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Hao Chen
Hua Liao
Bao-Jun Tang
Yi-Ming Wei

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Center for Energy and Environmental Policy Research
Beijing Institute of Technology
No.5 Zhongguancun South Street, Haidian District
Beijing 100081
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Yi-Ming Wei

Director of Center for Energy and Environmental Policy Research, Beijing Institute of Technology

For more information, please contact the office:

Address:

Director of Center for Energy and Environmental Policy Research
Beijing Institute of Technology
No.5 Zhongguancun South Street
Haidian District, Beijing 100081, P.R. China

Access:

Tel: +86-10-6891-8551
Fax: +86-10-6891-8651
Email: ceeper@vip.163.com
Website: <http://ceep.bit.edu.cn/english/index.htm>

**Impacts of OPEC's political risk on the international crude oil prices:
An empirical analysis based on the SVAR models**

Hao Chen ^{a,b,c}, Hua Liao ^{a,b,c}, Bao-Jun Tang ^{a,b,c}, Yi-Ming Wei ^{a,b,c*}

^a Center for Energy and Environmental Policy Research, Beijing Institute of Technology, Beijing 100081, China

^b School of Management and Economics, Beijing Institute of Technology, Beijing 100081, China

^c Collaborative Innovation Center of Electric Vehicles in Beijing, Beijing 100081, China

Email addresses: chenhao9133@126.com (H. Chen), wei@bit.edu.cn (Y.M. Wei)

*Corresponding author

Yi-Ming Wei (Prof. Y.M. Wei),

Email (wei@bit.edu.cn),

Tel.(86-10-68918009) / Fax.(86-10-68918651).

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Abstract

The impacts of OPEC's political risk on the fluctuations of international crude oil prices have caused widespread concern and analyzing the impacts is of great significance to the investment decisions and risk aversion strategies in the crude oil markets. Therefore, using the International Country Risk Guide (ICRG) index as a proxy for the countries' political risk situation, we empirically investigate the impacts of OPEC's political risk on the Brent crude oil prices, based on several Structural Vector Autoregression (SVAR) models. The main empirical results indicate that: (1) The political risk of OPEC countries does have a significant and positive influence on Brent crude oil prices in the sample period from January 1998 to September 2014, and the most significant positive influences appear in about one and a half year and last about a year. (2) The OPEC's integrated political risk contribute to 17.58% of the oil price fluctuations in the sample period, which is only lesser than that of the oil demand shocks (34.64%). (3) Compared with the political risk of OPEC countries in North Africa and South America, the political risk of OPEC countries in Middle East contribute most to the oil price fluctuations. (4) Among the eight components of the political risk in OPEC, the internal conflicts contribute most to the oil price fluctuations in the sample period.

Keywords: OPEC; Political risk; Oil price; SVAR

Highlights

- This paper quantitatively analyzes the impacts of OPEC's political risk on Brent oil prices.
- The political risk of OPEC countries does have a significant and positive influence on Brent crude oil prices.

- The OPEC's integrated political risk contribute to 17.58% of the oil price fluctuations in the sample period
- The political risk of OPEC countries in Middle East contributes most to the oil price fluctuations.
- The internal conflicts contribute most to the oil price fluctuations among the eight components of the political risk in OPEC

JEL classification:

C01

C32

C50

Q41

Q43

Q47

1 Introduction

The fluctuations of international crude oil prices could have huge impacts on the economic output (Wei et al., 2008; Wang and Zhang, 2014), inflation and unemployment (Uri, 1996; Du et al., 2010), stock market (Cong et al., 2008) and fundamental industries (Jiao et al., 2012). Thus, it has attracted widespread attention across the government agency, international organization and the academic community to analyze the oil pricing mechanism. As an

international traded energy product, oil has the same properties of ordinary products whose prices are influenced by the supply factors, demand factors and speculation factors, etc.(Wei and Zhou, 2010). Furthermore, owing to the uneven distribution of oil resources in the world and its great importance to the industrial production, transportation and social development, oil has always been seen as a strategic resource closely related to the energy security, and also a “political-intensive” product.

As shown in Fig. 1, international oil prices experienced a sharp increase of about 20 dollars induced by the Gulf War happened in 1990. Other major events, such as the Asian economic crisis, the 9-11 attacks, the Iraq War, the Venezuela's Strike in 2003, the 2008 Global Financial crisis and the Ukraine's political crises, have also triggered the sharp fluctuations of oil prices. Among them, the political risk events, especially these occurred in OPEC, may have a significant impact on the volatility of oil prices. This is due to the fact that OPEC countries not only own a greater share of oil resources, but also have a higher frequency of occurrence of the political risk events. In 2013, the crude oil supplied by OPEC made up 42.1% of the global oil production and the proved crude oil reserves in OPEC accounted for 71.9%. Moreover, the number of terrorist attacks in OPEC countries took up 29.2% of the world total according to statistics of Global Terrorism Database (GTD). Therefore, analyzing the impacts of the OPEC's political risk on the fluctuations of international oil prices will contribute to a more sound analysis and accurate prediction of the oil prices, which is of great significance to the investment decision making and risk aversion strategies in the crude oil markets.

