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The Turkish Stock Market Integration with Oil Prices: Cointegration Analysis with Unknown Regime Shifts

Summary: Oil prices are often considered as a vital economic factor due to the dependence of the world economy on oil. The goal of this paper is to contribute to the literature on the dynamic relationship between oil prices and stock prices under the presence of possible structural breaks in an emerging market, Turkey. The empirical evidence suggests that the oil prices are important in explaining the stock market movements. Stock prices, oil prices and nominal exchange rates are found as cointegrated after taking structural breaks into account. Moreover, results of parameter stability test are consistent with our findings indicating that relationship between series is strong in the long-run. The results are important in the way that they show the global factors are also dominant on the Turkish stock market.

Key words: Cointegration, Oil price, Stock market, Structural breaks, Turkey.

JEL: G10, C22.

Turkey is a dynamic economy, an emerging market in the intersection of Europe and Asia, with a population of about 70 million. Due to the fact that Turkey is not an oil producing country, she imports oil and is vulnerable to changes in the global oil prices. Turkish stock market, namely Istanbul Stock Exchange (ISE), is an emerging market with approximately three billion dollars of transaction volume in 2011. Since Turkey is an emerging economy, various downturns have been experienced. These downturns have created the structural breaks on the macroeconomic variable and also on stock exchange indices. On this paper we want to emphasize the importance of the structural breaks and possible forecasting errors in case of ignoring them.

The aim of this paper is to investigate the relationship between oil price shocks and stock market taking the possible structural breaks into the consideration. Analyzing the impact of the oil price shocks on stock markets is important both for policy makers and investors in the stock market. This paper has several contributions on this existing scarce literature about the relationship between oil price shocks and stock market. Firstly, we employed brand new estimation procedures to the literature. We apply cointegration tests which take the endogenous structural breaks into account namely, Allan W. Gregory and Bruce E. Hansen (1996) and Abdulnasser Hatemi-J (2008). Secondly, unlike most of the studies in the literature, which are bulkily focused on developed countries like United States and European countries, we analyzed the impact of oil price shocks on the Turkish stock market which is an emerging market. Thirdly, we extend the modeling framework by adding the exchange rate variable into the model. So, we can trace out the impact of the exchange rate through the channel of imported inflation.

The structure of this paper is as follows. In the next Section we give brief literature review on oil price shocks and stock market relationship. In the second Section, we discuss the methodology and estimation approaches which are employed. In the third Section, we discuss data and main empirical findings. At the end of this paper we provide some concluding remarks.

1. Literature Review

Oil has vital importance for modern economies and their economic growth. Generally, oil demand and industrial production growth are highly correlated and the countries experiencing rapid economic growth are considered as the fundamental source of the increasing demand for oil. Increase in oil demand without offsetting the increase in supply, lead to higher oil prices. Increase in oil prices has mainly two strong effects on consumers and producers: (1) it decreases the disposable income and lowers the spending on other goods and services; (2) raising the costs of non-oil producing countries. Also, rising oil prices are one of the leading indicators for inflationary pressures which central banks can control by raising interest rates. Higher interest rates make bonds more attractive than stocks and it leads to a fall in stock prices. So, the overall effect of rising oil prices on stock markets is expected to be negative.

Since 1970, oil prices are probably the most important factor affecting the world economy. Thus, the relationship between oil prices and the economic activity has been a great interest for the researchers. The early papers analyzing the effects of oil prices investigate the relationship between macroeconomic variables and oil price changes. The literature points to a negative correlation between the oil prices and economic growth (James D. Hamilton 1983; Micha Gisser and Thomas H. Goodwin 1986; Knut A. Mork, Øystein Olsen, and Hans T. Mysen 1994; Charles M. Jones and Gautam Kaul 1996). Hamilton (1983) investigates a general equilibrium model of unemployment and a business cycle model where it is costly to shift labor and capital inputs between sectors. In such a model, he shows that energy price shocks can reduce aggregate employment by inducing workers in adversely affected sectors to remain unemployed. Mary G. Finn (2000) shows that the oil price shocks decrease the energy use, thus output and labor's marginal product and lead to a decline in wages and labor supply. He perceives the oil price shock like an adverse shock that causes a contraction in economic activity.

