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Relationship Between Stock Price Indices of Abu Dhabi, Jordan, and USA - Evidence from the Panel Threshold Regression Model

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Abstract

Purpose – The paper tested the relationship between the stock markets of the Middle East and the USA with the oil price and US dollar index as threshold variables.

Research design, data, and methodology – The stock price indices of the USA, the Middle East (Abu Dhabi, Jordan), WTI spot crude oil price, and US dollar index were daily returns in the research period from May 21, 2001 to August 9, 2012. Following Hansen (1999), the panel threshold regression model was used.

Results – With the US dollar index as the threshold variable, a negative relationship existed between the stock price indices of Jordan and the USA but no significant result was found between the stock price indices of Abu Dhabi and the USA.

Conclusions – The USA is an economic power today:even if it has a closer relationship with the US stock market, the dynamic US economy can learn about subsequent developments and plan in advance. Conversely, if it has an estranged relationship with the US stock market, thinking in a different direction and different investment strategies will achieve good results.

Keywords : Abu Dhabi, Jordan, DJIA, NASDAQ, RUSSELL2000, PHLX.

JEL Classifications : G20, G10, F01, F30, E00.

1. Introduction

The oil crisis, 911 events and so on, have many events between America and the Middle East, the relationship between America and the Middle East lets the people in silence. Apart from conflicts of war, and religious, and cultural, what happens the economic relationship between America and the Middle East? The Middle East is the major producer of crude oil in the world, and has the important influence to crude oil price. Another, US dollar index is able to measure the strength of US dollar's international price, and as the pointer of United States domestic economic trend. Therefore, crude oil price and US dollars index were used as the threshold variables in this paper, using "Panel threshold regression model" to test the relationship between the stock markets of the Middle East and America.

The researchers studied the relationship between oil prices and the US dollar index were as: Zhang et al. (2008) studied the impact of changes in US dollar exchange rate on oil price, and the result showed that from the long run the US dollar exchange rate had a significant impact on oil price. Lizardo and Mollick (2010) indicate that oil price volatility influence dollar index and exchange rates of major oil import and export countries. Schubert et al. (2011) analyzed the influence of oil price on small developing economic entities. The results indicated that the long-term influence of oil price on the economic entities is mainly determined by their economy structures, other than the globalization of financial markets. Jian Chai et al. (2011) used a BVAR-TVP model to analyze dynamic impacts of core factors on oil price, the results pointed that oil prices became more sensitive to oil supply changes and the US dollar index was always the important factor of oil price.

The oil price and the US dollar index were changed from the independent variable or dependent variable to as threshold variables in this paper, to test the relationship between the stock markets of the Middle East and America. This paper is organized as follows. Section 2 presents the data used in the paper. Section 3 briefly describes the empirical methodology. Section 4 shows the empirical results and section 5 concludes this study.

2. Data

The stock indices that were used in this paper are daily returns of AMERICA (Dow Jones Industrial Average: DJIA, NASDAQ Composite: NASDAQ, RUSSELL 2000, PHLX Semiconductor Sector Index: PHLX) and the Middle East (Abu Dhabi: ADX, Jordan: Amman), and the threshold variables used in the paper are West Texas Intermediate (WTI) spot crude oil price and US dollar index. The research period is from May 21, 2001 to August 9, 2012. The data of the variables is taken from Taiwan Economic Journal (TEJ), Abu Dhabi securities exchange and Amman stock exchange.

