The Impact of Petrol Prices on Stock Prices of Energy Companies: A Panel Data Analysis for Turkey

Nur DilbazAlacahan[1]& Seda YavuzaslanSöylemez[2]

Abstract

The aim of this paper is to analyze the impact of petrol prices on the stock prices of energy companies traded in Istanbul Stock Exchange. To achieve this objective,quarterly panel data for 9 energy companies are examined for the period between 2009/Q2 2016/Q1. For the estimations, random effects panel data estimation method is used. According to the results, an increase inthe petrol prices has a significant and positive impact on the stock prices of energy companies. M2 money supply, gold price and interest rate on TRY are the macroeconomic variables that affectstock prices of energy companies, positively. Interest rate on USD and USD/TRY exchange rate has a negative impact on stock prices.In addition to the macro variables, ROA and capital growth are the micro variables affecting stock prices of energy companies. The impact of ROA and capital growth on stock prices is positive and significant.

Keywords: Petrol Prices, Stock Prices, Panel Data Analysis, Turkey

JEL Codes: E44, G12, E44

---

[1]Department of Banking and Finans, School of Applied Disciplines, CanakkaleOnsekiz Mart University, Biga, Canakkale, n_dilbaz@comu.edu.tr

[2]Department of Accounting and Tax, Biga Vocational School, CanakkaleOnsekiz University, Biga, Canakkale, sedaaslan@comu.edu.tr

1.Introduction

The share of petrol consumption in energy sources has been decreased from 35.96% to 32.94% from 2005 to 2015 (World Energy Council, 2016). Yet, petrolis still the most important source of energy followed by coal (29.20%) and gas (23.85) by 2015 (World Energy Council, 2016). Petrol prices are important since the production in all sectors depend on energy, and petrol is the primary resource in energy production. Increasing petrol prices cause the cost of production to increase in petrol importing countries while decreasing petrol prices cause *vice versa.*Increasing/decreasing input prices cause the prices of final goods to increase/decrease. An increase in the input prices might also cause inflationary problems due to the increases in the prices of final goods (Sadorsky, 1999).

Cost of production is not the only thing that is affected from petrol trade. There is a continuous money inflow to the petrol exporting countries from petrol importing countries, which causes foreign exchange rates of the petrol importing countries to increase. To deal with this problem, central banks of petrol importing countries increase the interest rates which lead economic actors to change the direction of their investments from stocks to government bonds and bills. This situation causes the stock prices to fall.

Petrol prices are also important for petrol importing countries' international competition. A change in the petrol prices will impact the production cost of the manufacturing companies which are also exporting. This situation has an impact on the international competition power of the manufacturing companies. That is also affecting the stock prices of these foreign trade market competitors. Moreover, theoretically, an increase in oil prices will affect the economic indicators of oil importing countries. It has a negative impact on balance of payments account while the price of exported goods declines as the value of exported goods declines and the national income decreases.

Energy is important for the growth and development of countries and is influential on many sectors, especially the industrial sector. As a direct input, a change in price of energy changes the cost of production. Particularly, a change in petrol prices not only affects the financial markets of the countries but also the stock prices.Economic units, which consider oil as an investment instrument, closely follow oil prices while making investment decisions. The reason for the negative effect of the increase in oil prices on the stock prices is attributed to the fact that petroleum-consuming companies are more than petroleum-producing companies in the world.

Turkey meets a large majority of its oil needs with imports (TURKSTAT, 2017). Turkey therefore, is a sensitive country to oil prices fluctuations. The aim of this study is to

find out if there is a significant impact of the petrol prices on stock prices of energy companies in Turkey.

In the literature, there is no particular studyfor Turkish data which empirically examines the impact of petrol prices on the stock prices of companies operates in one-particular sector: Energy. Since the changes in petrol price have a direct impact on energy sector companies and there are not enough studies examined the Turkish case from this aspect, it is believed that this study will represent a valuable contribution to the existing literature.

The organization of this paper is as follows: After section 1, section 2 gives the empirical literature about the determinants of stock prices and the impact of petrol prices on stock prices. Section 3 gives information about the data, the models used and finally analysis results. Section 4 gives the conclusion.