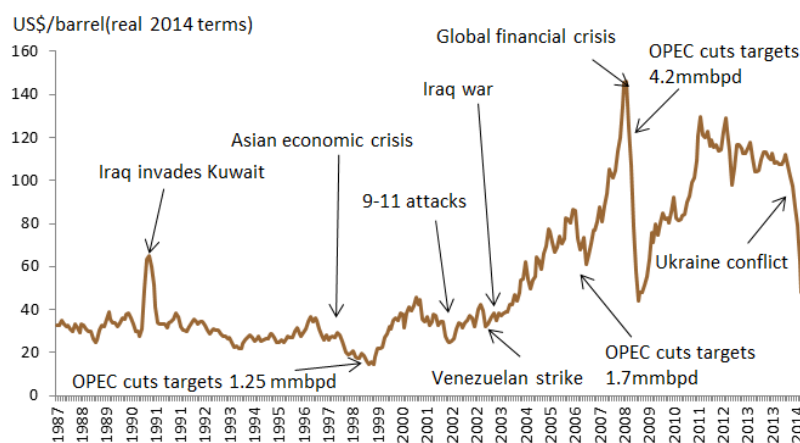


Fig.1. Relationships between Brent crude oil prices and major events

Note: adapted from EIA (2015) ¹

Motivated by this aim, we analyze the impacts of OPEC's political risk on the fluctuations of Brent oil prices, which attempts to address the following four questions.

(1) When the shocks of political risk events happened in OPEC, how will the international crude oil prices respond to these shocks?

(2) Compared with other influencing factors, how much oil price fluctuations can be

¹ Available at http://www.eia.gov/finance/markets/reports_presentations/eia_what_drives_crude_oil_price.pdf

explained by the shocks of the OPEC's political risk?

(3) Who contribute most to the oil price fluctuations among the member countries of OPEC?

(4) What's the impact differences of OPEC's different political risk types on the oil prices?

It is hoped that the answers to the above four questions will be helpful for the relevant oil investors to analyze and forecast the international crude oil prices, and for policy makers to monitor and regulate the crude oil markets.

The reminder of this paper is organized as follows. Section 2 presents the literature review, Section 3 describes the data and methodology used in this study. Section 4 provides the empirical results and discussions, and Section 5 unveils the main conclusions of this study and proposes some policy implications.

2 Literature review

Some previous studies have already researched on the impacts of political events on the international crude oil prices. For example, Hamilton (2009) analyzed the cause and influence of oil price shocks between 2007 and 2008 and concluded that most of the shocks were triggered by the politics-induced oil production halts. Kesicki (2010) compared the international oil prices surge from 2003 to 2008 with the price surge during the two oil crises in the 1970s, and summarized six reasons for the increase of international oil prices. A key point found by Wu and Zhang (2014) when analyzing the impacts of China's oil import on international oil prices is that, the unexplained fluctuations of oil prices may result from the geopolitical events. However, these studies mainly adopted qualitative methods to describe the impacts of political events on oil price volatility, and comparatively fewer studies have quantitatively estimated the influence of political risk on the oil prices, especially that of OPEC's. This is also the original motivation of this study. Coleman (2012) pointed out that the publication of Alhajji and Huettner (2000) may be the first quantitative assessment of the impacts of political risk on oil prices. He also explained that the selection of appropriate indicators which represent political risk is the key part on this topic. After a literature survey of the previous quantitative researches concerning the relationships between oil prices and political risk, we divide them into the following three categories according to the methods they mainly employed.

The first category takes the occurrence time of the political events as the basis for division of the study period, and the break points are often regarded as a 0-1 dummy variables. Then a quantitative study of the impacts of political risk on oil prices could be done by the traditional econometric methods. Lee et al. (2010) adopted a Component-ARJI model to analyze the impacts of several major events (the Gulf War, Operation Desert Storm and the Iraq War, etc.) on international oil prices. Coleman (2012) applied a linear regression model to investigate

the influence of ten political and economic events on the oil price fluctuations during the period from January 1984 to December 2007. Karali and Ramirez (2014) employed a multivariable GARCH-BEKK model to analyze the spillover effects in natural gas, heating oil and crude oil markets by incorporating the major political events. However, treating the political events as dummy variables is difficult to distinguish the type and the influence of different political events, it also fails to consider the dynamics and continuity of the political risk changes.

The second category, a possible name as ‘oil prices data mining’, mainly analyzes whether the political risk could be a significant factor in oil price fluctuations when extracting information from historical oil prices. The decomposition method and the entropy method are the two popular methods employed in this category. Based on an Ensemble Empirical Mode Decomposition (EEMD) model, Zhang et al. (2008) investigated the impacts of the Iranian revolution and the Gulf War on oil price fluctuations during the period from January 1946 to May 2006. Zhang et al. (2009) analyzed the impacts of the Gulf war and the Iraq war on oil price fluctuations using an Empirical Mode Decomposition (EMD) model. Martina et al. (2011) applied the entropy method to analyze the impacts of six extreme political and economic events on oil prices from 1986 to 2010. However, the ‘oil price data mining’ method mainly relies on the information of oil prices themselves and overlooks the impacts of other exogenous factors such as oil supply, oil demand and speculative activities.

The third category employs an index as a proxy for the situation of a country’s or a region’s political risk, and then analyzes its impacts on the fluctuations of oil prices via the econometric theory. At present, the most well-known national political risk index includes the ICRG index released by Political Risk Service (PRS) Group, the country risk rating index by the Japan Bond Research Institute (JBRI), the Forlend Index from Business Environment Risk Intelligence (BERI) and the country risk index ranking table by Euromoney (Hoti and McAleer, 2004). From the perspective of the index application, influence and updating frequency of the data, ICRG index is relatively better than the other three political risk indexes (Hoti and McAleer, 2004; Lee and Hooy, 2013). Moreover, the ICRG index has already been widely used in measuring a country’s political risk (Moser et al., 2008; Berggren et al., 2012; Hammoudeh et al., 2013). Thus, the ICRG index is selected in this research to reflect the situation of a country’s political risk.