Since, oil price is an important determinant of economic activity; the stock market should price the changes in the oil price. There is a scant literature analyzing the impact of oil prices on the stock market. Jones and Kaul (1996) use a cash-flow valuation model and found evidence of an adverse relationship between oil prices and stock markets in US, Canada, UK and Japan. Roger D. Huang, Ronald W. Masulis, and Hans R. Stoll (1996) estimate a vector autoregressive model using daily data on the oil futures market and stock market and report a connection between returns of oil stocks and oil futures. Huang, Masulis, and Stoll (1996) presents evidence that oil shocks do not affect aggregate returns, whereas Perry Sadorsky (1999) finds that oil price changes and oil price volatility has an important role in affecting stock returns.

Martin M. Boyer and Didier Filion (2007) analyze the determinants of Canadian oil and gas stock returns and point to a positive relationship between energy stock returns and oil and gas prices.

Jungwook Park and Ronald A. Ratti (2008) consider the relationship of oil price shocks and their impact on real stock returns in the US and 13 European countries for the period between 1986 and 2005. Their results conclude that increased volatility of oil prices significantly decreases real stock returns in many European countries. The authors also find that an increase in real oil price is associated with a significant increase in the short-term interest rate in the US and eight out of 13 European countries within one or two months.

Sridhar Gogineni (2010) investigates the impact of daily oil price changes on the stock returns of different kinds of industries. Not only the stock returns of industries that depend on oil, but also stock returns of some industries that are not totally dependent on oil are also sensitive to oil prices. He concludes that the sensitivity of industries' returns to oil price changes depends on both the cost-side and demand-side dependence on oil and that the relative effects of these factors vary across industries. Nicholas Apergis and Stephen M. Miller (2009) study the effect of explicit structural shocks that describe the endogenous character of oil price changes on the stock market returns of eight countries, namely, Australia, Canada, France, Germany, Italy, Japan, UK and the US. Their results support the view that international stock market returns do not respond in a large way to oil market shocks.

The number of the papers analyzing the oil price and stock market relation in emerging markets are comparatively less. Shawkat Hammoudeh and Eisa Alesia (2004) claim the changes in oil prices have significant effect on the stock market in Saudi Arabia. Bashar A. Zarour's (2006) paper also shows that in the May 2003 and May 2005 period, oil prices were a good determinant of stock markets in Gulf Cooperating Council (GCC) except for Abu Dhabi stock market. Ibrahim A. Onour (2007) also considers the GCC stock markets and he suggests that in the long-run the effects of oil price changes are transmitted to fundamental macroeconomic indicators which in turn affect the long run equilibrium linkages across markets. Syed A. Basher and Perry Sadorsky (2006) adopt an international multi-factor model that allows for both conditional and unconditional risk factors in several emerging markets. They have strong evidence that the stock markets in emerging economies are affected from the oil price risks. Evangelia Papapetrou (2001) obtains similar results for Greece. Aktham Maghyereh (2004) examines the linkages between crude oil price shocks and stock market returns in 22 emerging economies for the period 1998 to April 2004. His results contradict the other papers by showing no significant impact of oil price shocks on the stock index returns. His findings also imply that the returns in these markets do not show a signal for the oil price shocks.

There is only one paper analyzing the impact of oil prices on the economic conditions of Turkey (Uğur Soytaş et al. 2009). To the best of authors' knowledge there is one paper which separately analyzes the impact of oil prices to the stock market in Turkey. Ibrahim H. Eksi, Mehmet Senturk, and Semih H. Yildirim (2012) examines the relationship between crude oil prices and the indices of seven Turkish manufacturing sub-sectors over the period 1997:01-2009:12. The error correction model results reveal the long term causality from crude oil prices to chemical-petroleum-plastic and basic metal sub-sectors indicating that these sub-sectors are highly sensitive to crude oil prices. Turkey is an important emerging market that attracts lots of investors, both from Europe and from the Middle Eastern countries who are exporters of oil. The possible relationship between the oil prices and the Istanbul Stock Exchange (ISE) is of importance for both the investors in this market and also for the other investors in the emerging markets, since ISE is a leading market and any possible change in the returns of the stocks in ISE will have a potential effect on the other emerging markets.

