The Effects of oil prices on stock returns in MENA countries: A firm-level data analysis

F. İrem Doğan[1] Baykar Silahli[2] Atilla Cifter*,[3] Gokhan H. Akay[4]

Abstract

This paper examines the effect of oil price on real stock returns in MENA countries. We use a panel of stock indexes from ten MENA countries: Egypt, Israel, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, and Turkey. We employ extended version of the arbitrage pricing theory developed by Hamilton (1983) and Chen et al. (1986). These studies include oil prices as one of the determinant of stock returns. The estimation is conducted using the generalized method of moments-system approach, and the data consist of a balanced panel of 481 firms during the period June 2005- June 2015. The results indicate that oil prices impact real stock returns positively for MENA countries. We find that the effect of oil prices on real stock returns is higher for small firms than medium and large firms, and varies at the industry level. Oil prices significantly affects real stock returns in manufacturing, services, and wholesale and retail industries, and it has no effect in construction industry.

Keywords: Oil prices, real stock returns, firm-level analysis, MENA countries.

JEL classification: Q43, E44, C23.

* *Corresponding Author*

[1,4] Department of International Trade, Istanbul Kemerburgaz University, Istanbul, Turkey. *E-Mails:* *irem.dogan@kemerburgaz.edu.tr*; *gokhan.akay@kemerburgaz.edu.tr.*

[2,3] Department of International Logistics Management, Istanbul Kemerburgaz University, Istanbul, Turkey. *E-Mail:* *baykar.silahli@kemerburgaz.edu.tr;* *atilla.cifter@kemerburgaz.edu.tr.*

1. Introduction

Oil as a one of the most vital resources in the world shapes our life. The whole world is affected by what happens to trend of the price of oil. After the first oil crises of 1973, oil price movements have become crucial features of the economic indicators. Oil price shocks play an important role in influencing world's both economic and political environments.

During the past three decades, many studies have estimated the impact of oil price variability on stock returns for different countries[5]. Early seminal papers such as Hamilton (1983) and Chen *et al. (*1986) show that oil price changes have negative impact on the macroeconomic indicators. There is mixed literature to link between the price of oil and stock returns. Hamao (1989) reports that there is no evidence between the oil price and stock returns for Japanese stock market. On the other hand, Sadorsky (1999) that there is a negative relationship between oil prices and stock returns for U.S by using vector autoregression model. (VAR). Papapetrou (2001) states that oil price changes affect real economic activity and employment by employing the vector autoregression (VAR) model for Greece. Henriques and Sadorsky (2008) examine the relationship between energy and technology stock prices, oil prices and interest rates for US using VAR model. They conclude that technology and oil prices affect stock prices positively. There are limited number of studies focusing on the link between oil price and stock returns at sectoral level. Nandha and Faff (2008) investigate the impact of oil price shocks on stock market for 35 global industry indices for the period from April 1983 to September 2005. According to their study, oil prices negatively affects stock returns for all sectors except mining, oil and gas industries. Also, there are studies examine the relationship between oil price and stock returns by using panel of countries. Park and Ratti

[5] See Kling (1985), Jones and Kaul (1996), Kilian and Park(2009), Sim and Zhou(2015)

(2008) investigate the effect of oil prices on stock returns for the U.S. and 13 European countries for the period of 1986-2005. They conclude that oil price shocks have statistically significant effect on stock returns. Jones and Kaul (1996) test whether the relationship between oil prices and stock returns can be explained by future changes in real cash flows and/or changes in expected returns for four developed countries: US, Canada, Japan, and England. They report that the relationship between oil prices and stock returns can be explained by the impact of real cash flows. However, the effects of real cash flows are not very strong for Japan and the UK. Filis and Chatziantoniou (2014) investigate the financial and monetary policy responses to oil price shocks in oil-importing and oil-exporting countries. They find that oil prices negatively affect the stock returns in oil-importing countries whereas it positively affects the stock returns in oil-exporting countries. Mohanty et al. (2011) study oil price movements and stock market returns by investigating Gulf Cooperation Council (GCC) countries. They find that increase of oil prices has a positive effect on stock market (except Kuwait) for many industries. Akoum et al. (2012) examine the short term and long term dependencies between stock market returns and oil prices for the six GCC countries. They find that oil and stock returns are not strongly linked in the short term, whereas they are strongly linked in the long term. Awartani and Maghyered (2013) investigate the spillover between oil prices and stock returns in the GCC countries. They find that both of the volatility and returns are bi-directional.