2.Literature Review

There are bunch of empirical studies in the literature related to this study.Some of them focused on the determinants of the stock prices while some of them on the impact of petrol prices on stock prices. However, the studies examined the impact of petrol prices on stock prices are limited especially for Turkey. There are some studies tried to find out the impact of petrol prices on stock prices for Turkey but none of them focused on companies operate in a specific sector.

Malliaris& Urrutia (1992) pointed out the simultaneous stock price fall in several stock markets after the increasing petrol prices after Gulf crisis. This is one of the very first evidences on the impact of oil price shocks on stock prices in the literature.Jones and Kaul (1996) found that the change in petrol prices have negative effects on output and real stock returnsfor the US, UK, Canada, and Japan economies using the standard cash flow/dividend valuation model.

Sadorsky (1999) noted that the increase in petrol prices has affected the stock market in the negative direction, and he pointed out that volatility in petrol prices are one of the determinants of the stock market.According to the vector autoregression results, a positive oil shock tends to have a depressing impact on both industrial production and stock returns. Park and Ratti (2008) and Basher and Sadorsky (2006) concluded the same results with Sadorsky (1999). However, according to Apergis and Miller (2009), the impact is low. Le and Chang (2011) also indicated that the impact of the petrol price changes varies among different stock markets in different countries. Cong et al. (2008) examined the impact of petrol prices on

stock prices for China using the VAR model. As a result of the study, petrol price shocks have no significant impact on China's stock market indices.

In contrast with the results of Cong *et al.*, Chittedi (2012) found a significant impact of the petrol prices on stock prices for India. Acaravcı (2013) supported this result by using error correction model for Turkey's BIST100 (Borsa Istanbul) index and petrol prices. According to the results, there is a long-term relationship between BIST100 index and petrol prices. Kapusuzoğlu (2011) concluded the same. Abdioğlu and Değirmenci (2014) found a two-way causality between petrol prices and stock returns. Zortuk and Bayrak (2016) indicated the cointegration between stock prices and petrol prices. Wang *et.al.* (2013) analyzed the impact of the petrol price volatility on stock prices using VAR model. They found that the volatility has a negative impact on stock prices. Narayan and Narayan (2010) found a positive impact of petrol prices on stock prices for Vietnam.

Table 1 shows the empirical studies analyzed the determinants of the stock prices and the relationship between stock prices and petrol prices.

Table 1. Literature Review

Author, Year	Method	Results
Malliaris& Urrutia, 1992	Granger Causality	1987 Oil Crisis hit most of the stock markets, simultaneously.
Jones & Kaul, 1996	Regression	The reaction of US and Canada's stock prices to the changes in petrol prices are highly depended on cash flow.
Sadorsky, 1999	VAR Model	Volatility has a negative impact on stock returns.
Demir, 2001	Regression	Leverage rate, market to book value, returns on capital, returns on equity and profit growth are the factors determining stock prices.
Lanza *et al.* 2005	VAR Model	An increase in the exchange rates leads to a decrease in the stock values of non-US companies.
Bahser&Sadorsky, 2006	International Multi-Factor Model	Petrol prices affects the stock prices in developing countries.
Park &Ratti, 2008	VAR Model	There is a statistically significant impact of petrol price shocks on stock returns.
Cong *et al.* 2008	VAR Model	There is no significant impact of petrol price shocks on China stock market indices.
Apergis& Miller, 2009	VAR Model	The reaction of stock returns to the changes in petrol prices is low.
Narayan & Narayan, 2010	Error Correction Model	Exchange rates and oil prices have a positive impact on stock prices of Vietnam.
Albeni& Demir, 2011	Regression	Gold prices, interest rates and exchange rate of German Mark affect stock prices in Germany.
Kapusuzoglu, 2011	Johansen Cointegration & Granger Causality	There is a long-term relationship between Borsa Istanbul 100, 50 and 30 indices and petrol prices.
Le & Chang, 2011	VAR Model	The impact of a change in the petrol prices on stock prices changes from one country to another.
Nishat, 2011	GMM	Interest rate, M2 money supply, market to book value and capital structure has a significant impact on stock prices in Pakistan.