2. Methodology

2.1 Integration

We conduct unit root tests with endogenously determined structural breaks to investigate the integration properties of the time series since, cointegration tests that are adopted require that time series data should be integrated of order one, I(1).

2.1.1 Testing the Null Hypothesis of Stationarity

We employ extended modification of Denis Kwiatkowski et al. (1992) (KPSS) unit root test proposed by Carrion-i-Silvestre, Josep Lluís, and Andreu Sansó (2007). Extended KPSS allows two structural breaks in both the level and/or the slope of the time series with a null hypothesis of stationarity against the alternative of unit root. KPSS test is based on following regression:

$$y_t = f\left(t, T_{b1}, T_{b2}\right) + r_t + \varepsilon_t) \tag{1}$$

where $r_t = r_{t-1} + u_t$, and $u_t \sim (0, \sigma_u^2)$. In case of stationarity, σ_u^2 is equal to zero (0). In Equation 1, $f\left(t, T_{b1}, T_{b2}\right)$ indicates the following deterministic specification:

$$\text{Model CC: } \theta_0 + \gamma_0 t + \sum_{i=1}^{2} \theta_i DU_{i,t} + \sum_{i=1}^{2} \gamma_i DT_{i,t}^{*} \tag{2}$$

where $DU_{i,t} = 1$, $DT_{i,t}^{*} = \left(t - T_{bi}\right)$ if $t > T_{bi}$ and 0 otherwise, with $T_{bi} = \lambda_i T$, $\lambda_i \in \left(0,1\right), i = 1,2$, $T_{b1} \neq T_{b2} \pm 1$. *DU* and *DT* are the dummy variables specified for estimating the time of structural breaks. LM statistic of extended KPSS test can be written as follows:

$$\hat{\eta}_{CC} \Rightarrow \int_0^{\lambda_1} H_{1,CC}^2\left(r, \lambda_1, \lambda_2\right) dr + \int_{\lambda_1}^{\lambda_2} H_{2,CC}^2\left(r, \lambda_1, \lambda_2\right) dr + \int_{\lambda_2}^{1} H_{3,CC}^2\left(r, \lambda_1, \lambda_2\right) dr \tag{3}$$

where $\Rightarrow$ stands for weak convergence to the associated probability measure and $H_{k,j}\left(r, \lambda_1, \lambda_2\right), k = 1,2,3$ are functions of Wiener processes and of the break fractions (Carrion-i-Silvestre and Sansó 2007). Break points are estimated through minimization of the sequence of sum of squared residuals (SSR): $\left(\hat{T}_{b1},\hat{T}_{b2}\right)=\arg\min_{\lambda_1,\lambda_2\in\Lambda} SSR\left(T_{b1},T_{b2}\right)$, where $\Lambda=\left[2/T,\left(T-1\right)/T\right]^2$ to minimize the loss of information.

2.1.2 Testing the Null Hypothesis of Unit root

Junsoo Lee and Mark C. Strazicich (2003) (LS) propose a unit root test with a null hypothesis of having unit root against the alternative of trend stationarity. This test considers two structural breaks and assumes structural breaks under both null and alternative hypotheses, so that LS overcomes the shortcoming of over-rejection of the null hypothesis. LS gives more accurate results than unit root tests such as Eric Zivot and Donald W. K. Andrews (1992) and Robin L. Lumsdaine and David H. Papell (1997) which experience size distortions in the presence of a unit root with structural break since, they assume no break under the null (Lee and Strazicich 2003). Lee and Strazicich (2003) propose the following LM unit root test:

$$y=\delta' Z_t+e_t,\ e_t=\beta e_{t-1}+\varepsilon_t \tag{4}$$

where Z_t is a vector of exogenous variables. Unit root test is based on the β parameter in the Equation 4. Model C which allows two changes in level and trend is specified as follows: $Z_t=\left[1,t,D_{1t},D_{2t},DT_{1t},DT_{2t}\right]$, where $DT_{jt}=t$ for $t\geq T_{Bj}+1, j=1,2$, and zero otherwise. D_{it}, and DT_{it} are dummy variables that capture changes in the level and slope parameter, respectively. LM statistic is proposed as follows:

$$\Delta y_t=\delta'\Delta Z_t+\phi\tilde{S}_{t-1}+u_t \tag{5}$$

where $\tilde{S}_t$ is de-trended series. In case of two structural breaks, $\Delta Z_t=\left[1,B_{1t},B_{2t}D_{1t},D_{2t}\right]'$ in which $B_{it}=\Delta D_{it}$ and $D_{it}=\Delta DT_{it}$, *i=1,2*. The null hypothesis of unit root is described by $\phi=0$ and tested using t-test, against the alternative hypothesis of $\phi<0$. The LM t-test statistic can be written as:

$$\tilde{\tau}=\text{t-statistic testing the null hypothesis } \phi=0. \tag{6}$$

Break points (T_B) for the LM unit root test with two structural breaks are determined by the minimum unit root test statistic that is based on following specification:

$$LM_\tau=\underset{\lambda}{Inf}\ \tilde{\tau}\left(\lambda\right) \tag{7}$$

where $\lambda=\left(T_B/T\right)$.

2.2 Cointegration Tests

The two-step Robert F. Engle and Clive W. J. Granger (1987) (EG) cointegration test uses the following ordinary least squares (OLS) regression in testing the null hypothesis of no cointegration:

$$y_t = \alpha_0 + \beta_0 x_t + u_t \tag{8}$$

where both y_t (dependent) and x_t (explanatory) variables are integrated of order one, I(1). Then, residuals from the Regression 4 are saved and used to detect whether there is cointegration by using three residual based test statistics: *ADF*, Z_α, and Z_t. These three tests check whether residuals have a unit root.

Gregory and Hansen (1996) (GH) suggest that residual-based test statistics for cointegration namely, *ADF*, Z_α, and Z_t are misspecified if a structural shift occurs during the data period. Hence, GH extends EG cointegration test by taking into account one change in both the intercept and/or the slope parameters. To determine structural change reflected in changes in the intercept α_0 and/or changes in the slope β_0, the dummy variable D_{1t} is added to the Equation 8. In this way, three models are created: the first model captures only the changes in the intercept (C), the second one accounts for the changes in the slope (C/T), and the third one captures the regime shift (C/S). Since our consideration is to capture the changes both in the intercept and slope, we estimated the third model which is as follows:

$$y_t = \alpha_0 + \alpha_1 D_{1t} + \beta_0' x_t + \beta_1' x_t + u_t \tag{9}$$

where α_0 and β_0 denote the intercept and slope coefficients before the regime shift, and α_1 and β_1 denote the changes to the intercept and slope coefficients at the time of the shift. D_{1t} is the dummy variable indicating the time of the regime shift, τ.

After the residuals, u_t, obtained from the models estimated by OLS are used to form Peter C. B. Phillips's (1987) test statistics $Z_\alpha(\tau)$, $Z_t(\tau)$ or the *ADF* statistic emphasizing the break point, the null hypothesis of no cointegration in the possible presence of breaks are tested by using the smallest values of these statistics. These statistics are defined as follows:

$$ADF^* = \inf_{\tau \varepsilon T} ADF(\tau)$$
$$Z_\alpha^* = \inf_{\tau \varepsilon T} Z_\alpha(\tau)$$
$$Z_t^* = \inf_{\tau \varepsilon T} Z_t(\tau)$$

In our analysis, Hatemi-J (2008) (HJ) cointegration test that accounts for the effect of two structural breaks on both the intercept and the slope is estimated. HJ proposed an extended version of C/S model of GH:

$$y_t = \alpha_0 + \alpha_1 D_{1t} + \alpha_2 D_{2t} + \beta_0' x_t + \beta_1' D_{1t} x_t + \beta_2' D_{1t} x_t + u_t \tag{10}$$

where D_{1t} and D_{2t} are dummy variables defined as:

$$D_{1t} = \begin{cases} 0 \ if \ t \le [n\tau_1] \\ 1 \ if \ t > [n\tau_1] \end{cases} \qquad D_{2t} = \begin{cases} 0 \ if \ t \le [n\tau_2] \\ 1 \ if \ t > [n\tau_2] \end{cases}$$