To sum up, the previous indicators and methods which employed in analyzing the influence of political risk on oil price fluctuations provide an important reference for our research. Some issues, however, still need to be resolved. Since traditional regression models are mainly used in previous studies and the dynamic interaction between the influencing factors are often ignored (Kilian and Murphy, 2014). Moreover, it is often difficult to identify whether a variable is exogenous or endogenous in the traditional regression models. In addition, given the important role of OPEC in the global oil market, it is still deficient of quantitative studies about the impacts of the OPEC’s political risk on the international oil prices in a long period. Fortunately, the Structural Vector Autoregression (SVAR) model, improved from the VAR model, could deal with all these problems combined with the ICRG index. SVAR models have advantage in analyzing the dynamic interactions between relevant time sequences variables, and have already been widely used in the area of energy and environmental researches (Jiao et al., 2012; Nick and Thoenes, 2014; Wang and McPhail, 2014). Therefore, this paper applies the SVAR model to quantitatively investigate the impacts of OPEC countries’ political risk on the fluctuations of Brent crude oil prices.

3 Methodology

3.1 Data specifications

Based on the framework of SVAR model in Kilian and Lee (2014), we mainly consider five variables in this study, namely the political risk of OPEC countries(Risk), oil supply(Supply), oil demand(Demand), speculation(Speculation) and international crude oil prices(P). The first four variables are also the major influencing factors of crude oil prices summarized by Kesikcki (2010). We select the sample period ranging from January 1998 to September 2014 based on the data availability, and only ten member countries of OPEC are considered in this study because some countries like Angola and Indonesia entered in or moved out of OPEC during the sample period.²

ICRG political risk index is adopted as a proxy for the political risk situation of OPEC countries. ICRG index has twelve components and each component ranges between 0 and a maximum value. A bigger value of the component indicates that the country has lower political risk. However, not all the twelve components of the ICRG index are closely related to the oil production and oil market.³ For example, some components emphasize on a country's investment profile. Therefore, only eight components of the ICRG political risk index are finally selected to estimate the integrated political risk situation, namely the external conflicts, internal conflicts, ethnic tensions, religious tensions, socioeconomic conditions, corruption, law and order, and government stability. Definitions and the value range of the eight political risk components are shown in table 1. Moreover, we also consider the impact of the share of oil production in assessing the OPEC's political risk and the OPEC's integrated political risk index is calculated as follows:

$$Risk = \sum_{i=1}^{10} \omega_i \bullet \sum_{j=1}^8 (\max value_j - PRI_{ij}) \quad (1)$$

Where ω_i is the country i 's share of the total OPEC oil production in the sample period; PRI_{ij} is the country i 's political risk sub-index j , and $\max value_j$ is the maximum value of political risk sub-index j . We have transformed the original risk index value to $(\max value_j - PRI_{ij})$ so that a larger value of the risk index denotes a higher risk.

² The ten countries who always belong to OPEC during the period from January 1998 to September 2014 are Algeria, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela.

³ Details about the 12 components can be seen from the website at <http://www.prsgroup.com/>.

Table 1 Specifications of the eight sub-components of the political risk index

Indicator	Core aspects	Value Range
Government Stability	Government Unity, Legislative Strength, Popular Support.	0~12
Socioeconomic conditions	Unemployment, Consumer Confidence, Poverty.	0~12
Internal Conflict	Civil War, Terrorism/Political Violence, Civil Disorder.	0~12
External Conflict	War, Cross-Border Conflict, Foreign Pressures.	0~12
Corruption	Special payments and bribes connected to licenses, tax and loans.	0~6
Religious Tensions	Religious group that seeks to replace civil law by religious law and to exclude other religions from the political and/or social process.	0~6
Law and Order	Crime rate, illegal strikes.	0~6
Ethnic Tensions	Tension within a country attributable to racial, nationality, or language divisions.	0~6

As to the other variables, the monthly Brent crude oil spot prices drawn from US Energy Information Agency (EIA) are chosen as a representative of international oil prices (Cong et al., 2008), and all the oil prices have been converted to the 2014 constant prices in order to eliminate price differences resulting from inflation and purchasing power change.⁴ The global crude oil production data are drawn from EIA and the global real economic activity index developed in Kilian(2009) is employed as a proxy for the global oil demand. The proportion of net long positions of non-commercial traders in US crude oil futures on the NYMEX is adopted for measuring speculation activities in crude oil markets following Sander et al.(2004). All the variables except the speculation and demand variables have been transformed into logarithmic values before further research.

Before we establish the SVAR models, we firstly examine the stationary properties of the five variables by the Augment Dickey-Fuller (ADF) and Phillips-Perron (PP), and the unit root test results are shown in Table 2. We find that all the level variables are non-stationary except for speculation because the null hypothesis of a unit cannot be rejected at the significance of 5%. However, all variables in the first differenced term are stationary.

Table 2 Results of unit root test

Unit root tests		P	Supply	Demand	Speculation	Risk
ADF	Level	-1.422	-0.835	-2.960	-3.772	-2.176
		-0.571	0.807	0.041	0.004	0.216
	First differenced	-12.485	-11.869	-10.392	-12.609	-12.355
		0.000	0.000	0.000	0.000	0.000
PP	Level	-1.530	-0.635	-2.287	-5.105	-2.176
		0.516	0.859	0.177	0.000	0.216
	First differenced	-12.541	-14.943	-10.633	-18.319	-12.269
		0.000	0.000	0.000	0.000	0.000

Note: An intercept is chosen for all the variables in unit root test. The numbers in the table are t statistic values and p-values are reported in the parentheses.