This note investigates the effect of oil price on real stock returns in MENA countries. We employ a panel of stock indexes from ten MENA countries: Egypt, Israel, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, and Turkey. We use extended version of the arbitrage pricing theory (APT) developed by Hamilton (1983) and Chen et al. (1986) since these studies include oil prices as a determinant of real stock returns. The estimation is conducted using the generalized method of moments-system approach, and the data consist of a balanced panel of 481 firms during the period June 2005- June 2015. The results indicate that oil prices impact real stock returns positively for MENA countries. We find that the effect of oil prices on real stock returns is higher for small firms than medium and large firms and varies at the industry level. Oil prices significantly affects real stock returns in manufacturing, services, and wholesale and retail industries, and it has no effect in construction industry.

The reminder of the paper is as follows. Section 2 discusses data. Section 3 presents empirical methodology. Section 4 shows the empirical results and section 5 provides conclusions.

2. Data

We use a panel of stock indexes from financial and non-financial firms from ten MENA countries: Egypt, Israel, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, and Turkey[6]. We use the extended version of the APT developed by Hamilton (1983) and Chen *et al.* (1986). These studies included oil prices as a determinant of stock returns. We employ monthly firm-level stock returns[7] obtained from Osiris (Bureau van Dijk) database. This database contains over 80,000 firm-level data up to 20 years. We select 481 firms from this database due to data availability in these ten MENA countries. Industrial production index, interest rates, and exchange rates are used as control variables, and we obtained the control macro variables from International Financial Statistics (IMF). We obtain monthly oil prices from U.S. Energy Information Administration. The time period is between June 2005-June 2015 and all the variables are used as log difference. The sectors are categorized

[6] These countries are selected based on data availability.
[7] Real stock returns used as inflation adjusted stock returns.

according to North American Industry Classification System (NAICS), and we categorized the firms with four industries: construction, manufacturing, services, and wholesale and retail. These main industries are selected based on data availability[8]. We test the effect of oil prices on stock returns for each of these sectors. We also categorize the firms according to their size. The Commission of the European Communities (1992) and Eyre and Smallman (1998) define the groups as micro and small firms (1 to 99 employees), medium-sized firms (100 to 499 employees), and large firms (500 or more employees).

Table 1A shows distribution of firms, and Table 2A shows definitions of dependent and independent variables. Table 1 illustrates descriptive statistics and correlation matrix of the variables. Panel B of Table 1 reports the correlation coefficients. Since the independent variables are weakly correlated, we do not find that there is a multicollinearity problem between independent variables.

Table 2 reports the IPS and the Fisher type panel unit root tests. The tests are conducted including only constant as well as a constant and a deterministic trend. Table 3 shows that the null of unit root hypothesis could be rejected according to the IPS and the Fisher type panel unit root tests. We, therefore, concluded that panel data series are stationary.

[8] We classified the firms under an industry with at least ten firms. We excluded energy and holding firms since the number of firms is less than ten firms in these industries.