with the unknown parameters $\tau_1 \in (0,1)$ and $\tau_2 \in (0,1)$ signifying the relative timing of the regime change point and the bracket denotes the integer part. Applicable test statistics of HJ are the smallest values of these three tests across all values for τ_1 and τ_2, with $\tau_1 \in T_1 = (0.15, 0.70)$ and $\tau_2 \in T_2 = (0.15 + \tau_1, 0.85)$. These statistics are defined as:

$$ADF^* = \inf_{(\tau_1,\tau_2)\in T} ADF(\tau_1,\tau_2),$$

$$Z_t^* = \inf_{(\tau_1,\tau_2)\in T} Z_t(\tau_1,\tau_2),$$

$$Z_\alpha^* = \inf_{(\tau_1,\tau_2)\in T} Z_\alpha(\tau_1,\tau_2),$$

where $T = (0.15n, 0.85n)$.

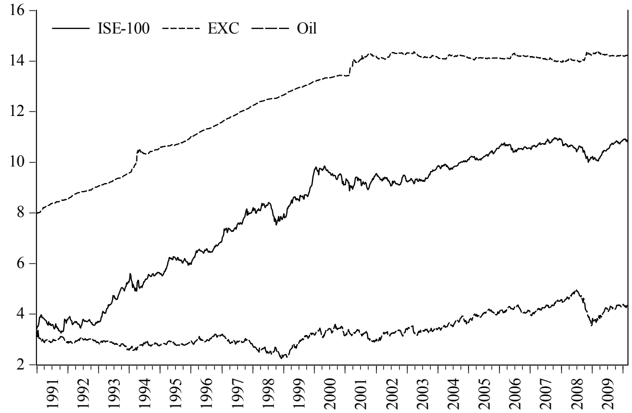
2.3 Long-Run Elasticities and Parameter Stability Tests

Since financial time series generally have a unit root (Charles R. Nelson and Charles R. Plosser 1982), standard errors of coefficients are estimated incorrectly by conducting conventional OLS algorithm. Thus, it is more efficient to apply Fully Modified OLS (FM-OLS; Phillips and Hansen 1990) or Dynamic OLS (DOLS; James H. Stock and Mark W. Watson 1993) procedures which estimate α and β (in Equation 8) with appropriate standard errors. DOLS procedure is adopted due to the reason that it is the most appropriate procedure to estimate the model. Hansen's (1992) parameter stability test is also conducted. Hansen (1992) proposes three tests for parameter instability: L_c, *MeanF*, and *SupF*. These tests put the same null hypothesis of stability. In addition, Hansen (1992) concludes that L_c is a test of the null of cointegration against the alternative of no cointegration.

3. Data and Empirical Results

3.1 Data

The data analyzed in this paper are weekly time series of Istanbul Stock Exchange (ISE) National-100 Price Index (ISE-100) and US Crude Oil (Oil) and nominal exchange rate of Turkish Lira against US Dollar (EXC). The sample for all indices covers the period from January 2nd 1991 to February 24, 2010 which makes a total of 986 observations. Price series of ISE-100, Oil and EXC are transformed to the natural logarithm form. Data are obtained from Electronic Data Delivery System (EDDS) of the Central Bank of The Republic of Turkey (CBRT) and Energy Information Administration (EIA).



Source: The Central Bank of The Republic of Turkey (CBRT) and Energy Information Administration (EIS).

Figure 1 Time Series Data

Figure 1 reflects the patterns of all price series for the period 1991-2010 where Turkey has experienced several domestic and global crises such as the economic crisis in 1994, Asian crisis which began in July 1997, Russian ruble crisis in 1998, Turkish banking crisis in 2000 and 2001, and the ongoing global financial crisis which began in the late 2007. Price index of ISE-100 increases steadily throughout the period, however the increase in the price level of oil for the same period is slower than that in ISE-100. In addition, we observe a significant increase in the level of EXC in 2000 and 2001 when Turkey has experienced devaluation in the EXC due to the Turkish financial crisis.

