013 and 2023. Renewable Energy, 64, 164-171.

Mesutoğlu, B. (2001), Türkiye'de Benzin Fiyatlarındaki Gelişmeler ve Benzin Talebinin Fiyat Esnekliği üzerine bir İnceleme: (1990-1999). In Devlet Planlama Teşkilatı. Available from: https://www.ekutup.dpt.gov.tr [Last accessed on 2022 Feb 02].

Mikayilov, J.I., Mukhtarov, S., Dinçer, H., Yüksel, S., Aydın, R. (2020), Elasticity analysis of fossil energy sources for sustainable economies: A case of gasoline consumption in Turkey. Energies, 13(3), 731.

Park, S.Y., Zhao, G. (2010), An estimation of US gasoline demand: A smooth time-varying cointegration approach. Energy Economics, 32(1), 110-120.

Saelim, S. (2019), Carbon tax ıncidence on household demand: Effects on welfare, ıncome ınequality and poverty ıncidence in Thailand. Journal of Cleaner Production, 234, 521-533.

Süleymanlı, C. (2021), Macroeconomic factors affecting the volume of consumer-based problem loans in turkey: Analysis through econometric methods with structural breaks. International Journal of Business and Economic Studies, 3(1), 1-16.

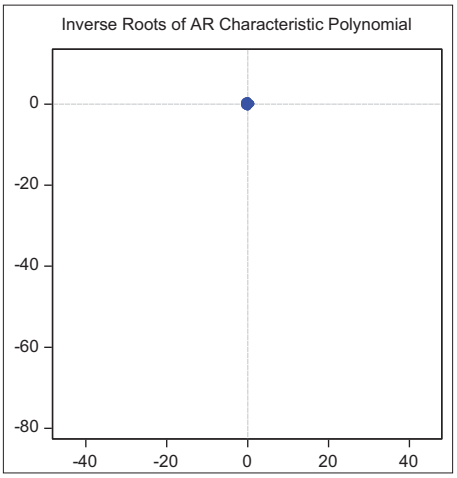
Wadud, Z. (2016), Diesel demand in the road freight sector in the UK: Estimates for different vehicle types. Applied Energy, 165, 849-857.

Yalta, A.T., Yalta, A.Y. (2016), The dynamics of fuel demand and illegal fuel activity in Turkey. Energy Economics, 54, 144-158.

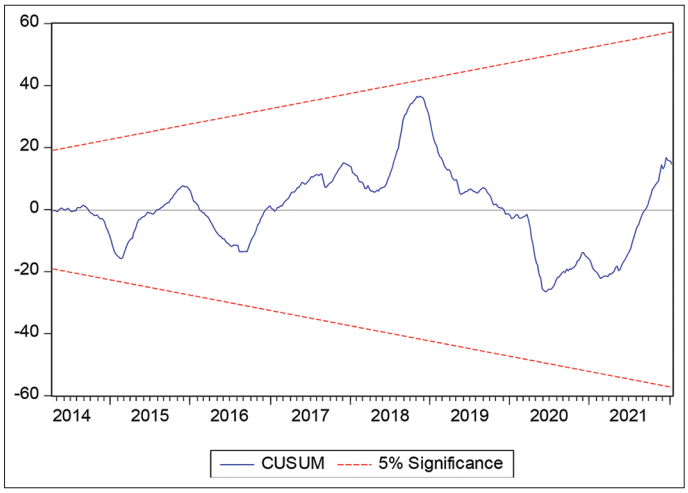
Zhu, X., Li, L., Zhou, K., Zhang, X., Yang, S. (2018), A meta-analysis on the price elasticity and income elasticity of residential electricity demand. Journal of Cleaner Production, 201, 169-177.

APPENDIX

Appendix 1: Inverse roots of AR characteristic polynomial



Appendix 2: CUSUM test result



Appendix 3: Graphics of variables