Table 1. Descriptive statistics and correlations

Panel A: Descriptive Statistics					
	Obs.	Mean	Std.Dev.	Min.	Max
R_{it}	58201	-0,0047	0,1574	-8,4125	4,4092
IP_{it}	58201	0,0022	0,0767	-0,3639	0,2821
Int_{it}	58201	-0,0098	0,1167	-1,6017	0,8979
$Exch_{it}$	58201	0,0013	0,0245	-0,0699	0,1935
Oil_{it}	58201	0,0019	0,0900	-0,3109	0,1959
Panel B: Correlations					
	R_{it}	IP_{it}	Int_{it}	$Exch_{it}$	Oil_{it}
R_{it}	1				
IP_{it}	-0,0144	1			
Int_{it}	-0,0240	0,0214	1		
$Exch_{it}$	-0,1427	0,0062	-0,0575	1	
Oil_{it}	0,1221	0,0580	0,0306	-0,0332	1

Table 2. Panel unit root tests

	Fisher-type		IPS	
Variables	η_μ	η_τ	η_μ	η_τ
R_{it}	-158,716***	-149,071***	-110,4490***	-110,388***
IP_{it}	-183,957***	-182,777***	-6,190***	-6,420***
Int_{it}	-142,507***	-132,521***	-6,172***	-6,395***
$Exch_{it}$	-165,248***	-155,848***	-6,185***	-6,420***
Oil_{it}	-22,645***	-22,649***	-7,622***	-6,614***

Notes: The number of lags in the Fisher-type and the IPS tests has been selected using the Schwarz information criterion. * Indicates rejection of the unit root hypothesis at the 1% significance level. η_μ, η_τ are the two statistics for the null of stationarity around a constant and the null of stationarity around a constant and a deterministic trend, respectively.

3. Methodology

Asset prices can be predicted with two main prediction model, namely capital asset pricing model (CAPM, Sharpe, 1964; Lintner, 1965) and arbitrage pricing theory (APT, Ross, 1976). The CAPM uses a single factor whereas the APT uses multiple macroeconomic factors. Chen (1983) finds that the APT performs well against the CAPM for S&P 500. To investigate the effect of oil prices on stock returns, we use extended version of APT developed by Hamilton (1983) and Chen et al. (1986). These studies include oil prices as a determinant of real stock returns. We selected is industrial production, short term interest rates, exchange rates as control macroeconomic variables. There variables are also used in Chen et al. (1986), Priestley (1996), Antoniou et al. (1998), and Azeez and Yonezawa (2006). We used the following extended version of the APT:

$$R_{it} = \alpha + \beta_1 R_{it-1} + \beta_2 IP_{it-1} + \beta_3 Int_{it-1} + \beta_4 Exch_{it-1} + \beta_5 Oil_{it-1} + \varepsilon_{it} \tag{1}$$

Where *R* is real stock returns, *IP* is industrial production, *Int* is short term interest rates, *Exch* is exchange rates, *Oil* is oil prices, and ε is error term. We use the lags of the independent variables to find the announcement effects on stock returns. We expect that *IP* positively affects real stock returns, whereas *Int* and *Exch* negatively affect real stock returns. Following Mohanty et al. (2011) and Filis and Chatziantoniou (2014), we expect that hat oil prices has a positive effect on stock returns for MENA countries. We use the generalized method of moments-system approach with two-step procedure for consistent and efficient estimators[9].

4. Empirical findings

Short-run effects of oil prices on the stock returns are estimated with the two step GMM-system. The results are shown in Table 5 and 6. Since the pooled OLS is not an efficient panel data estimation technique, we test the effect of oil prices with the two-step GMM-system and instrumental variable approaches. Three diagnostic test statistics are reported for the GMM-

[9] See Zivot and Wang (2006) for detailed discussion of two-step procedure.

system estimation: (1) Wald test of joint significance, (2) Hansen test of over identifying restrictions, and (3) for zero autocorrelation up to order two. The Wald test statistics indicate that the oil prices, and all control variables are jointly significant at a 1% level in the GMM-system estimation for all firms, even for small, medium, and large firms. The Arellano-Bond (1991) test shows that the AR (1) test rejects the null hypothesis of no first-order autocorrelation, and that the AR (2) test does not reject the null hypothesis of no second order autocorrelation of residuals. The null hypothesis of the validity of the instruments set should be accepted based on the Hansen[10] test. According to the two-step GMM-system estimation, oil prices are a statistically significant determinant of stock returns.

