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The Impact of China's Economic Growth on Crude Oil Price: Evidence from Structural VAR

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This paper examines the impact of Chinese economic growth on the real price of crude oil based on monthly time series data from 1992:01 to 2017:06 using structural vector auto-regression (SVAR). The variables of the SVAR model are global crude oil production, index of global economic activity, China's real GDP and real price of crude oil. Due to a break in the real price of oil series during the 2008 global financial crisis, the data is divided into two intervals. The results for the period prior to the 2008 crisis show that global demand shocks had a significant impact, while shocks from Chinese economic activity and global oil supply were insignificant. However, the results for the post 2008 period demonstrate that demand shocks of the Chinese economy have a significant but delayed impact, while global supply shocks have an immediate impact. The findings indicate a new regime after the 2008 crisis with a resurgence of a supply driven crude oil market structure that is influenced by Chinese economic performance.

Keywords: crude oil market, China, SVAR

JEL Classifications: Q31, Q32, Q41, Q43

I Introduction

Historically, the crude oil market was controlled by an oligopoly of oil majors, even after nationalization of the oil industries in developing oil exporting countries and the subsequent formation of OPEC, the crude oil market continued to be driven from the supply side, allowing for stable oil prices throughout most of the 20th century (see figure 1), except for intermittent periods of supply side disruptions due to political and armed conflict in the middle east - the 1973 OPEC oil embargo and the first gulf war in 1980.

However, the oil market dynamics changed in the mid 1980's with new non-OPEC crude oil supplies entering the market, OPEC share of global crude oil production dropped from 51%

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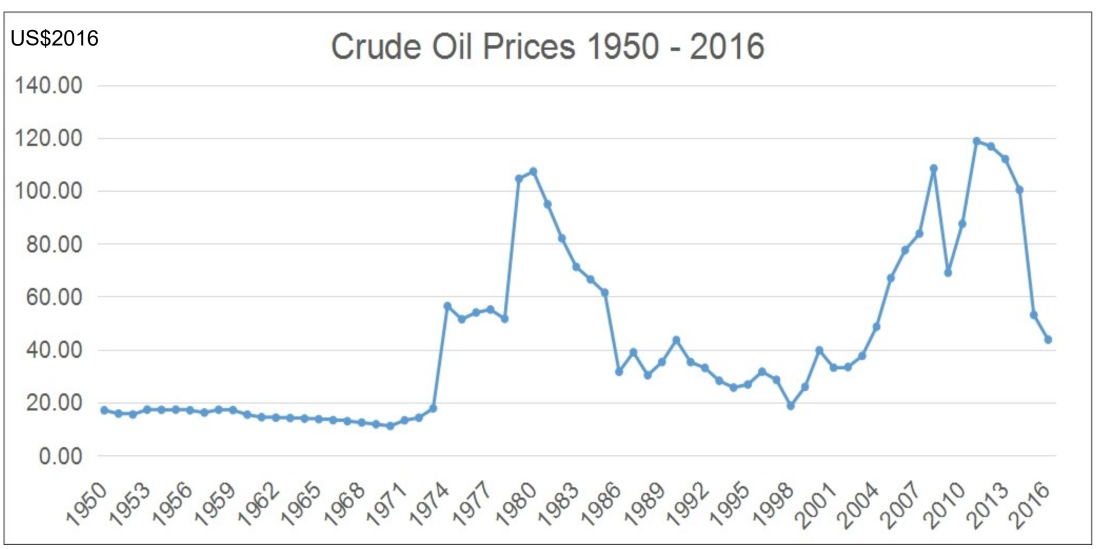
in 1973 to 28% in 1985, which considerably weakened OPEC as an oil pricing cartel (Fattouh, 2011). Coupled with the decline in world demand for crude oil due to global economic recession in the 1980's, led to a global crude oil market driven by supply and demand market fundamentals that continues to the present time (Kilian, 2009; Fattouh, 2011; Chevillon & Rifflart, 2009).