3.2 The SVAR model

Traditionally, the premise of using a SVAR model is that all variables are stationary (Sims,

⁴ See the CPI Calculator in the website of the US Department of Labor, i.e., http://www.bls.gov/data/inflation_calculator.htm

1980), but this is not in line with the results of unit roots test from Table 2, so we estimate the SVAR model with data in levels following the method of Toda and Yamamoto(1995), whose advantage is that the pre-testing for cointegration is not required and potential bias for unit root and cointegration tests is avoided (Clarke and Mirza, 2006; Basher et al., 2012). Moreover, we can get the long-run information we mainly concentrate on which is based on the level variables rather than the first-differenced variables (Wu and Zhang, 2014).

To analyze the impacts of OPEC's political risk on the oil price fluctuations, we firstly define a vector of five variables as $\mathbf{x}_t = (Risk_t, Supply_t, Demand_t, Speculation_t, P_t)$. Then, a SVAR model is established based on the vector as:

$$\mathbf{A}_0 \mathbf{x}_t = \boldsymbol{\alpha} + \sum_{i=1}^p \mathbf{A}_i \mathbf{x}_{t-i} + \mathbf{H} \mathbf{d}_t + \boldsymbol{\varepsilon}_t \quad (2)$$

Where $p = q + 1$ is the length determined by Toda and Yamamoto(1995) and q is determined according to the principles of minimum Akaike Information criterion(AIC) and Schwarz Information criterion (SC) values; Previous studies have found structural breaks around the 2008 financial crisis and estimate the SVAR models individually for different sub-periods (Wang et al., 2014; Ratti and Vespignani, 2015). Unlike these studies, we introduced an exogenous dummy variable $\mathbf{d}_t$ to the SVAR models for the structural breaks inspired by Kim(1999) and Wang and Xue(2010), which will improve the results accuracy since more samples can be used in estimating the SVAR models. Moreover, the original data of some political risk components remain unchanged after 2006, which will be a difficulty for us to estimate the SVAR models for the period after the 2008 financial crisis. In addition, the focus of this study is to analyze the integrated impacts of political risk on oil prices for the whole sample period rather than compare the results among different sub-periods. $\boldsymbol{\alpha}, \mathbf{H}, \mathbf{A}_0$

and $\mathbf{A}_i$ are the unknown coefficient vector and matrixes to be estimated; $\boldsymbol{\varepsilon}_t$ is the vector of serially and mutually uncorrelated structural innovations. The reduced form of the VAR is represented as:

$$\mathbf{x}_t = \mathbf{A}_0^{-1} \boldsymbol{\alpha} + \sum_{i=1}^p \mathbf{A}_0^{-1} \mathbf{A}_i \mathbf{x}_{t-i} + \mathbf{A}_0^{-1} \mathbf{H} \mathbf{d}_t + \mathbf{e}_t \quad (3)$$

Where $\mathbf{e}_t = \mathbf{A}_0^{-1} \boldsymbol{\varepsilon}_t$ is the vector of the estimated residuals in the reduced VAR model. The restrictions on $\mathbf{A}_0^{-1}$ is based on Kilian and Lee(2014), and we only assume that the changes in OPEC's political risk is only due to the outbreak of political events within OPEC countries, and is exogenous to contemporaneous shocks of oil supply, oil demand, speculation and oil prices, so *Risk* is assumed only respond to the OPEC political shocks contemporaneously in this model, and the errors $\mathbf{e}_t$ of the reduced form can be decomposed into the following components:

$$\mathbf{e}_t = \begin{bmatrix} e_t^{Risk} \\ e_t^{Supply} \\ e_t^{Demand} \\ e_t^{Speculation} \\ e_t^P \end{bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{country\ risk\ shock} \\ \varepsilon_t^{supply\ shock} \\ \varepsilon_t^{demand\ shock} \\ \varepsilon_t^{speculation\ shock} \\ \varepsilon_t^{other\ oil\ price\ shock} \end{bmatrix} \quad (4)$$

Where element 0 in the matrix denotes that there is not an expected contemporaneous responses from specific shocks; the nonzero elements $a_{ij}(i=1,2,\dots,5; j=1,2,\dots,5)$ is the coefficient of the i 's responses to the shocks j .

Then, the impulse response function (IRF) of SVAR is employed to measure the influence of one standard structural innovation from OPEC political risk on the oil prices, and the variance decomposition approach (VDA) of SVAR is used to examine the contributions of OPEC political risk to Brent oil price fluctuations. As IRF and VDA have already been widely used in empirical researches, details about IRF and VDA can be referred to Cong et al. (2008).

4 Empirical results and discussions

4.1 How will oil prices respond to the OPEC's integrated political risk shocks ?

In this section, we will analyze the impulse responses of OPEC's integrated political risk shocks on the Brent crude oil prices. A five-variable $SVAR(Risk, Supply, Demand, Speculation, P)$ model is firstly established according to the Eq.(2). December 2008 is identified as a structural break using the Chow break test and this date is also the starting time of the Brent oil prices begin to rebound after a sharp decline. The least square method is adopted to estimate the SVAR models and all the empirical results are drawn from the software of EViews 8.