Table 3 presents GMM-system estimates for all firms the size-based results described in Eq. (1), and Figure 1 shows the coefficients of oil prices for all firms, and the firm size estimations. Significant negative coefficient of the lag of real stock returns indicates that there is asymmetric effect in the stock markets. Concerning all firms, in line with expectations, oil prices are positive and statistically significant. Control variables' coefficients are significant and negative since increase in the industrial production, interest rates, and exchange rates makes stock returns to decline. As it is shown in Figure 1, oil price coefficient is 0.122 for medium firms, 0.107 for large firms, and 0.182 for small firms. It might be the case that small firms are less likely to be affected and engage in export-import activities.

[10] The Hansen test -shows p-value for second hypothesis for second order serial correlation- is used since we use two step GMM estimator (see Roodman (2006) for more) and not Sargan test.

Table 3. GMM-System Estimates

	All firms	*Small firms*	*Medium firms*	*Large firms*
Constant	-0.006***	-0.013***	-0.005***	-0.005***
	(-10.88)	(-8.37)	(-6.05)	(-5.50)
R_{it-1}	-0.062***	-0.118*	-0.002	-0.089**
	(-2.60)	(-1.86)	(-0.10)	(-2.27)
IP_{it-1}	0.022***	-0.003	0.023	0.031***
	(2.48)	(-0.05)	(1.28)	(2.59)
Int_{it-1}	-0.046***	-0.054***	-0.045***	-0.043***
	(-8.93)	(-3.10)	(-4.72)	(-6.39)
$Exch_{it-1}$	-0.190***	-0.512**	-0.106*	-0.197***
	(-4.91)	(-1.95)	(-1.71)	(-4.22)
Oil_{it-1}	0.122***	0.182***	0.122***	0.107***
	(14.37)	(6.22)	(8.61)	(9.10)
Wald test	0.000	0.000	0.000	0.000
Hansen test	1.000	1.000	1.000	1.000
Diff-in-Hansen tests	1.000	1.000	1.000	1.000
Arellano-Bond test for AR(1)	0.000	0.001	0.000	0.000
Arellano-Bond test for AR(2)	0.151	0.311	0.425	0.272
Observations	57720	8760	18120	30840
Number of instruments	1186	1186	1186	1186

Notes: *, **, *** indicate a significance of 10%, 5%, and 1% respectively. The numbers in brackets are the t-statistics. The Hansen test shows the validity of the instrumental variables, and the null hypothesis is that the instruments are not correlated with the residuals. The Diff-in-Hansen test Diff Hansen reports the p-value for the validity of the additional moment restrictions required by the system-GMM. AR(1), and AR(2) show p-values of Arellano-Bond autocorrelation tests. The null hypothesis for AR(1) is that the first-differenced regression error term has no first-order serial correlation, and the null hypothesis for AR(2) is that the first-differenced regression error term has no second-order serial correlation.

Table 4 reports industry-based analysis and Figure 2 shows the coefficients of oil prices for significant industries. We find that oil price coefficient of the firms, βs,it, becomes statistically insignificant for construction industry in Table 6. However the Wald tests indicate that all of the industries are statistically significant with positive signs, except construction industry. The results suggest that the effect of firm- and macro-specific factors on oil price varies among industries. For the manufacturing industry, control variables such as interest rate and exchange rate are statistically significant with negative coefficients. For the services industry interest rate and exchange rate are negative and significant while industrial production is significant with positive coefficient. For the wholesale and retail industry, none of the control variables are statistically significant.