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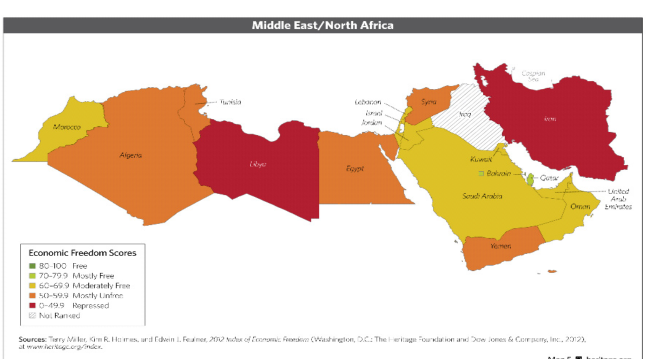
Abu Dhabi is the capital of the United Arab Emirates, and is true of the oil country, because Abu Dhabi have more than 90% of the oil reserves of the United Arab Emirates, and it is one of the highest GDP per capita in the world. Recently the government of Abu Dhabi has been diversifying their economic plans, non oil and gas GDP now constitutes 64% of the UAE's total GDP, this trend is reflected in Abu Dhabi with substantial new investment in industry, real estate, tourism and retail. Abu Dhabi is a greatly modern city with broad boulevards, tall office and apartment buildings, and busy shops its tourism is well developed. Abu Dhabi's sovereign wealth fund, the Abu Dhabi Investment Authority(ADIA), is the one of world's wealthiest sovereign fund in terms of total asset value.

Jordan borders Saudi Arabia to the east and south-east, Iraq to the north-east, Syria to the north and the West Bank and Israel to the west, sharing control of the Dead Sea with the latter, it is located in the Middle East crisis. Over half of Jordan is covered by the Arabian Desert. Jordan is a small country with limited natural resources, but with instability across the region in Iraq and Lebanon, Jordan is emerging as the "business capital of the Levant" and "the next Beirut", its economy is undergoing a major shift from an aid-dependent, renter economy to one of the most robust, open and competitive economies in the region. In recent years, there has been shift to knowledge-intensive industries, i.e. ICT. Another, Jordan is the cradle of three religions of Judaism, Christianity, Islam, and due to carry out multifaceted diplomacy, headquarters of many Western countries in the Middle East is in Jordan (Amman) of Jordan's capital.

The stock exchange of are more than ten years, and according to the Heritage Foundation's Index of Economic Freedom, economic freedom of the two countries are the top in the Middle East and North Africa (Fig 1). But the natural resources and economic development of Abu Dhabi and Jordan are different. Therefore the stock indexes of Abu Dhabi and Jordan were used as variables in this paper.



<Figure 1> Economic Freedom in Middle East/ North Africa, resource from Heritage organization.

Table 1 report the results of summary statistics of all variables in this study, such as mean, standard deviation, maximum, minimum, skewness, kurtos is and Jarque-Bera value. Among the three countries' stock indices, PHLX has the smallest standard deviation and DJIA has the largest standard deviation. Skewness statistics show that the stock indexes of America are left-tailed, and the stock indexes of the Middle East are right-tailed. And the Jarque-Bera tests show that all variables reject the null hypothesis of normal distribution at 1% significance level.

<Table 1> Summary Statistics of Variables

	DJIA	NASDAQ	RUSSELL 2000	PHLX	ABU DHABI (ADX)	JORDAN (AMMAN)
Mean	10807.52	2175.561	637.545	407.694	2915.613	2509.338
Median	10634.84	2176.000	651.520	411.195	2690.780	2399.081
Maximum	14164.53	3122.570	861.550	706.150	6205.750	5043.722
Minimum	6547.050	1114.110	327.040	171.3200	884.5800	837.791
Std. Dev.	1516.553	420.766	134.122	86.955	1212.043	1054.432
Skewness	-0.077	-0.159	-0.316	-0.157	0.623	0.313
Kurtosis	2.461	2.516	2.060	2.995	2.755	2.243
Jarque-Bera	26.729***	28.560***	109.241***	8.483**	137.521***	91.149***

Notes: ***, **, and * denote the significant levels at 1%, 5%, and 10%.

3. Method

Following Hansen (1999), the panel threshold regression model was used in this paper to discuss and analysis the relationship between the stock price index of the Middle East and America, whether happen to asymmetric situation that was under the influence of oil prices or US dollar index.

Since Tong (1978) proposed Threshold Autoregressive model, thereafter, this non-linear time series model has become very popular for economic and financial research. When the Threshold Autoregressive Model is used, the first we should test if there exists threshold effects. If we cannot reject the null hypothesis, the threshold effect doesn't exist. Afresh, the existence of nuisance will make the testing statistic follow non-standard distribution.