The oil market is experiencing uncertainty with respect to crude oil price movement, this is especially worrisome since the oil industry is capital intensive and future returns on investment need to be established as accurately as possible. The price volatility prevalent in the crude oil market adversely affects market participant's decisions, therefore, there is a strong need to understand the primary drivers of crude oil price to be better able to predict future oil price trends. This research will help shed new insight into the role of the Chinese economy as a determinant of oil price movement during this past twenty-five-year period.

This study analyses the role of Chinese economic activity on crude oil prices over the last twenty five years (1992 - 2017) using a structural VAR model to determine whether there is causal relationship that can help understand future oil price movements. The studies so far have only covered the upsurge in oil prices, i.e., the periods modelled extend to 2014 only, and not the subsequent decline in price after 2014 as is the case in this study. In addition, the model uses monthly GDP series developed by Chang, Chen, Waggoner and Zha (2015) as it is a more accurate measure of the prevalent Chinese economic climate than industrial production index that has been used previously as a proxy of Chinese economic activity (Klotz, Lin & Hsu, 2014; Tian, 2016; Ratti & Vespignani, 2016).

Figure 1**.** Historical crude oil prices from 1950 to 2016



Source: BP statistical review

The main findings of this study are the prevalence of two different market structures governing the oil price movement, the pre-2008 period is characterized by a demand-driven market, while the post-2008 interval is identified as a supply-driven market that is influenced by Chinese economic performance.

While the bulk of crude oil demand originates from developed countries, with OECD crude oil consumption accounting for 58% of world total in 2006, the increase in growth of oil consumption comes from emerging economies with a surge in consumption in China starting from the mid 1990's leading to China's imports of crude oil outstripping that of the US in 2015 (BP, 2017) as measured by consistent yearly average of total imports (see table 1). The emerging economies of Asia account for two thirds of the global growth in energy consumption with China accounting for a third of the global increase in demand to become the second largest crude oil consumer after the United States (Chevillon & Rifflart, 2009; Beirne et al., 2013).

The compounding effect of continuous double-digit growth in China has had an impact on all commodities including crude oil, see figure 2, as can be seen in the price surge that started in 1998 (Beirne et al., 2013). The impact of a right shift in China's import demand for a non-renewable resource was found to raise the price of that commodity (Allen & Day, 2014) as increased oil demand is magnified due to the energy intensive nature of the exports sector that dominates the Chinese economic model (Kahrl & Roland-Holst, 2008).

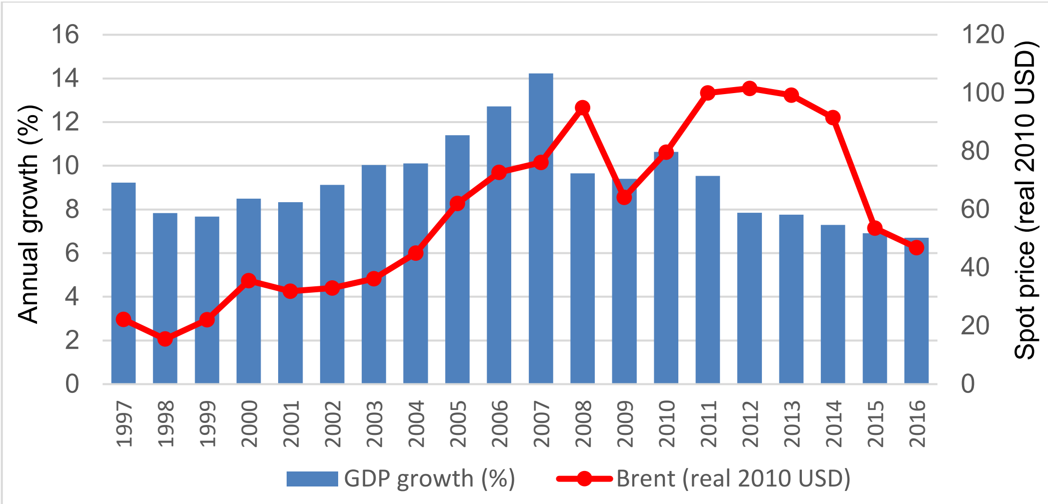
Table 1. China and USA share of global crude oil imports

Country	1970	1980	1990	2000	2010	2016
China	-0.01%	-0.07%	-0.07%	2.1%	7.2%	9.1%
USA	7.5%	11.2%	12.1%	15.5%	13.1%	7.5%

Source: BP statistical review. Note: imports calculated by subtracting consumption from production figures. Negative figures indicate production exceeds consumption.