Table 4. Industry-based GMM-System Estimates

	Construction	Manufacturing	Services	Wholesale and Retail
Constant	-0.015**	-0.004***	-0.008***	-0.006*
	(-2.33)	(-4.63)	(-10.36)	(-1.95)
R_{it-1}	0.187	-0.054	-0.087**	-0.016
	(0.48)	(-1.62)	(-2.19)	(-0.29)
IP_{it-1}	0.393	0.010	0.033***	0.065
	(0.71)	(0.69)	(2.79)	(0.77)
Int_{it-1}	-0.381	-0.026***	-0.052***	-0.082
	(-1.13)	(-2.86)	(-7.15)	(-1.04)
$Exch_{it-1}$	-1.912	-0.175***	-0.210***	-0.137
	(-0.50)	(-3.97)	(-2.53)	(-0.47)
Oil_{it-1}	0.140	0.119***	0.123***	0.109***
	(0.16)	(9.25)	(9.04)	(2.67)
Wald test	0.696	0.000	0.000	0.001
Hansen test	1.000	1.000	1.000	1.000
Diff-in-Hansen tests	1.000	1.000	1.000	1.000
Arellano-Bond test for AR(1)	0.211	0.000	0.000	0.002
Arellano-Bond test for AR(2)	0.845	0.426	0.195	0.977
Observations	1440	27240	25320	3720
Number of instruments	1186	1186	1186	1186

Notes: *, **, *** indicate a significance of 10%, 5%, and 1% respectively. The numbers in brackets are the t-statistics. The Hansen test shows the validity of the instrumental variables, and the null hypothesis is that the instruments are not correlated with the residuals. The Diff-in-Hansen test Diff Hansen reports the p-value for the validity of the additional moment restrictions required by the system-GMM. AR(1), and AR(2) show p-values of Arellano-Bond autocorrelation tests. The null hypothesis for AR(1) is that the first-differenced regression error term has no first-order serial correlation, and the null hypothesis for AR(2) is that the first-differenced regression error term has no second-order serial correlation.