Hansen (1999) suggested a "bootstrap" method to compute the asymptotic distribution of testing statistics, in order to test the significance of threshold effect. In addition, when the null hypothesis doesn't hold, which means that the threshold effect certainly exists, Chan (1993) proved that OLS estimation of threshold is super consistent, the asymptotic distribution is derived. However, nuisance influences this distribution and makes it non-standard. Hansen (1999) used simulation likelihood ratio test to derive the asymptotic distribution of testing statistic for a threshold, and proposed to use two-stage OLS method to estimate the panel threshold model.

On the first stage, for any given threshold (γ), compute the sum of square errors (SSE) separately. On the second stage, try to find the estimation of $(\hat{\gamma})$ by minimization of the sum of squares. At last, use the estimation of threshold to estimate the coefficient for every "regime" and do analysis.

3.1. Threshold Model Construction

Thus we set up single threshold model as follows:

$$g_{it} = \begin{cases} \mu_i + \theta' h_{it} + \alpha_1 k_{it} + \varepsilon_{it} & if \quad k_{it} \le \gamma \\ \mu_i + \theta' h_{it} + \alpha_2 k_{it} + \varepsilon_{it} & if \quad k_{it} > \gamma \end{cases} \qquad (1)$$

$$\theta = (\theta_1, \theta_2, \theta_3, \theta_4)', \quad h_{it} = (s_{it}, m_{it-1}, k_{it-1}, g_{it-1})'$$

Where g_{it} represents stock price index of America k_{it} is threshold variable and γ is threshold value h_{it} is control variables, that has lag (0) of control variable (US dollar index or WTI) and lag (-1) of dependent variable (America), independent variable (ABU DHABI (ADX) or Jordan (Amman)) and WTI. Besides, μ_i is the fixed effect, represents the heterogeneity of companies under different operating conditions; the errors ε_{it} is assumed to be independent and identically distributed with mean zero and finite variance $\sigma^2(\varepsilon_{it} \sim iid(0, \ \sigma^2))$; i represents different companies; t represents different periods. Another threshold regression model of (1) is to set:

$$g_{it} = \mu_i + \theta' h_{it} + \alpha_1 k_{it} I(k_{it} \le \gamma) + \beta_2 k_{it} I(k_{it} > \gamma) + \varepsilon_{it} \qquad (2)$$

where I (.) represent indicator function,

$g_{it} = \mu_i + \theta' h_{it} + \alpha' k_{it}(\gamma) + \varepsilon_{it}$ can be written as:

$$g_{it} = \mu_i + [\theta', \alpha'] \begin{bmatrix} h_{it} \\ k_{it}(\gamma) \end{bmatrix} + \varepsilon_{it}$$

$$g_{it} = \mu_i + \beta' x_{it}(\gamma) + \varepsilon_{it} \qquad (3)$$

$$k_{it}(\gamma) = \begin{bmatrix} k_{it} I(k_{it} \le \gamma) \\ k_{it} I(k_{it} > \gamma) \end{bmatrix}$$

where $\alpha = (\alpha_1, \alpha_2)', \beta = (\theta', \alpha')', \ x_{it} = (h_{it}', k_{it}'(\gamma))'$

The observations are divided into two "regimes" depending on whether the threshold variable k_{it} is smaller or larger than the threshold value (γ). The regimes are distinguished by differing regression slopes, α_1 and α_2. We will use known g_{it} and k_{it} to estimate the parameters ($\gamma, \alpha, \theta, \sigma^2$).