Chittedi, 2012	ARDL Model	Changes in petrol prices has a significant impact on stock prices in India.
Acaravcı, 2013	Error Correction Model	There is long-term relationship between BIST 100 index, petrol pricesand industrial production index.
Aktaş&Akdağ, 2013	Regression	Interest rates, consumer price index, exchange rates, capacity utilization rate and consumer confidence index affect BIST 100 index.
Wang *et al.* 2013	VAR	Volatility of the petrol prices has a negative impact on stock prices.
Abdioğlu&Değirmenci, 2014	Granger Causality	There is a two-way causality relationship between petrol prices and stock returns.
Zortuk&Bayrak, 2016	Cointegration	There is a cointegration between petrol prices and stock prices.

Source:*Authors*

3. Data, Model and Analysis Results

3.1. Data

There are three data sources used to construct our quarterly panel data for our estimations. We created the micro-variables of our panel data (Leverage, ROE, ROA, Profit Growth, Capital Growth) using the financial statements of the energy sector firms. We reached the financial statements of the firms by the official website of Turkey's Public Disclosure Platform. Our panel data consists of 9 firms "AKENERJI Electric ProductionInc.", "AKSA Energy Production Inc.", "AKSU Energy and Trade Inc.", "AYEN Energy Inc.", "AYGAZ Inc.", "PETKIM Petrochemical Holding Inc.", "TURCAS Petroleum Inc.", "TUPRAS-Turkish Petroleum Refineries Inc." and "ZORLU Energy Electricity Production Inc.". Our time period contains 28 quarters between 2009/Q2 and 2016/Q1. We used U.S. Energy Information Administration data for Brent Crude Oil (petrol) prices. For the other macro variables (M2 Money Supply, Gold Price, Interest Rate, Exchange Rate) from Electronic Data Delivery System of Central Bank of the Republic of Turkey.

3.2. Model

In our estimations, we used the following econometric model to identify the determinants of energy companies' stock prices:

$$SP_{it} = \beta_0 + \beta_1 PP_{it} + \beta_2 M2_{it} + \beta_3 GP_{it} + \beta_4 ITRY_{it} + \beta_5 IUSD_{it} + \beta_6 LEV_{it} + \beta_7 ROA_{it}$$
$$+ \beta_8 ROE_{it} + \beta_9 PG_{it} + \beta_{10} CG + \beta_{11} YD + \varepsilon_{it}$$

(1)

Where SP_{it} represents the natural logarithm of the quarterly average stock prices of the energy sector companies, PP_{it} represents the quarterly Brent Crude Oil prices, $M2_{it}$ represents the natural logarithm of quarterly M2 money supply of the Central Bank of

the Republic of Turkey, GP_{it} represents natural logarithm of quarterly average gold price (gram/TRY) $ITRY_{it}$ represents the quarterly interest rate for Turkish Lira, $IUSD_{it}$ represents the quarterly interest rate for U.S. Dollar, LEV_{it} represents the leverage, ROA_{it} represents the return on assets, ROE_{it} represents the return on equity, PG_{it} represents the profit growth, CG_{it} represents capital growth and YD represents the dummy variables for years. Additionally, i and t indicate firm and time, respectively.

3.3. Analysis Results

To determine the impact of petrol (Brent Crude Oil) on stock prices of energy companies in Turkey, we used random effects regression method. We used random effects panel data method because it gives the most reliable results due to the data is firm leveldata (Baltagi, 2008).

We used quarterly data of 9 energy companies traded in Borsa Istanbul for the period 2009/Q2-2016/Q1. Table 2 gives the random effects estimation results. According to our estimation results, obviously, an increase in petrol prices affects Turkish energy firms' stock prices negatively. This result is significant in the 0.01% level.Considering the aspects that petrol as the most important raw material for energy companies and they sell the petrol or its derivatives, this result is quite meaningful. Because these companies are importing petrol and selling petrol products directly, and these price changes are directly reflected to the individual and corporal investors.When the price of BrentCrude Oilfalls, it leads the cost of production of energy companies to decrease which leads investors to buy more of stock shares of energy companies.

According to the estimation results M2 money supply, gold price and interest rate on TRY are the macroeconomic variables that affect stock prices of energy companies, positively. Table 2 shows that interest rate on USD and USD/TRY exchange rate has a negative impact on stock prices. In addition to the macro variables, we used some firm-level financial variables of the firms.