The introduction of vector auto-regression (VAR) provides a distinct advantage to traditional macroeconomic models, by incorporating the dynamics of multiple time series, it allows all the endogenous variables to be jointly examined (Sims, 1980). While the exact specification of VAR models is still open to debate (Beckers & Strom, 2015), it continues to be a popular method of studying the global oil market (Kilian 2009; Chevillon & Rifflart, 2009; Dua, He & Wei, 2010; Ratti & Vespignani, 2013; Klotz et al., 2014; Chen, Yu & Kelly, 2016; Tian, 2016; and Liu, Wang, Wu & Wu, 2016).

Figure 2. China GDP annual growth (%) and Brent oil spot price (real 2010 USD)



Source: World Bank

Few empirical studies on crude oil price movement were conducted until the recent oil price volatility, this is probably due to the relatively stable and low oil prices prevalent during most of the 20th century, which led initial work to focus on modelling the supply side of the oil market (Hotelling, 1931 and Pindyck, 1978), the Hotelling model was limited by simplifying assumptions such as known stock of the resource and no cost reduction of extraction due to technology change (Krautkraemer, 1998; Gaudet, 2007).

The surge in the oil prices after 2003 drew a lot interest from researchers to analyse the market and better understand oil price determinants but with mixed results. The role of the emerging economies was closely examined, and Chinese economic performance was found to be a primary factor in determining oil price movement (Li & Lin, 2011; Kilian & Hicks, 2013; Beirne, Beulen, Liu & Mirzai, 2013; Ratti & Vespignani, 2013; Klotz, Lin & Hsu, 2014; Ratti & Vespignani, 2016; Liu et al., 2016).

On the other hand, many studies have reached the opposite conclusion, i.e., China has had either a secondary or no effect on oil prices (Du, He & Wei, 2010; Tian, 2016; Chen, Yu & Kelly, 2016; Cross & Nguyen, 2017). There is a clear gap in modelling the oil market over both the surge and downturn in crude oil prices, this period is of particular interest as it also coincides with a slowdown in the Chinese economy over the last few years.

The rest of the paper is organized as follows. Section 2 describes the methodology and details the identification scheme of the SVAR model. Section 3 presents the results of the

SVAR models together with a detailed discussion of the findings. Section 4 concludes the study and provides policy implications of the findings.

II Methodology

Under the theoretical framework of supply and demand, this paper extends the structural VAR model proposed by Kilian (2009) by adding Chinese economic activity to model the crude oil market. Thus, the model identifies the determinants of oil price as four structural shocks: oil supply shocks, aggregate demand shocks, Chinese demand shocks and oil specific demand shocks, the latter representing precautionary demand. An increase in uncertainty regarding future oil supply was linked to increase in precautionary demand causing an increase in the price of oil for oil; the concept of precautionary demand was identified with the marginality of convenience yield of physical oil inventory (Kilian, 2009; Chevillon & Rifflart, 2009; Alquist & Kilian, 2010).

The first step is to specify the model, next is to ensure that the model satisfies the requirements of stationarity and the absence of autocorrelation and heteroskedasticity as well as model stability before conducting analysis of the impulse response functions and forward error variance decomposition. The Granger causality of the variables on real price oil will be examined using the chi-square statistic of the Wald test with the null hypothesis of no Granger causality. The final step is to carry out robustness checks by changing the lag order (Rydland, 2011; Liu et al., 2016) to ensure that the results from the regression hold under alternative measures.