3.2. Estimation

Note that taking averages of (3) over the time index t to derive:

$$\bar{g}_{it} = \mu_i + \beta' \bar{k}_{it}(\gamma) + \bar{\varepsilon}_{it} \qquad (4)$$

where $\bar{g}_i = \frac{1}{T}\sum_{t=1}^{T} g_{it}$, $\bar{\varepsilon}_i = \frac{1}{T}\sum_{t=1}^{T} \varepsilon_{it}$, and

$$\bar{k}(\gamma) = \frac{1}{T}\sum_{t=1}^{T} k_{it}(\gamma) = \begin{bmatrix} \frac{1}{T}\sum_{t=1}^{T} k_{it} I(k_{it} \le \gamma) \\ \frac{1}{T}\sum_{t=1}^{T} k_{it} I(k_{it} > \gamma) \end{bmatrix}$$

Taking the difference between (3) and (4) yields:

$$g_{it}^* = \alpha' k_{it}^*(\gamma) + \varepsilon_{it}^* \qquad (5)$$

where $g_{it}^* = g_{it} - \bar{g}_i$, $k_{it}^*(\gamma) = k_{it}(\gamma) - \bar{k}_i(\gamma)$, and $\varepsilon_{it}^* = \varepsilon_{it} - \bar{\varepsilon}_i$

Let

$$g_i^* = \begin{bmatrix} g_{i2}^* \\ \vdots \\ g_{iT}^* \end{bmatrix}, \quad k_i^*(\gamma) = \begin{bmatrix} k_{i2}^*(\gamma)' \\ \vdots \\ k_{iT}^*(\gamma)' \end{bmatrix}, \quad \varepsilon_i^* = \begin{bmatrix} \varepsilon_{i2}^* \\ \vdots \\ \varepsilon_{iT}^* \end{bmatrix}$$

Denote the stacked data and errors for an individual, with one time period deleted. Then let $G^*, K^*(\gamma)$ and e^* denote the data stacked over all individuals.

$$G^* = \begin{bmatrix} v_1^* \\ \vdots \\ v_i^* \\ \vdots \\ v_n^* \end{bmatrix}, \quad K^*(\gamma) = \begin{bmatrix} x_1^*(\gamma) \\ \vdots \\ x_i^*(\gamma) \\ \vdots \\ x_n^*(\gamma) \end{bmatrix}, \quad e^* = \begin{bmatrix} \varepsilon_1^* \\ \vdots \\ \varepsilon_i^* \\ \vdots \\ \varepsilon_n^* \end{bmatrix}$$

Use this notation, (5) is equivalent to

$$G_{it}^* = K_{it}^*(\gamma)\alpha + e_{it}^* \qquad (6)$$

The equation (6) represents the major estimation model of threshold effect. For any given γ, the slope coefficient α can be estimated by ordinary least squares (OLS). That is,

$$\hat{\sigma}(\gamma) = (K^*(\gamma)' K^*(\gamma))^{-1} K^*(\gamma) G^* \qquad (7)$$

The vector of regression residuals is

$$\hat{e}^*(\gamma) = G^* - K^*(\gamma)\hat{\alpha}(\gamma) \qquad (8)$$

And the sum of squared errors, SSE is

$$SSE_1(\gamma) = \hat{e}^*(\gamma)' \hat{e}^*(\gamma) = G^*(I - K^*(\gamma)(K^*(\gamma)' K^*(\gamma))^{-1} K^*(\gamma)') G^* \qquad (9)$$

Chan (1993) and Hansen (1999) recommend estimation of γ by lease squares. This is easier to achieve by minimization of the concentrated sum of squared errors (9). Hence the least squares estimators of γ is

$$\hat{\gamma} = \arg\min SSE_1(\gamma) \qquad (10)$$

Once $\hat{\gamma}$ is obtained, the slope coefficient estimate is $\hat{\alpha} = \hat{\alpha}(\hat{\gamma})$. The residual vector is $\hat{e}^* = \hat{e}^*(\hat{\gamma})$, and the estimator of residual variance is

$$\hat{\sigma}^2 = \hat{\sigma}^2(\hat{\gamma}) = \frac{1}{n(T-1)} \hat{e}^{*\prime}(\hat{\gamma}) \hat{e}^*(\hat{\gamma}) = \frac{1}{n(T-1)} SSE_1(\hat{\gamma}) \qquad (11)$$

where n indexes the number of sample, T indexed the periods of sample.