Fig.2 presents the impulse response results of Brent oil prices to one standard deviation of a political risk shock, a supply shock, a demand shock and a speculation shock. We can find that oil prices respond to the OPEC's political risk shocks positively and the positive influences become significant in 17 months and last about 10 months, indicating that the political risk shocks have a delayed significant impacts on oil prices in the sample period. This is also confirmed by the fact of oil price fluctuations after the Iraq war. After the outbreak of Iraq war on March 20, 2003, Brent oil prices dropped from 30.61 US\$/barrel in March to 25 US\$/barrel in April rather than increased, and only ten months later the oil price began to rise dramatically, However, the statistical significance of the responses is weak because the confidence bands enclose zero. Therefore, we conclude that OPEC's integrated political risk shocks do have a positive impact on the Brent oil prices in the sample period from January 1998 to September 2014. However, statistical significance is weak.

As to the other influencing factors, the oil demand shocks have a significant and positive impacts on the Brent crude oil prices in the sample period while the supply shocks do not, and this is consistent with Kilian(2009), who had found that the oil demand have a persistent positive effect on the oil prices, while the oil supply only have a small positive influence on

the oil prices(although not significant).⁵ In addition, he concluded that the oil price surge from 2003 to 2008 was primarily driven by the global oil demand shocks rather than the oil supply shocks using the historical decomposition of the oil prices. Moreover, speculation shocks have a significant positive influence on the oil prices and Morana(2013) has also found that the contributions of the financial speculation shocks to oil price fluctuations became particularly remarkable since mid-2000s.

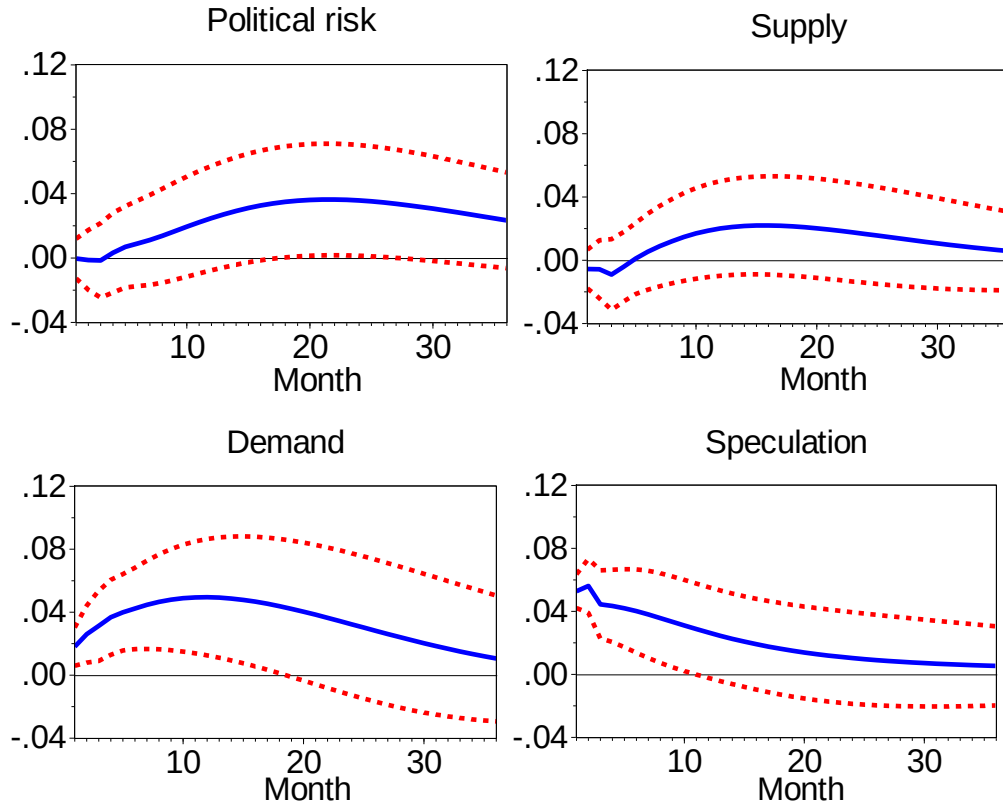


Fig.2. Responses of Brent oil prices to structural one std. dev. shocks

Notes: The vertical axis represents the logarithm value of oil price changes, the blue solid lines represent the mean impulse response of oil prices, and the red dotted lines represent two standard deviations from the mean. The response period is fixed at 36 months.

Moreover, the estimated coefficients of the dummy variables in the SVAR models are shown in Table 3, ⁶and we can see that there is a significant structural break in both the autoregressive model of oil supply and oil price during the sample period, which indicates that both the fluctuation mechanism of oil supply and oil price has changed after the 2008 global financial crisis. Wu and Zhang (2014) had also found that there is a significant difference between the moving patterns of Brent oil prices in the pre-crisis period and the post-crisis period, and Reynolds(2014) had concluded that the new shale oil technology is an important driving force of the increased global oil production after 2008.

⁵ The reason Kilian(2009) explained for why the oil supply disruptions have a positive effect on the oil prices is that oil disruptions in one region will trigger endogenous expansions of crude oil production in other places, which will help offset the initial production shortfall.

⁶ To save space, only the estimated results of the dummy variable are presented in Table 3, and the estimated results of other variables in the vector autoregression models can be obtained upon request.

Table 3 Estimated results of the dummy variables in the vector autoregression models

Dependent variable	Risk	Supply	Demand	Speculation	P
d	0.0010 (0.0038)	0.0032* (0.0021)	-0.2601 (2.2401)	0.0245 (0.0188)	0.0549*** (0.0236)

Note: The values in parentheses are standard deviations of the coefficients to be estimated. ***, ** and * denote significance at 1%, 5% and 10% levels respectively.