The model assumes a vertical oil supply curve based on the unresponsiveness of supply in the short run to changes in oil price due to the capital-intensive nature of the oil industry (Kilian, 2009; Kilian, 2013). A supply shock by an exogenous shift to the right will have a negative relationship with crude oil price by increasing supply and thereby reducing the price. The three demand shocks on the other hand have a positive relationship with crude oil price, where increase in demand due to shift to the right of the demand curve will increase crude oil price. The proposed structural VAR model is expressed as follows:

$$C_0 X_t = \alpha + \sum_{i=1}^{j} C_i X_{t-1} + \varepsilon_t \tag{1}$$

where X_t is the vector of the four endogenous variables, α is the vector of the intercept terms, j is the optimal lag length and and ε_t is the vector of structural errors that are serially and mutually uncorrelated structural innovations with zero mean and variance-covariance matrix $\sum\varepsilon$. The vector $X_t = (GOS_t, GAD_t, CEC_t, RPO_t)$, where GOS_t is the change in global oil supply, GAD_t is an index of global real economic activity developed by Kilian (2009), CEG_t is the change in Chinese economic activity (GDP) and RPO_t is the change in real price of oil.

The ε_t vector includes four structural shocks that affect the real price of oil, one supply shock from the global oil supply and three demand shocks from global aggregate demand, Chinese demand and oil specific demand. The structural model is transformed to reduced form by multiplying the above equation by C_0^{-1} which has a recursive structure. The resultant reduced form vector of errors e_t is then as follows: $e_t = C_o^{-1} \varepsilon_t$.

In order for the VAR model to be estimated, a recursive identification scheme with zero short-run restrictions (Cholesky identification) are imposed on the model. The identification restrictions are based on economic theory and are imposed on the model as shown below,

$$(2) \quad C_0X_t = \begin{bmatrix} 1 & 0 & 0 & 0 \\ c_{21} & 1 & 0 & 0 \\ c_{31} & c_{32} & 1 & 0 \\ c_{41} & c_{42} & c_{43} & 1 \end{bmatrix} \begin{bmatrix} GOS_t \\ GAD_t \\ CEG_t \\ RPO_t \end{bmatrix}$$

The identifying restrictions are made on the following assumptions, global oil supply does not immediately respond to other structural shocks since the industry requires a lag time to adjust production due to the high capital costs needed to increase production, hence it only depends on lags of the other variables, therefore, in the matrix c12=c13=c14=0. Global aggregate demand responds to oil supply shocks as supply shortages can affect the world demand for commodities including oil (Kilian, 2009; Ratti & Vespignani, 2013), however, it will only respond to oil price and Chinese economic activity with a lag period due to (1) size and sluggish nature of the global economy; (2) the largely regional trade relations, hence the impact of a Chinese economic shock would be larger and more significant on its supply partner economies in Asia rather than on global and developed economies (Dinda, 2017); (3) the one-sided nature of the trade relationship, such that Chinese demand cannot have an immediate impact on global demand (Tian, 2016); therefore, c23=c24=0. On the other hand, Chinese economic growth responds to shortages in supply and global aggregate demand due to the export-oriented nature of the Chinese economy, and will only respond with a lag period to oil prices, so c34=0 (Kilian, 2009; Tian, 2016).

The sample period of the study covers monthly data from January 1992 to June 2017, the period chosen coincides with both the rise of China's economic activity and its ascendancy as a major participant of the global economy, as well as the deviation of oil price from their historical trends (see figure 1), this period will cover both the rise of oil prices after 2003 and includes the subsequent decline after 2014.

Table 2 summarizes the variables description and the source of data. The global oil supply is represented by the change in cumulative world oil production obtained by differencing the logarithm. Global aggregate demand is given by the global real economic activity index developed by Kilian (2009), it is calculated based on dry cargo single voyage freight rate and has become widely used in the literature as a proxy for cumulative world oil demand (Kilian, 2009; Ratti & Vespignani, 2013; Cross & Nguyen, 2017).

Chinese economic growth is represented by the monthly growth of real Chinese GDP per capita obtained by differencing the logarithm. There has been a strong historical correlation between fractional change in oil consumption and fractional change in GDP (Brecha, 2013) and GDP data has frequently been used as a proxy for oil demand (Cross & Nguyen, 2017; Bierne et al., 2013; Kilian & Hicks, 2009). Since data indicates that lower income countries, i.e., emerging economies, have much higher energy intensities (Chevillon & Rifflart, 2009), GDP is taken as a proxy for oil demand in this paper.