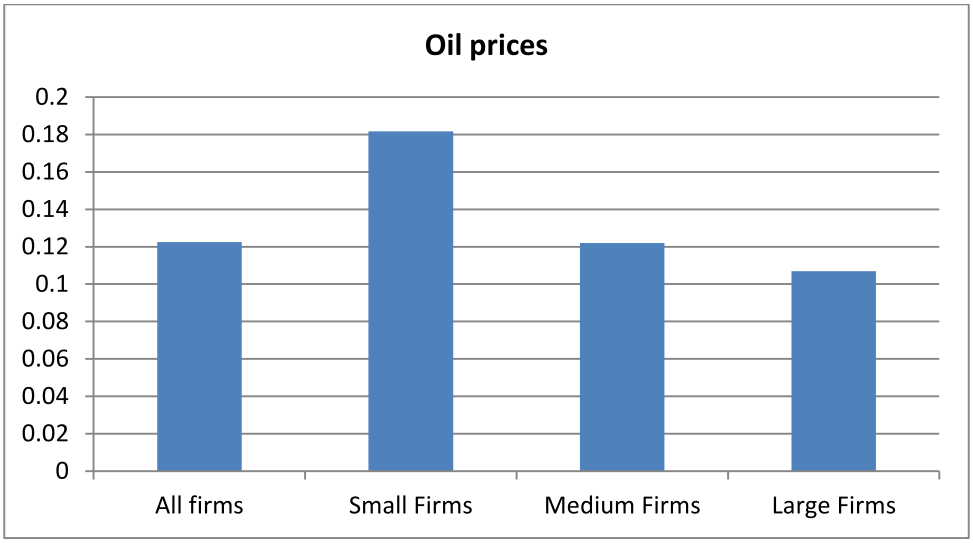

Figure 1. Coefficients of oil prices based on the firm size

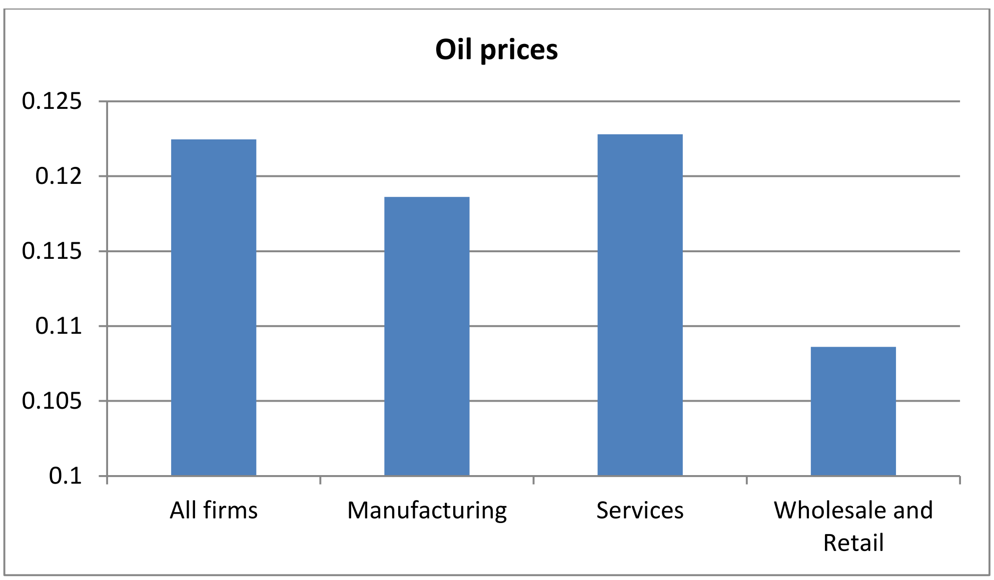

Figure 2. Coefficients of oil prices based on the industries

5. Conclusion

This note investigates the effect of oil price on real stock returns in MENA countries. We employ a panel of stock indexes from ten MENA countries: Egypt, Israel, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, and Turkey. The estimation is conducted using the generalized method of moments-system approach, and the data consist of a balanced panel of 481 firms during the period 2005-2015. Oil prices and its exporting-as well as importing- is a growing part of the economies of the MENA countries since it is one of the most vital resources in the world shapes our life. The whole world is affected by what happens to trend of the price of oil.

For this purpose, this note employs the generalized method of moments-system approach, and the data consist of a balanced panel of 481 firms during the period 2005-2015. The empirical results demonstrate that oil prices positively affect the real stock returns. We find that the effect of oil prices on real stock returns is higher for small firms than medium and large firms and varies at the industry level. Oil prices significantly influences real stock returns in manufacturing, services, and wholesale and retail industries, and it has no effect in construction industry. The present paper can be used to provide important recommendation on energy policy in sectoral level.

Appendix

Table 1A. Distribution of Firms

Countries	Number of Firms	Sectors	Number of Firms
Egypt	17	Construction	12
Israel	86	Manufacturing	227
Jordan	57	Services	211
Kuwait	43	Wholesale and Retail	31
Morocco	22		
Oman	14		
Qatar	19		
Saudi Arabia	61		
Tunisia	20		
Turkey	142		
TOTAL	**481**	**TOTAL**	**481**

Source: Osiris (Bureau van Dijk) database.

Table 2A. Definitions and source of the variables

Variables	Definitions	Sources
R_{it}	Log-difference of the firms' real stock returns	Stock returns: Bureau van Dijk's Orbis database[a], Inflation rates (CPI): International Financial Statistics of International Monetary Fund[b]
IP_{it}	Log-difference of industrial production indexes	International Financial Statistics of International Monetary Fund[b]
Int_{it}	Log-difference of short-term interest rates (1-3 months)	International Financial Statistics of International Monetary Fund[b]
$Exch_{it}$	Log-difference of foreign exchange rates (National Currency per SDR)	International Financial Statistics of International Monetary Fund[b]
Oil_{it}	Log-difference of Europe Brent Spot Price FOB	U.S. Energy Information Administration[c]

[a] https://osiris.bvdinfo.com/version-2016120/home.serv?product=osirisneo
[b] http://elibrary.imf.org/
[c] http://tonto.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=RBRTE&f=M

References

Akoum, I., Omran, M., Graham, M., Kivihaho, J., Nikkinen, J., 2012, Co-movement of oil and stock prices in the GCC region: A wavelet analysis, *Quarterly Review of Economics and Finance* 11, 52(4): 385–394.