3.2 Empirical Results

3.2.1 Integration

Table 1 reports the results from the KPSS test with two structural breaks. Null hypothesis of stationarity is rejected for all series at 5% significance level. In other words, extended KPSS test suggests that all of the time series data are integrated of order one, I(1).

Table 1 KPSS with Two Structural Breaks Test Results

Series	TB_1	TB_2	Test value
ISE-100	09-Jul-97	28-Mar-01	0.0715[a]
Oil	07-Jan-98	15-Oct-08	0.1137[a]
Exc	02-Mar-94	20-Jun-01	0.0534[b]

Note: a, b denote statistical significance at the 1%, 5%, level, respectively. The critical values for the test values are obtained from Carrion-i-Silvestre and Sansó (2006).

Source: Authors' calculations.

Table 2 LM Unit Root with Two Structural Breaks Test Results

Series	TB_1	TB_2	LM test statistic	k
ISE-100	26-Jan-00	17-Dec-03	-4.6734	11
Oil	16-Aug-99	08-Dec-04	-4.3230	11
Exc	23-Feb-94	19-Jun-02	-5.1713	9

Note: a, b, c denote statistical significance at the 1%, 5%, 10% level, respectively.

Source: Authors' calculations.

We also investigate whether the series have a unit root in the presence of two unknown structural breaks by using another econometric methodology suggested by Lee and Strazicich (2003) as a complement for the extended KPSS. This Lagrange-Multiplier (LM) unit root test has a null hypothesis of a unit root with two breaks against the alternative of stationarity with two breaks. Results from the LM test are summarized in Table 2. LM test suggests that all series are integrated, namely, not stationary. Results from the LM test are consistent with the findings from the extended KPSS test.

Time for breaks points is estimated differently for each series indicating that specific factors affect the mean of those time series. This is an important implication for the integrated series used in the investigation of long run relationships.

3.2.2 Cointegration

Since all series are integrated, we apply a residual based cointegration test to investigate the possible long-run relationship among them. HJ extends the GH cointegration test by allowing two regime shifts in cointegrating relationship.

In this paper, we consider three long-run models:

$$\begin{aligned} &Model\ A: \ln(ISE-100) = \alpha_0 + \beta_0 \ln(Oil) + u_t \\ &Model\ B: \ln(ISE-100) = \alpha_0 + \beta_0 \ln(Oil) + \beta_1 \ln(EXC) + u_t \end{aligned} \tag{11}$$

Table 3 Hatemi-J's (2008) Test for Cointegration with Two Regime Shifts (Model C/S)

	ADF^*	TB	Z^*_t	TB	Z^*_α	TB
A	-6.689(4)[a]	18-May-94 29-Jun-94	-7.085[a]	20-Jul-94 3-Aug-94	-92.613[a]	20-Jul-94 3-Aug-94
B	-6.627(5)[b]	19-Jan-94 4-Jan-95	-6.451[c]	9-Feb-94 7-Dec-94	-74.223	23-Feb-94 7-Dec-94

Note: a, b, and c indicate the presence of cointegration at significance level of 1%, 5%, and 10%, respectively. Critical values are taken from Hatemi-J (2008, p. 501).

Source: Authors' calculations.

Table 3 indicates the results of HJ cointegration test with two unknown regime shifts in the relationship. Null hypothesis of no cointegration for Model A is rejected at the significance level of 1%, indicating a very strong evidence of long-run relationship between ISE-100 and Oil. Estimated break points in that cointegrating relationship are mostly clustered in the year 1994.

When we model cointegration relationship between ISE-100 and the two regressors including both Oil, and EXC, HJ test reveals that ISE-100 is cointegrated with Oil along with EXC. *ADF** test suggests that those variables are cointegrated at the significance level of 5%; whereas, Z_t^* test cointegration relationship is significant at l0% level. We conducted three more cointegration tests: EG with no structural breaks, GH with a null hypothesis of no-cointegration, and a complementary test by Carrion-i-Silvestre and Sansó (2006) (SS) with a null hypothesis of cointegration. EG test suggests no cointegration among the series. Results of the tests with one regime shift are not reported here in order to conserve space; however, the results can be summarized as follows: Time series data in Model A are not found as cointegrated according to GH test; on the other hand, GH suggests existence of strong long-run relationship between ISE-100 and Oil along with EXC. We find similar results according to SS test. Overall, results of those three tests suggest considering possible structural breaks in the data. In addition, results of cointegration tests with one regime shifts reveal the importance of modeling long-run relationship between ISE-100 and Oil with an auxiliary variable, EXC. Those cointegration test results with one regime shifts are all available upon request from authors.