The GDP series used was developed by Chang, Chen, Waggoner and Zha (2015) and is updated by the Federal Reserve Bank of Atlanta. This GDP series was chosen for the following reasons: available as monthly data series; to avoid discrepancies between the production approach to calculate GDP adopted by China versus the aggregate expenditures approach used elsewhere, even though the World Bank have accepted official Chinese GDP figures since 1998 (Holz, 2014).

Table 2. Summary of Variables

Variable	Description & Data source
Global crude oil supply (GOS)	World crude oil production in thousand bpd on monthly basis. EIA Energy Review (2017)
Global aggregate demand (GAD)	Compiled global business index on monthly basis. Kilian's index at www.umich.edu
Chinese economic growth (CEG)	Real GDP per capita on monthly basis. Chang et al., 2015
Real price of oil (RPO)	Real price of Brent crude oil on monthly basis. EIA (2017) retrieved from Federal Reserve Bank of St. Louis

The measure of real price of oil is the monthly change in the spot real price of Brent obtained by differencing the logarithm. The Brent benchmark is used as a reference for almost two thirds of crude oil trading in the world and is therefore more relevant to this study than West Texas Intermediate (WTI).

III Empirical Results and Discussion

Table 3 presents the results of the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. Global aggregate demand (Kilian's index) is a compiled business cycle index that is built to be stationary, it is the only variable that is integrated of order zero I(0). The other three variables, global oil supply, Chinese economic growth and real price of oil are non-stationary at the level and integrated of order one I(1). Taking the first difference of the logarithm of these three variables will satisfy the stationarity assumption required to run SVAR analysis.

The real price of oil has a break point at October 2008 that corresponds with the financial crisis of 2008. No such break point was found for the Chinese economic growth variable, as GDP per capita continued to grow throughout the financial crisis. Breakpoint testing of the other variables does not yield results that coincide with significant economic events and are thus discarded. The break point selection is done by minimizing the Dickey-Fuller t-statistic. As such, the SVAR model will be split into two time-frames, the first (SVAR I) will cover the period starting from January 1992 till September 2008 and the second (SVAR II) will cover the next period starting from October 2008 till June 2017.

Table 3. Unit root test results

	ADF[a] (SIC)	PP[a]	KPSS[b]
GOS	-0.614 (0)	-0.435	2.044***
ΔGOS	-14.758*** (1)	-18.868***	0.032
GAD	-3.065** (2)	-2.823*	0.316
ΔGAD	-13.187*** (1)	-13.733***	0.064
CEG	4.729 (6)	12.007	2.043***
ΔCEG	-14.152*** (2)	-28.694***	0.764***
RPO	-1.993 (1)	-1.821	1.352***
ΔRPO	-14.308*** (0)	-14.308***	0.11

*, ** and *** indicate 10%, 5% and 1% level of significance respectively

a H_0: the series has a unit root.

b H_o: the series is stationary. Barlett-Kernel used as spectral estimation method