3.3. Testing for a threshold

This paper hypothesizes that there exists threshold effect between the stock price index of AMERICA and the Middle East. It is important to determine whether the threshold effect is statistically significant. The null hypothesis and alternative hypothesis can be represented as follows:

$$\begin{cases} H_0 : \alpha_1 = \alpha_2 \\ H_1 : \alpha_1 \neq \alpha_2 \end{cases}$$

When the null hypothesis holds, the coefficient $\alpha_1 = \alpha_2$ the threshold effect doesn't exist. When the alternative hypothesis holds, the coefficient $\alpha_1 \neq \alpha_2$ the threshold effect exists.

Under the null hypothesis of no threshold, the model is

$$g_{it} = u_i + \theta' h_{it} + \alpha' k_{it}(\gamma) + \varepsilon_{it} \tag{12}$$

After the fixed-effect transformation is made, we have

$$G_{it}^* = \alpha' K_{it}^* + e^* \tag{13}$$

The regression parameter is estimated by OLS, yielding estimate $\tilde{\alpha}_1$, residuals $\tilde{e}^*$ and sum of squared errors $SSE_0 = \tilde{e}^{*\prime}\tilde{e}^*$.

Hansen (1999) suggests that we use the F Test Approach to test the existence of threshold effect, and use the sup-Wald statistic to test the null hypothesis.

$$F = \sup F(\gamma) \tag{14}$$

$$F(\gamma) = \frac{(SSE_0 - SSE_1(\hat{\gamma}))/1}{SSE_1(\hat{\gamma})/n(T-1)} = \frac{SSE_0 - SSE_1(\hat{\gamma})}{\hat{\sigma}^2} \tag{15}$$

Under the null hypothesis, some coefficients (e.g. the pre-specified threshold γ) do not exist, therefore, the nuisance exists. According to "Davies' problem" (1977), the F statistic becomes non-standard distribution. Hansen (1996) showed that a bootstrap procedure attains the first-order asymptotic distribution, so p-values constructed from the bootstrap are asymptotically valid. Treat the regressors x_{it} and threshold variable d_{it} as given, holding their values fixed in repeated bootstrap samples. Take the regression residuals $\hat{e}_{it}^*$, and group them by individual: $\hat{e}_i^* = (\hat{e}_{i1}^*, \hat{e}_{i2}^*, \cdots, \hat{e}_{iT}^*)$. Treat the sample $\{\hat{e}_1^*, \hat{e}_2^*, \cdots \hat{e}_n^*\}$ as the empirical distribution to be used for bootstrapping. Draw a sample of size n from the empirical distribution and use these errors to create a bootstrap sample under H_0. Using the bootstrap sample, estimate the model under the null (13) and alternative (5) and calculate the bootstrap value of the likelihood ratio statistic $F(\gamma)$ (15). Repeat this procedure a large number of times and calculate the percentage of draws for which the simulated statistic exceeds the actual. This is the bootstrap estimate of the asymptotic p-value for $F(\gamma)$ under H_0. The null of no threshold effect is rejected if the p-value is smaller than the desired critical value.

$$P = P(\tilde{F}(\gamma) > F(\gamma) \mid \zeta) \tag{16}$$

where ζ is the conditional mean of $\tilde{F}(\gamma) > F(\gamma)$.

3.4. Asymptotic distribution of threshold estimate

Chan (1993) and Hansen (1999) showed that when there is a threshold effect $\alpha_1 \neq \alpha_2, \hat{\gamma}$ is consistent for γ_0, and that the asymptotic distribution is highly non-standard. Hansen (1999) argued that the best way to form confidence intervals for γ is to form the 'no-rejection region' using the likelihood ratio statistic for tests on γ. To test the hypothesis

$$\begin{cases} H_0 : \gamma = \gamma_0 \\ H_1 : \gamma \neq \gamma_0 \end{cases}$$