Accordingly, ROE and capital growth are the micro variables affecting stock prices of energy companies. The impact of ROE and capital growth on stock prices is positive and significant. Standard errors are robusted according to the 9 firms used in the analysis. All in all, the results show that investment behavior of the individual and corporal investors who trade the stock shares of energy companies of Borsa Istanbul affected from changes in the petrol prices. As the petrol price falls, the stock prices of the energy firms ("AKENERJI Electric Production Inc.", "AKSA Energy Production Inc.", "AKSU Energy and Trade Inc.",

"AYEN Energy Inc.", "AYGAZ Inc.", "PETKIM Petrochemical Holding Inc.", "TURCAS Petroleum Inc.", "TUPRAS-Turkish Petroleum Refineries Inc." and "ZORLU Energy Electricity Production Inc.") rises.

Table 1. Random Effects Regression Results

Dependent Variable: (ln) Stock Price **Variables**	
(ln) Petrol Price	-0.379***
	(0.0962)
(ln) M2 Money Supply	2.139***
	(0.317)
(ln) Gold Price	1.065***
	(0.198)
Interest Rate (TRY)	0.197***
	(0.0197)
Interest Rate (USD)	-0.0953**
	(0.0453)
Exchange Rate (USD/TRY)	-1.715***
	(0.164)
Leverage	-0.499
	(0.855)
ROE	1.31e-05**
	(6.68e-06)
ROA	0.605
	(0.525)
Profit Growth	-0.00352
	(0.00343)
Capital Growth	0.00128***
	(0.000436)
Constant	-43.89***
	(6.654)
Observations	231
Number of Firms	9

Robust standard errors in parentheses

(*** $p<0.01$, ** $p<0.05$, * $p<0.1$)

4.Conclusion

Petrol price, its volatility and its trend are very important factors for almost all economies. Specifically, for the petrol importing economies, the price elasticity of the demand for petrol is low because the petrol is the primary energy source. Because of the price elasticity of the demand for petrol is low in petrol importing economies, vulnerability of these countries towards petrol price volatility is high.This situation proves the importance of forecasting the possible impacts of these price shocks on petrol importing countries.

As a petrol importing country, Turkey meets most of its energy need from petrol products. Importing a large amount of petrol continuously is not only worsen the current account balance, but also creates a fragility among its economic actors due to the volatile

petrol prices. Countries like Turkey (highly depended on the foreign resources for energy), obviously, will be affected from the petrol prices shocks.To reduce the impact, they should decrease their dependency on foreign resources. Using renewable energy resources would be one of the most effective solutions for this problem.

In this study we aimed to find out what is the impact of the petrol prices on energy companies' stock prices. We used random effects panel data regression methodin our analysis. We analyzed the data of 9 energy sector companies of Turkey's Borsa Istanbul (a.k.a. Istanbul Stock Exchange) for the period 2009/Q1-2016/Q2.

For the selected sample, an increase in the petrol prices affects the stock prices of energy companiesnegatively. In addition to the petrol prices, change in gold prices, M2 money supply, interest rate on TRY, interest rate on USD, ROE and capital growth are the variables affecting the stock prices of 9 energy companies of Turkey's Borsa Istanbul (BIST). In particular, change in gold prices,M2 money supply, interest rate on Turkish Lira, and capital growth positively affects the stock prices while interest rate on USD, and USD/TRY exchange rate, have a significant negative impact on stock prices.

References

Abdioğlu, Z., &Değirmenci, N. (2016). Petrol FiyatıŞoklarınınHisseSenediGetirileriÜzerindekiEtkileri. *TISK Academy/TISK Akademi*, *11*(22).

Acaravcı, S. ve İ. Reyhnoğlu (2013). EnerjiFiyatlarıveHisseSenediGetirileri: Türkiyeekonomisiiçin Bir Uygulama*NevşehirHacıBektaşVeliÜniversitesiSosyalBilimlerEnstitüsüDergisi 3 (2013) 94-110.*

Aktaş, M. veAkdağ, (2013).Türkiye'deEkonomikFaktörlerinHisseSenediFiyatlarıileİlişkilerininaraştırılmasıUluslararasıSosyal Alan araştırmalarıDergisiCilt 2, Sayı. 1.