4.2 How much oil price fluctuations can be explained by OPEC's political risk shocks?

In this section, we will investigate the contributions of OPEC's integrated political risk to the oil price fluctuations. The oil price variances are decomposed to five components using the variance decomposition approach and the results are shown in Table 4, we can see that the OPEC's political risk shocks (0.27%) only contribute to a small fraction of oil price fluctuations in the short-term(6 month), and this can also explain why the impulse responses of oil prices to the integrated political risk shocks are not significant in the early time. However, Speculation shocks (28.58%) have a good explanatory power of oil price fluctuations in the short-term. Since the variance decomposition results reach a stable state in month 36, so the decomposition results in month 36 are finally employed to compare the different factors' contributions to the oil price fluctuations. We can find that the OPEC's political risk contribute to 17.58% of the oil price fluctuations in the sample period, ranking second among the four oil price influencing factors considered in this study. Moreover, oil demand shocks (34.64%) contribute most to the oil price fluctuations in the sample period while oil supply shocks (5.88%) contribute least to the oil price fluctuations. This is in consistency with Kilian (2008), who found that oil supply shocks have little systematic predictive power for changes in the oil prices. Moreover, Kilian and Murphy(2014), who claimed that the demand side of the oil market, rather than the unexpected diminishing oil supplies, are capable of explaining of the majority of the oil price evolutions from 2003 to 2008.

Table 4 Contributions of OPEC's political risk shocks to the oil price fluctuations

Month	Political risk shocks	Supply shocks	Demand shocks	Speculation shocks	Other shocks
6	0.27%	0.42%	14.60%	28.58%	56.14%
12	2.65%	2.19%	26.79%	25.51%	42.86%
18	7.43%	4.42%	33.29%	21.70%	33.16%
24	12.16%	5.52%	35.14%	19.12%	28.06%
30	15.57%	5.85%	35.10%	17.81%	25.67%
36	17.58%	5.88%	34.64%	17.26%	24.64%

4.3 Which area of the OPEC countries contributes most to the oil price fluctuations?

In this section, we will compare the OPEC countries' political risk contributions to oil prices fluctuations from the perspective of geographical difference. The previous ten OPEC member countries are divided into three groups according to their geographical locations, namely the Middle East group (Iran, Iraq, Kuwait, Qatar, Saudi Arabia and UAE), the North Africa group (Algeria, Libya and Nigeria) and the South America group (Venezuela), A

seven-variable $SVAR(ME, NA, SA, Supply, Demand, Speculation, P)$ model is established similar to the SVAR models in section 4.1,⁷ where ME , SA and NA stands for the integrated political risk of OPEC countries in Middle East, South America and North Africa respectively.

Table 5 presents the three groups' political risk contributions to the oil price fluctuations, and we can see that OPEC countries in Middle East contribute 19.92% to the oil price fluctuations in the sample period, ranking first among the three regions. Moreover, the importance of Middle East's political risk shocks in shaping the oil price fluctuations can also be proved by the impulse response results(Fig.3), political risk shocks in Middle East will significantly raise the Brent oil prices in a half year and the significant influences last for 16 months, and the positive responses of oil prices to the Middle East's political risk shocks is larger than that of the other two groups and is more significant. This is because the OPEC countries in Middle East own a higher share of the total oil production, and they account for 73.7% of the OPEC's total oil production in 2014. Moreover, the OPEC countries in Middle East have a higher frequency of geopolitical events occurrence than that of other regions, especially for Iraq, whose number of terrorist attacks and fatalities rank first among the OPEC countries consecutively from 2004 to 2014 according to Global Terrorism Database (GTD).⁸

Table 5 Comparison of different OPEC members' contributions to the oil price fluctuations

Contributions	Middle East	North Africa	South America
1998M1~2014M9	19.92%	9.57%	10.30%

Note: the contributions to the oil price variations are at the horizon of 36 months and the variance decomposition results already reach a stable state in month 36.

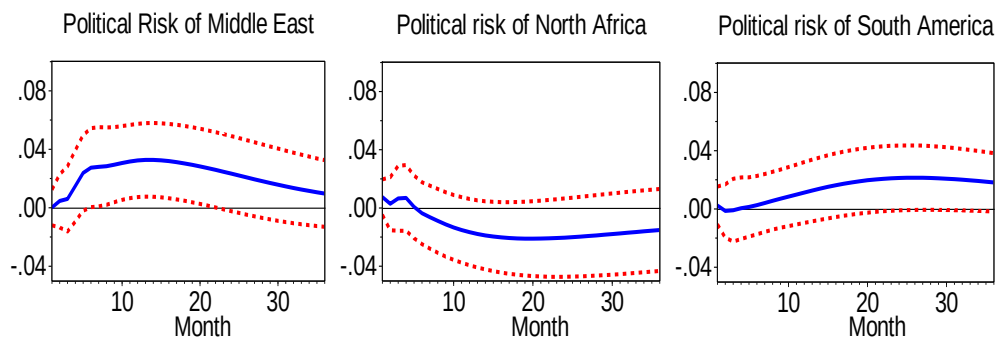


Fig.3. Brent oil prices' responses to political risk shocks in different countries

4.4 What's the impact differences of OPEC's different political risk types on the oil prices?

In this section, we will compare the influences of political risk's different components to the oil prices fluctuations. Eight types of OPEC's political risk, which made up the former

⁷ Details about the model can be obtained upon request.