We construct the testing model:

$$LR_1(\gamma) = \frac{SSE_1(\gamma) - SSE_1(\hat{\gamma})}{\hat{\sigma}^2} \tag{17}$$

Hansen (1999) pointed out that when $LR_1(\gamma_0)$ is too large and the p-value exceeds the confidence interval, the null hypothesis is rejected Besides, Hansen (1999) indicated that under some specific assumptions and $H_0 : \gamma = \gamma_0$,

$$LR_1(\gamma) = d\zeta \tag{18}$$

as $n \to \infty$, where ζ is a random variable with distribution function

$$P(\zeta \le x) = (1 - \exp(-x/2))^2 \tag{19}$$

The asymptotic p-value can be estimated under the likelihood ratio. According to the proof of Hansen (1999), the distribution function (18) has the inverse

$$c(\alpha) = -2\log(1 - \sqrt{1-\alpha}) \tag{20}$$

from which it is easy to calculate critical values. For a given asymptotic level α, the null hypothesis $\gamma = \gamma_0$ rejects if $LR_1(\gamma)$ exceeds $c(\alpha)$.

3.5. Multiple thresholds Model

If there have double thresholds, the model is modified as:

$$g_{it} = \begin{cases} \mu_i + \theta_i' h_{it} + \alpha_1' k_{it} + \varepsilon_{it} & if \quad k_{it} \le \gamma_1 \\ \mu_i + \theta_i' h_{it} + \alpha_2' k_{it} + \varepsilon_{it} & if \quad \gamma_1 < k_{it} \le \gamma_2 \\ \mu_i + \theta_i' h_{it} + \alpha_3' k_{it} + \varepsilon_{it} & if \quad \gamma_2 < k_{it} \end{cases} \tag{21}$$

where threshold value $\gamma_1 < \gamma_2$. This can be extended to multiple thresholds model ($\gamma_1, \gamma_2, \gamma_3, \cdots \gamma_n$) .

4. Empirical Results

4.1. The result of Panel unit root test

An extension of the traditional least squared estimation method, Hansen's (1999) panel threshold regression model requires that the variables in the model be stationary in order to avoid spurious regressions. Thus, we first perform the unit root test.

Panel unit root tests are used in this paper to examine the variable stationary. Levin-Lin-Chu (LLC) test, Im-Pesaran-Shin (IPS) test and Hadri test are used for the panel unit root test (Levin, Lin and Chu, 2002; Im, Pesaran and Shin, 2003; Hadri, 1999). The results are shown in Table 2. Null Hypothesis of Levin-Lin-Chu (LLC) test & Im-Pesaran-Shin (IPS) test is that has a unit root (common unit root process). The results of LLC and IPS were unable to reject the null hypothesis (H0) at level. All are able to reject the null hypothesis (H0) at 1% significance level after first difference, that means America and Abu Dhabi (ADX) are I(1). On the contrary, Null Hypothesis of Hadri test is stationary. The results of Hadri reject the null hypothesis (H0) at level. After first difference, it is unable to reject the null hypothesis (H0), that means America and Abu Dhabi (ADX) are I (1).

These stationary findings enable us to go further estimations of the panel threshold regression. The first differenced variables are used in this study.

<Table 2> Panel Unit root tests for America, Abu Dhabi (ADX) and Jordan(Amman)

	Level			1st difference		
	LLC	IPS	Hadri	LLC	IPS	Hadri
America	-0.002	-2.790*	0.852***	-1.034***	-93.593***	0.029
Abu Dhabi (ADX)	-0,002	-3. 232*	0.146***	-0.948***	-85.860***	0.046
America	-0.0018	-2.820	0.933***	-1.032***	-98.284***	0.030
Jordan (Amman)	-0.0010	-2.409	0.198***	-0.969***	-92.281***	0.077

Note :*, **, *** indicates significance at the10%, 5%, 1% level.

4.2. The result of panel threshold regression test

The daily return rate of variables was used, and oil prices the US dollar index as threshold variables were adopted, by panel threshold regression model to examine the asymmetrical nonlinear threshold relationship between the stock price index of the Middle East and America in this paper. First is to test whether or not the threshold effect exists, the empirical results of this paper are listed in tables 3 to table 6.