Albeni, M., ve Demir, Y. (2011). Makro EkonomikGöstergelerin Mali Sektör Hisse SenediFiyatlarınaEtkisi (İMKB Uygulamalı). *SosyalveBeşeriBilimlerAraştırmalarıDergisi*, 1(14).

Apergis, N. ve Miller, S. M. (2009). Do Structural Oil-Market Shocks Affect Stock Prices? *Energy Economics*, 31, 569-575.

Baltagi, B. (2008). Econometric Analysis of Panel Data. John Wiley & Sons.

Basher, S. A veSadorsky, P. (2006). Oil Price Risk and Emerging Stock Markets, *Global Finance Journal*, 17, 224-251.

Chittedi, K. R. (2012), Do Oil Prices Matters For Indian Stock Markets? An Empirical Analysis", Journal of Applied Economics and Business Research, 2(1), 2-10.

Cong, R., Wei, Y., Jiao, J. and Fan, Y. (2008). Relationships Between Oil Price Shocks and Stock Market: An Empirical Analysis from China, *Energy Policy*,36, 3544-3553.

Demir,   Y.   (2001).   HisseSenediFiyatınıEtkileyenİşletmeDüzeyindekiFaktörlerlerve   Mali SektörÜzerineİMKB'de Bir Uygulama,SüleymanDemirel Üniversitesi,İ.İ.B.F.,Cilt.6,Sayı 2;109-130.

EIA (2017) U.S. Energy Information Administration, Brent Crude Oil Prices, https://www.eia.gov/

Hausman, J.A., 1978. Specification Tests in Econometrics. Econometrica 46, 1251–1271.

Jones, C.M ve Kaul, G. (1996). Oil and Stock Markets, Oil and The Stock Markets, *The Journal of Finance*, 51(2), 463-491.

KAP (2017) KAP Financial Statements of Firms Trade in Istanbul Stock Exchange, Income Sheets & Balance Sheets https://www.kap.org.tr/en/

KapusuzoğluA.(2011). Relationships Between Oil Price and Stock Market: An Empirical Analysis from Istanbul Stock Exchange (ISE), *International Journal of Economics and Finance*, 3(6), 99-106.

Lanza, A., Manera, M., Grasso, M., veGiovannini, M. (2005). Long-run Models of Oil Stock Prices. *Environmental Modelling & Software*, *20*(11), 1423-1430.

Le, T. H., Chang, Y. (2011). The Impact Of Oil Price Fluctuations on Stock Markets in Developed and Emerging Countries", Munich Personal RepECArchieve, No: 31753 , 1-36.

Malliaris, A.G., Urritia, J.L. (1992). The International Crash Of October 1987: Causality Tests, The Journal of Financial and Quantitative Analysis, 27(3), 353-364.

Narayan, P. K., ve Narayan, S. (2010). Modelling the Impact of Oil Prices on Vietnam's Stock Prices. *Applied Energy*, *87*(1), 356-361.

Nishat, M. (2011). The Determinants of Stock Prices in Pakistan. *Asian Economic and Financial Review*, *1*(4), 276.

Sadorsky, P. (1999), Oil Price Shocks and Stock Market Activity, Energy Economics, 2, 449-469.

TCMB (2017) Electronic Data Delivery System of Turkish Central Bank https://evds2.tcmb.gov.tr/

Wang, Y., Wu.,C.ve Yang, L. (2013). Oil Price Shocks and Stock Market Activities: Evidence from Oil-Importing and Oil-Exporting Countries, *Journal of Comparative Economics*, 41, 1220-1239.

World Energy Resources, 2016, World Energy Council. https://www.worldenergy.org/wp-content/uploads/2016/10/World-Energy-Resources-Full-report-2016.10.03.pdf

Zortuk, M. ve S. Bayrak (2016) Ham Petrol FiyatŞokları - HisseSenediPiyasasıİlişkisi: ADL EşikDeğerliKoentegrasyonTestiEskişehirOsmangaziÜniversitesi İİBF Dergisi, Nisan 201611(1), 7-22.