Long-run elasticities based on the dynamic ordinary least squares (DOLS) procedure are reported in Table 4. Overall, all estimated parameters, but the intercept in Model A are significant at 1% level. β_1 and β_2 coefficients suggest positive relationship between dependent and independent variables for each model.

Table 4 Long-Run Elasticities, Dynamic OLS (DOLS)

Model	DOLS		
	α	β1	β2
Model A	-1.4392 (4.2151)	2.8533[a] (1.0804)	-
Model B	-7.0487[a] (0.7754)	0.6862[a] (0.2524)	1.0320[a] (0.1030)

Note: a denotes statistical significance at level of 1%. Numbers in parentheses are estimated standard errors of coefficients. Order of lag and lead is determined according to Schwarz Information Criteria. Coefficient covariance matrix is heteroskedasticity-autocorrelation consistent (HAC) and kernel option and bandwidth method is Quadratic-Spectral and Andrews-Automatic, respectively.

Source: Authors' calculations.

There are two channels though which oil prices can impact stock prices. First, oil is considered an input in the production process. An increase in the oil prices raises the cost of production which will put downward pressure on aggregate stock prices. Second, for a net oil importer country, an increase in oil prices will depress on the country`s foreign exchange rate and put upward pressure on the expected domestic inflation rate. A higher expected inflation rate raises the discount rate, which has a negative effect on stock returns (Huang, Masulis, and Stoll 1996).

The relationship between exchange rates and stock returns could be positive or negative depending on whether the country is an export or an import dominant country. Rudiger Dornbusch and Stanley Fisher (1980) argue that exchange rates affect the competitiveness of firms by changing the value of its earnings and costs of its funds. For an export dominant country, as its exchange rate increases, competitiveness of exports falls, which has a negative impact on domestic stock prices. For an import dominant country, an appreciation in the exchange rate by reducing input costs generates a positive effect on domestic stock prices.

We find positive and statistically significant relationship between stock prices and oil prices but it is inconsistent with theoretical expectations. Those results are the same with the findings of Paresh K. Narayan and Seema Narayan (2010) who state that the increasing foreign portfolio investments inflows and changes in the preferences of local market participants are the different unique factors leading them to find a relationship between oil prices and stock market prices inconsistent with theoretical expectations. Moreover, Rong-Gang Cong et al. (2008) reports that oil price shocks do not show statistically significant impact on the most of the Chinese stock market indices. However, they conclude that measure of oil price shocks calculated as China real oil price yields more statistically significant impacts on real stock returns indicating that the investors may consider the movement in another factor, exchange rate. Those results are also consistent with our findings which reveal the importance of modeling long-run relationship between ISE-100 and Oil with an auxiliary variable, EXC.

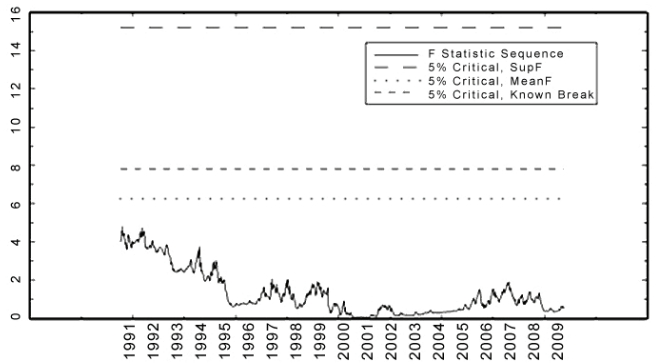
Results of parameter stability test of Hansen (1992) are depicted in Table 5. Null hypothesis of stability cannot be rejected by all three tests, indicating that parameters are stable in the two models. Moreover, Hansen (1992) suggests that L_C is a cointegration test with the null hypothesis of cointegration against the alternative of no cointegration. Results of stability tests of Hansen (1992) are consistent with the results of HJ cointegration test.