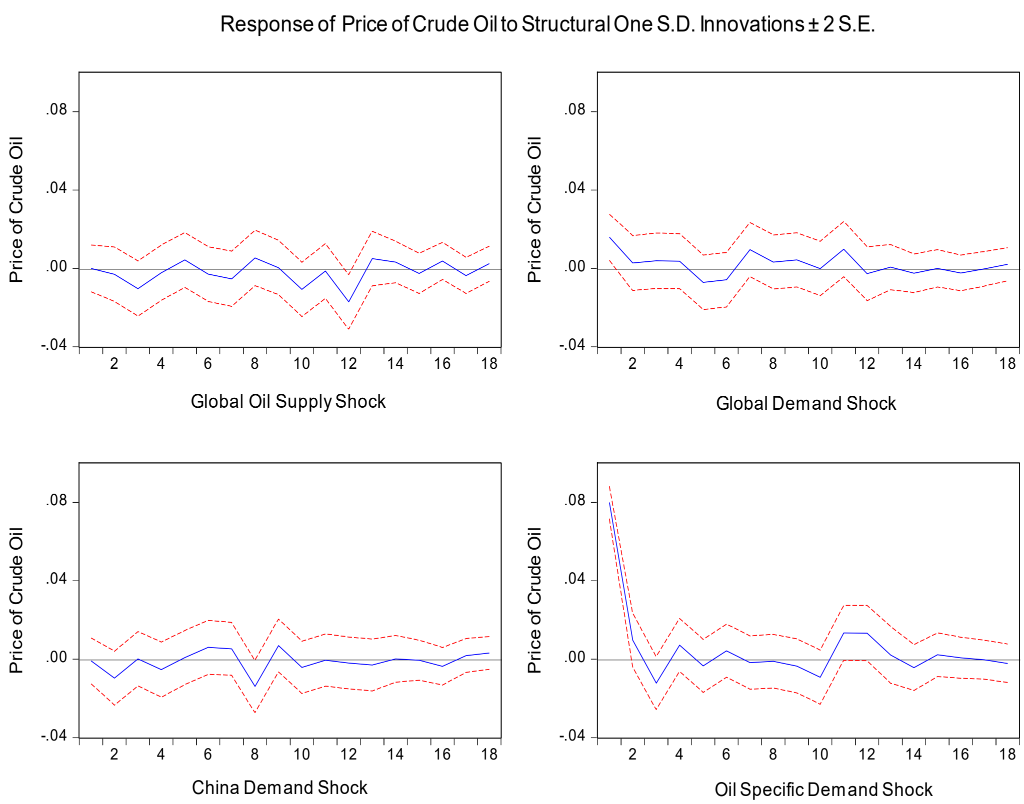
3.1 Structural VAR before the 2008 global financial crisis (SVAR I)

SVAR I extends from 1992m1 till 2008m09. The lag length is initially selected to be three lags based on the Akaike Information Criterion (AIC), however, this lag length does not satisfy the requirement of no residual serial correlation. As such, the lag length is increased to lag 12 and tested, this lag length is recommended for monthly data and it also satisfies LM autocorrelation test. The roots of the AR characteristic polynomial equation are less than unity indicating that the model is stable.

The impulse response functions of the real price of oil are shown in figure 3. An oil supply shock, in the first panel, does not have a significant impact on real price of crude oil and is of a transitional nature. This is due to the fact that a disruption in supply from one region will be offset by an increase in supplies from another region, this is in agreement with (Kilian, 2009; Tian, 2016). This leads us to focus on the effects of demand shocks. A Global demand shock has a significant impact in the first month and is persistent for twelve months, this finding is supported by Kilian (2009) and Hamilton (2009) that find global demand factors contribute more to oil price movement than supply factors during the time frame of the SVAR I model; it is also consistent with Kim (2018) study that determines the global demand shock of 2008 financial crisis, originating in the US, led to the fall in oil prices during 2008-2009 interval.

A China demand shock is not significant and fades out after ten months, this is similar to previous studies (Du et al., 2010; Tian, 2016; Cross & Nguyen, 2017) and can be explained by the smaller size of the Chinese economy relative to the world economy during this period. However, this is in contrast to other studies that find that China has had an impact on oil price, which is probably due to the limited time frames used in those analysis that only cover the price surge period (Li & Lin, 2011; Kilian & Hicks, 2013).

Figure 3. Response of Real Price of Crude Oil to Structural Shocks before the 2008 financial crisis (SVAR I)



Oil specific demand shock is highly significant and can cause an increase in the price oil by as much as 8% within the first month, these results are in line with Killian (2009) and Tian (2016).

The discrepancy in the magnitude and persistence of the global aggregate demand and oil-market specific demand on the real price of oil between SVAR I and (Kilian, 2009) can be attributed to the difference in time frames between the two studies (1992-2008) versus (1975-2007); and the addition of the Chinese economic activity as an extra variable in the model.