⁸ The Global Terrorism Database (GTD) can be accessed at <http://www.start.umd.edu/gtd/>.

integrated political risk index, are adopted individually to establish the SVAR models and their influences on the oil prices are compared by the impulse response functions. These SVAR models are very similar to the models established for the OPEC's integrated political risk, and the unique difference is that the variable of the integrated political risk in section 4.1 should be replaced by one of the eight specific political risk indicators. For example, $SVAR(Corruption, Supply, Demand, Speculation, P)$ is built to analyze the impacts of OPEC's corruption shocks on the oil prices. Fig.4 presents the impulse response results of Brent oil prices to one standard deviation of eight sub-components of political risk shocks in the sample period.

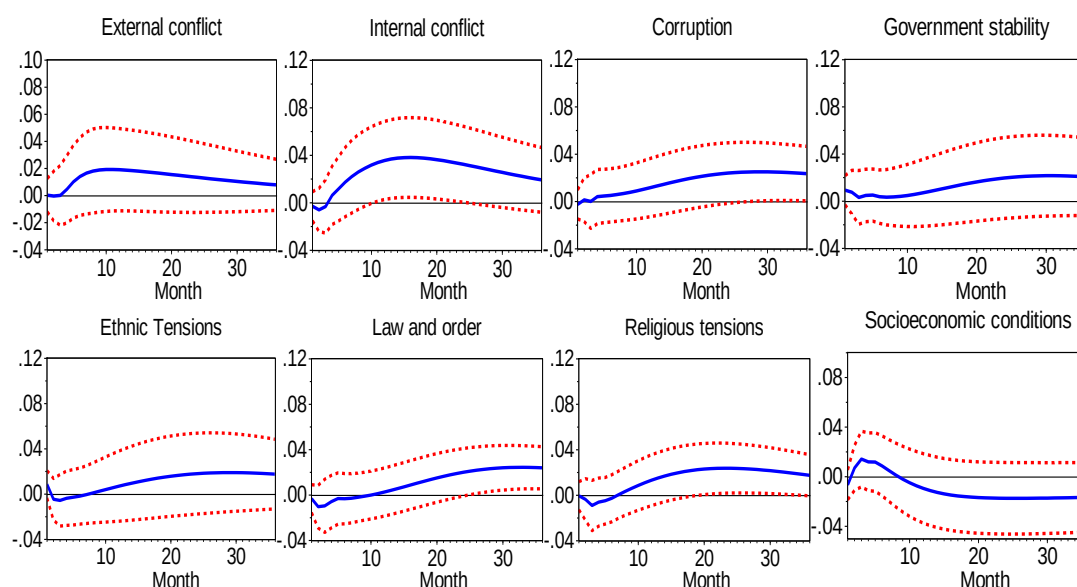


Fig.4. Brent oil prices' responses to structural one std. dev. shocks

We can see that four out of the eight components of political risk shocks have a significant positive influences on the oil prices, namely the internal conflicts, religious tensions, corruption and law and order, while the rest four components of political risk shocks do not have a significant influence on the Brent oil prices (Fig.4). Moreover, the impulse responses of oil prices to the internal conflict shocks are the biggest in magnitude and become significant earlier than that of other components' shocks. As to the contributions of the eight components to the oil price fluctuations, the internal conflict shocks (20.95%) contribute most to the oil price fluctuations while the ethnic tension shocks (4.72%) contribute least to the oil price fluctuations (Table 6). Therefore, oil price analysts and oil market investors should on one hand attach different attention to different political risk types, and on the other hand should analyze and forecast their individual impacts on the oil prices. For example, due to the great importance of OPEC's internal conflicts in shaping the oil price fluctuations, the dynamic situation of internal conflicts in OPEC countries should be monitored such as the civil war, terrorism and civil disorder events.

Table 6 Eight sub-components' contributions to the oil price fluctuations

	Political Risk Shocks	Supply Shocks	Demand Shocks	Speculation Shocks	Other shocks
Internal Conflict	20.95%	6.05%	30.84%	17.75%	24.41%
Corruption	11.62%	10.13%	18.00%	32.05%	28.20%
Religious Tensions	9.65%	4.48%	28.67%	30.12%	27.08%
Law and Order	9.22%	4.03%	25.40%	26.18%	35.17%
Government Stability	6.35%	7.69%	44.15%	16.18%	25.63%
Socioeconomic Conditions	6.03%	19.45%	25.80%	25.24%	23.48%
External Conflict	4.80%	12.53%	38.84%	21.53%	22.30%
Ethnic Tensions	4.72%	11.10%	39.84%	21.42%	22.92%

Note: the contributions to the oil price variations are at the horizon of 36 months and the variance decomposition results already reach a stable state in month 36.

4.5 Robustness analysis

In this section, we will analyze the robustness of our model results from the perspective of different international crude oil prices and different identification schemes.

4.5.1 Different crude oil prices

Since the WTI crude oil prices and Dubai crude oil prices are also the major benchmarks of world crude oil pricing, we re-estimate the SVAR models with WTI and Dubai crude oil prices. We can find that the significance of the impulse response results are consistent with the conclusions drawn from the SVAR models using the Brent oil prices.⁹ In addition, the variance decomposition results of the different oil prices are shown in table 7.

Table 7 Variance decomposition of different international crude oil prices

	political risk shocks	Supply shocks	Demand shocks	speculation shocks	other shocks
WTI	18.94%	8.17%	39.30%	11.70%	21.89%
Dubai	16.28%	5.75%	34.49%	14.15%	29.33%

Note: the contributions to the oil price variations are at the horizon of 36 months and the variance decomposition results already reach a stable state in month 36.