Table 5 Parameter Stability Test of Hansen (1992)

Tests	Test statistic	p-value
Model A.		
L_C statistic	0.0576	> 0.20
Mean-F	1.3044	> 0.20
Sup-F	4.8155	> 0.20
Model B.		
L_C statistic	0.1312	> 0.20
Mean-F	2.6453	> 0.20
Sup-F	6.9482	> 0.20

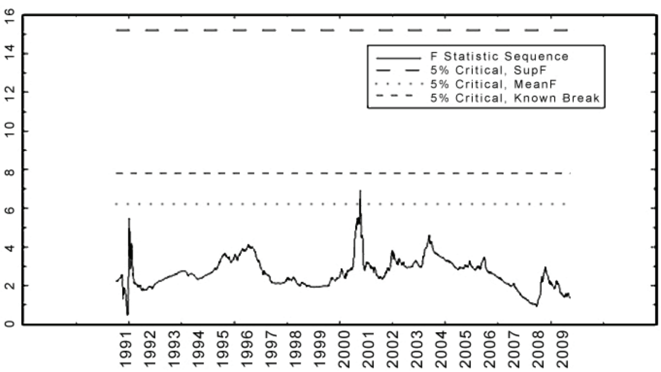
Source: Authors' calculations.

Moreover, Figure 2 and 3 display the sequence of *F* statistics for structural change, for each model, along with 5% critical values. In Figure 2 and 3, although structural change measured by F statistic between the years 2000 and 2001 seems to be significant, parameters are stable in the long-run period.



Source: Authors' calculations.

Figure 2 Hansen's (1992) Test: F-statistic Sequence for Model A



Source: Authors' calculations.

Figure 3 Hansen's (1992) Test: F-statistic Sequence for Model B

4. Conclusions

Since 1970, oil has been accepted as one of the fundamental sources of the growth. As an emerging country, Turkey wants to reach out the higher growth rate. Due to the fact that Turkey is not an oil producing country, she imports oil and is vulnerable to changes in the global oil prices. Throughout her economic history, Turkey had experienced various downturns and these downturns have left permanent structural changes behind. These changes as structural breaks can be traced out on macroeconomic variables as well as financial variables. In this paper, the relationship between stock prices in Turkey and global oil prices is examined taking the possible structural breaks in to the account.

Since, oil is an important input in the production processes, any fluctuation in the oil price is expected to change the costs of the firms. If the markets are assumed efficient, the changes in the cash flows of the companies should be reflected in their prices, too. Also, Turkey as being an emerging country should consider structural breaks in data more importantly. In this study, in order to apply a cointegration test, unit root tests with two structural breaks are used (Lee and Strazicich 2003; Carrion-i-Silvestre and Sansó 2006). Gregory and Hansen (1996) cointegration test with one regime shift and Hatemi-J (2008) cointegration test with two regime shifts are utilized.

But to the best of author's knowledge, the literature on this subject in emerging markets and also in Turkey is very limited. On the light of this information, the results of this paper can be considered as new findings so far. We find positive and statistically significant relationship between stock prices and oil prices. Results of parameter stability test of Hansen (1992) are consistent with our findings indicating that relationship between series is strong in the long-run. The potential reasons for this kind of relationship can be identified as follows: (i) the increasing foreign portfolio investments inflows; (ii) change in preferences of the local participants from holding foreign currency and domestic bank deposits to stocks. The results are important in the way that they show that the global factors are also dominant on the Turkish stock market.

Our findings also suggest that oil prices are important indicators of stock prices in Turkey. This shows that the stock market in Turkey is rational in the way that the fluctuations of the oil prices are priced. Furthermore, stock prices, oil prices and nominal exchange rates are found as cointegrated after taking structural breaks into account. These findings are highly crucial for Turkey, because in the light of these results we can underline the importance of the structural breaks in the economic history of Turkey, conveniently. These findings also support that in order to avoid forecasting errors in the analysis; the structural changes have to be taken into the consideration, especially for the emerging countries. Because emerging countries have had experienced various types of structural changes during their development process and these structural changes can affect the economic variables drastically.

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