According table 3, when Abu Dhabi (ADX) is as independent variable, by 100 times of ‘bootstrap’ method, found regardless of the threshold variable was WTI, or US Dollar index, and no matter existed one or two or three threshold, p-value all are more than 0.1, it is unable to reject the null hypothesis (H0). This means that when the Abu Dhabi(ADX) is independent variable, regardless of the threshold variable is WTI or US Dollar index, the four major stock market index of America would not be affected.

<Table3> Tests for the threshold effects – Independent variable: Abu Dhabi (ADX)

Threshold variable	Threshold value	F	P-Value	Critical value of F		
				1%	5%	10%
WTI	Single Threshold Model -0.01231	38.5732	0.5800	68.3066	62.1345	61.4529
	Double Threshold Model -0.0116, -0.00684	40.5395	0.8100	57.2612	54.0950	52.5214
	Triple Threshold Model -0.0116 , -0.0068, -0.0037	27.8816	0.5200	41.9536	39.8927	36.8287
Threshold variable	Threshold value	F	P-Value	Critical value of F		
				1%	5%	10%
US dollar Index	Single Threshold Model -0.01316	53.2421	0.7100	91.8675	88.2106	80.4856
	Double Threshold Model -0.01316, -0.00956	31.6567	0.5100	44.9210	39.2022	38.0054
	Triple Threshold Model -0.01396, -0.00956, 0.00258	34.0093	0.3700	58.6956	52.6480	47.2059

1. F-statistics and p-values result from repeating the bootstrap procedures 100 times for each of the three bootstrap tests.
2. ***, ** and * indicate significance at the 1, 5 and 10% levels, respectively.

According table 4, when Jordan(Amman) is as independent variable, by 100 times of ‘bootstrap’ method, found when the threshold variable was WTI, no matter existed one or two or three threshold, p-value all are more than 0.1 that is unable to reject the null hypothesis (H0). This means that when the Abu Dhabi (ADX) is independent variable and the threshold variable is WTI, the four major stock market index of America would not be affected.

But when the threshold variable is US dollar index, the result is different, that had 1% significant level in two threshold models. This means that when the Jordan (Amman)is independent variable and the threshold variable is US dollar index, the four major stock market index of America would be affected. According to estimated threshold values in table 4, regression model are as follows:

$$g_{it} = \begin{cases} \mu_i + \theta_i^{'} h_{it} + \alpha_1^{'} k_{it} + \varepsilon_{it} & if \quad k_{it} \le 0.00294 \\ \mu_i + \theta_i^{'} h_{it} + \alpha_2^{'} k_{it} + \varepsilon_{it} & if \quad 0.00294 < k_{it} \le 0.00458 \\ \mu_i + \theta_i^{'} h_{it} + \alpha_3^{'} k_{it} + \varepsilon_{it} & if \quad 0.00458 < k_{it} \end{cases}$$

When threshold variable is US dollar index, the threshold values are 0.00294 and 0.00458, would split the observations into three intervals, forming an asymmetrical nonlinear relationships. That means have different threshold parameters at different intervals, as shown in table 5.

<Table 4> Tests for the threshold effects – Independent variable: Jordan (Amman)

Threshold variable	Threshold value	F	P-Value	Critical value of F		
				1%	5%	10%
WTI	Single Threshold Model 0.00485	30.5040	0.7000	37.3391	37.3547	39.2860
	Double Threshold Model -0.00228, 0.00485	6.5556	0.8420	9.4078	9.4551	11.3514
	Triple Threshold Model -0.00228, -0.00088, 0.00458	19.0742	0.3980	21.2307	21.2703	22.2966
Threshold variable	Threshold value	F	P-Value	Critical value of F		
				1%	5%	10%
US dollar Index	Single Threshold Model 0.00458	19.8275	0.7840	30.8405	26.9364	25.5449
	Double Threshold Model 0.00294, 0.00458	16.8096 ***	0.0000	16.6625	16.6800	16.8096
	Triple Threshold Model -0.00946, 0.00294, 0.00458	15.9848	0.7320	31.0304	31.1426	36.7232

1. F-statistics and p-values result from repeating the bootstrap procedures 100 times for each of the three bootstrap tests.
2. ***, ** and * indicate significance at the 1, 5 and 10% levels, respectively.