Compared with the decomposition results in section 4.2, we can find that although the values of the five shocks' contributions to the oil prices have changed a little, but the conclusions drawn from the SVAR models using the Brent oil prices remain unchanged. For example, compared with the decomposition results of Brent oil prices, the integrated political risk of OPEC countries contribute more to the WTI oil price fluctuations(18.94%) while contribute less to the Dubai oil price fluctuations (16.28%). However, no matter which oil price is used in estimating the SVAR models, the integrated political risk's contributions rank second among the four oil influencing factors, which is only lesser than that of the demand shocks.

⁹ The impulse response graphs are not provided here to conserve space, but they are available on request from the authors.

4.5.2 Different identification schemes

Motivated by Basher et al.(2012), who claimed that there is possibility that the global oil demand cannot respond to oil supply shocks within the same month, that is to say, the oil supply shocks do not have immediate effects on the oil demand. To analyze whether this change will have a significant impact on the previous results, we set the value of a_{32} in Eq.(4) as 0 and re-estimate the SVAR model again. We find that this change do not have any noticeable impacts on the results based on the former identification scheme (Table 8).¹⁰

Table 8 Variance decomposition results using different identification schemes

	political risk shocks	Supply shocks	Demand shocks	speculation shocks	other shocks
New Identification	16.92%	7.58%	33.79%	16.83%	24.88%

5 Conclusions and policy implications

5.1 Conclusions

Political risk has always been an important concern for analyzing the fluctuations of international crude oil prices, especially the political risk of OPEC countries. Therefore, this paper uses the ICRG political risk index as a proxy of OPEC's political risk situation, and establishes several SVAR models together with other major oil price influencing factors like supply, demand and speculation. Based on the impulse response functions and variance decomposition approaches of the SVAR models, we empirically study the impacts of OPEC political risk on the fluctuations of Brent oil prices from January 1998 to September 2014, through which some conclusions are drawn as follows:

(1) The integrated political risk of OPEC countries does have a significant and positive influence on Brent crude oil prices in the sample period, and the most significant positive influences come in about one and a half year and last about a year. Therefore, it is necessary for the oil price forecasters and analysts to track and monitor the political risk events happened in OPEC, thus supporting the analysis and forecast of oil prices. In addition, the demand shocks and speculation shocks have an instant positive influence on the Brent crude oil prices, while supply shocks do not have a significant influence on the oil prices.

(2) The OPEC's integrated political risk contribute to 17.58% of the oil price fluctuations in the sample period, ranking second among the four oil influencing factors considered in this study. In addition, oil demand shocks (34.64%) contribute most to the oil price fluctuations in the sample period while oil supply shocks (5.88%) contribute least to the oil price fluctuations. Therefore, unlike the common commodities, the impacts of geopolitical events on oil prices should be analyzed and quantifying the impacts of political risk on oil prices will be of great significance in risk aversion in the crude oil market.

(3) As to the political risk's contributions to the oil price variations among different OPEC countries, the Middle East group(19.92%) contribute most to the oil prices fluctuations in the sample period. Moreover, political risk shocks in Middle East will significantly raise the

¹⁰ The impulse response results can be obtained upon request.

Brent oil prices in a half year and the significant influences will last for 16 months. The reason why the Middle East group affect oil prices greatly is that is mainly due to the larger share of oil production and higher frequency of the occurrence of geopolitical events. Therefore, adequate attention should be paid to the dynamic changes of political risk situation of the OPEC countries in the Middle East.

(4) Different political risk types have a different impact on the Brent oil prices, among the eight components of the political risk in OPEC, the internal conflicts, religious tensions, corruption and law and order have a significant positive influence on the Brent oil prices, while the rest four components do not have a significant influence on the oil prices. Moreover, the internal conflict has a more instant impact on the oil price than other components, and contribute most to the oil price fluctuations in the sample period. Therefore, apart from analyzing the integrated political risk situation in OPEC, adequate attention should be paid to the differences of oil prices impacts resulting from different types of political risk, and special attention should be paid to the internal conflicts in OPEC, such as the civil war, terrorism and civil disorder events.

5.2 Policy implications

Based on the conclusions obtained above, some important policy implications can be drawn as follows:

(1) Since the integrated political risk of OPEC countries have a significant positive influence on the international crude oil prices in the sample period, crude oil market regulators and policy makers among the world should cooperate and consider establishing an emergency mechanism for the occurrence of political events, so as to stabilize the world oil supply and reduce the sharp fluctuations of crude oil prices.

(2) The OPEC's political risk have played an important role in shaping the oil price fluctuations from January 1998 to September 2014, but the available quantitative data of countries' political risk is still less, especially for the high frequency data. This will not only be an obstacle for a better understanding the oil price fluctuations, but also a difficulty for academic researches. Therefore, considering the great importance of political risk in explaining the oil price variations, international organizations should bridge the gap of data unavailability by monitoring the political risk situation at the national level and regional level.

(3) Considering the higher frequency of political risk events occurred in OPEC countries located in Middle East and their significant influence on oil price fluctuations, large oil importing countries like China and India could increase their investment in the areas of low political risk like North America and the Caspian, for it will not only avoid the risk of oil price fluctuations, but also provide a stable supply for their domestic oil demands, China's "Belt and Road" policy put forward in 2014 may be a good example for other countries.

This study has analyzed the influences of OPEC's political risk on the Brent oil prices, has estimated the contributions of OPEC's political risk to the fluctuations of oil prices, has compared the different OPEC countries' contributions to shaping the oil price fluctuations and has compared the contributions of different political risk types to the oil price fluctuations. However, some issues are still left to be done in the further work, such as using data of higher frequency, longer sample period and more countries, which might provide more support for describing, monitoring and forecasting the oil price.

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