Azeez, A.A., Yonezawa, Y., 2006, Macroeconomic factors and the empirical content of the Arbitrage Pricing Theory in the Japanese stock market, *Japan and the World Economy* 18, 568-591.

Awartani, B., Maghyereh, A. I., 2013, Dynamic spillovers between oil and stock markets in the Gulf Cooperation Council countries, *Energy Economics* 36, 28-42.

Chen, N., 1983, Some empirical tests of the theory of arbitrage pricing, *Journal of Finance* 38(5), 1393-1414.

Chen, N., Roll, R., Ross, S. A., 1986, Economic Forces and the Stock Market, *Journal of Business* 59(3), 383-403.

Choi, I., 2001, Unit root tests for panel data. *Journal of International Money and Finance* 20, 249-272.

Eyre, P., Smallman, C., 1998, Euromanagement Competences in Small and MediumSized Enterprises: A Development Path for New Millennium?, Management Decision, 36(1), 34-42.

Filis, G., Chatziantoniou, I., 2014, Financial and monetary policy responses to oil price shocks: evidence from oil-importing and oil-exporting countries, *Review of Quantitative Finance and Accounting* 42 (4), 709-729

Hamao, Y., 1989, An empirical examination of the arbitrage pricing theory: using Japanese data, *Japan and the World Economy* 1, 45-61.

Hamilton, J.D., 1983, Oil and the macroeconomy since World War II, *Journal of Political Economy* 92 (2), 228-248.

Henriques, I., Sadorsky, P., 2008, Oil prices and the stock prices of alternative energy companies, *Energy Economics* 30 (2008) 998-1010.

Im, K. S., Pesaran, M. H., Shin, Y., 2003, Testing for unit roots in heterogeneous panels. *Journal of Econometrics* 115, 53-74.

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

Lintner, J., 1965, The valuation of risk assets and the selection of risky investments in stock portfolio and capacity budgets. *Review of Economics and Statistics* 47, 13–37.

Mohanty, S. K., Nandha, M., Turkistani, A. Q., Alaitani, M. Y., 2011, Oil price movements and stock market returns: Evidence from Gulf Cooperation Council (GCC) countries, *Global Finance Journal* 22, 42-55.

Nandha, M., Faff, R., 2008, Does oil move equity prices? A global view, *Energy Economics* 30 (2008) 986-997.

Papapetrou, E., 2001, Oil price shocks, stock market, economic activity and employment in Greece, *Energy Economics* 23, 511-532.

Park, J., Ratti, R. A., 2008, Oil price shocks and stock markets in the U.S. and 13 European countries, *Energy Economics* 30, 2587-2608.

Priestley, R., 1996, The arbitrage pricing theory, macroeconomic and financial factors, and expectations generating processes, *Journal of Banking and Finance* 20, 869-890.

Roodman, D., 2006, How to do xtabond2: An introduction to difference and system GMM in Stata. Center for Global Development Working Paper, No.103.

Ross, S.A., 1976, The arbitrage theory of capital asset pricing, *Journal of Economic Theory* 13, 341-60.

Sadorsky, P., 1999, Oil price shocks and stock market activity, *Energy Economics* 21, 449-469.

Sharpe, W., 1964, Capital asset prices: a theory of market equilibrium under conditions of risk. *Journal of Finance* 19, 425–442.

Zivot, E., Wang, J. 2006, Modeling Financial Time Series with S-PLUS®. Springer.