According table 5, the estimates of threshold parameter all are negative, this mean when the dollar index as the threshold variable, the relationship between stock price index of Jordan(Amman) and America is negative in any interval. To synthesize table 4 and table 5, the results of empirical model can be displayed as follows:

$$g_{it} = \mu_i - \underset{(0.0425)}{0.2990} k_{it} I(k_{it} \le 0.00294) - \underset{(0.1288)}{0.8524} k_{it} I(0.00294 < k_{it} \le 0.00458)$$
$$- \underset{(0.0564)}{0.0459} k_{it} I(k_{it} > 0.00458) + \theta^{'} h_{it} + \varepsilon_{it}$$

<Table 5> Estimated coefficients of America stock price index -Independent variable: Jordan (Amman)

	Coefficient estimate	OLS SE	White SE
α1'	-0.2990	0.0425	0.0705
α2'	-0.8524	0.1288	0.1467
α3'	-0.0459	0.0564	0.0739

1. OLS SE and White SE represent conventional OLS SEs (considering homoscedasticity) and White-corrected SEs (considering heteroscedasticity), respectively.

In addition, from table 6, the estimated coefficients of control variables parameters was known, 0.1114,-0.1267, 0.3073, and -0.0143.

-0.1267 and -0.0143, mean that two control variables, America (-1) and WTI (-1), in the result of testing "Jordan(Amman) impacts on America" is negative it means when early a period's stock price index of America and early a period's oil prices rose, would reduce " Jordan(Amman) impacts on America stock prices in current period ".

But, 0.1114 and 0.3073, mean that two control variables, WTI (0) and Jordan(Amman) (-1), in the result of testing "Jordan(Amman) impacts on America" is positive it means when early a period's Jordan(Amman) and current period'soil prices rose, would increase "Jordan(Amman) impacts on stock prices index of America in current period".

<Table 6> Estimation of the coefficients of the control variables

	Coefficient estimate	OLS SE	White SE
$\theta_1^{'}$: WTI (0)	0.1114	0.0070	0.0106
$\theta_2^{'}$: America (-1)	-0.1267	0.0120	0.0207
$\theta_3^{'}$: Jordan Amman (-1)	0.0370	0.0163	0.0253
$\theta_4^{'}$: WTI (-1)	-0.0143	0.0070	0.0085

1. OLS SE and White SE represent conventional OLS SEs (considering homoscedasticity) and White-corrected SEs (considering heteroscedasticity), respectively.

Above, Abu Dhabi is the capital of the United Arab Emirates, oil reserves is very rich, and its tourist industry is well developed, but the influence of Abu Dhabi (ADX) to the stock price index is not significant. Instead, when the US dollar index as threshold variable, Jordan (Amman), oil reserves is poor in the Middle East but information industry is booming, to the stock price index of America has the effect, and perhaps is connected with the Jordan's industrial development and foreign policy.

5. Conclusions

This paper used "Panel threshold regression model" and with "Abu Dhabi and Jordan" as example, to examine the relationship between the stock price index of America and Middle East countries, although Abu Dhabi and Jordan both are of the Middle East country, but the results are different. It had not significant examining result between the stock price index of Abu Dhabi and American, no matter the threshold variable was the US dollar index or oil price. But when used the US dollar index as the threshold variable, the negative relationship existed between the stock price index of Jordan and America.

America is an economic power today, even if has a closer relationship with America's stock market, by America's economic dynamics is able to learn many subsequent developments, and can make advance planning. Conversely, if has an estranged relation with America's stock market, also by different thinking direction and different invest strategies, to get good results. As if, regardless of the market is short or long, there are winners.

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