3.2 Structural VAR after the 2008 global financial crisis (SVAR II)

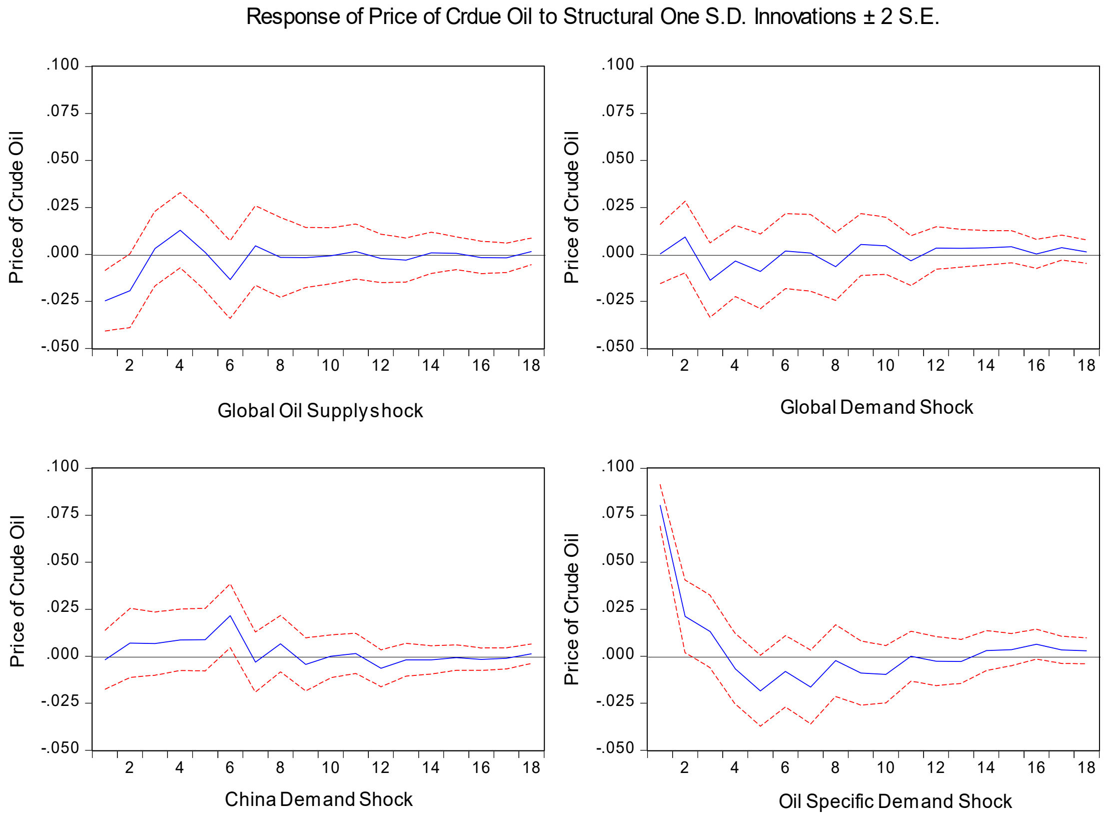
The SVAR II model time frame extends from 2008m10 to 2017m06. The initial lag length is initially set to 3 lags based on AIC, but is then increased by increments to a lag length of 7 to satisfy the autocorrelation LM test. Model stability is satisfied by ensuring that the roots of AR polynomial equation lie within the unity circle.

The SVAR II model presents different impulse response functions than the previous period. As can be seen from the first panel in figure 4, a production shock has an immediate and significant impact on real price of oil that is reversed in the third month before eventually dying out in the eighth month. This is probably due to the new shale oil supplies that have entered the market and consequent production restrictions introduced by OPEC countries that have destabilized the supply-demand structure. This suggests that the over-supplied crude oil market has changed the oil pricing dynamic and led to a return of a supply-driven oil price.

Shocks from global economic activity do not seem to have a significant impact on real price oil during this time frame. This is in contrast to the SVAR I model and is quite counter-intuitive, it can be linked to the supply glut diminishing the effect of demand shocks. On the other hand, a shock from Chinese demand has a significant and persistent effect on real price of crude oil that reaches a peak after six months after which the effect tends to zero during the ninth month. This relates to the expanding crude oil imports as a result of the increasing size of the Chinese economy, becoming the second largest economy in real terms and the largest in power purchasing parity (PPP) terms, and may signify China becoming an oil pricing power. The six-month delay in the peak could be due to the delays of reporting economic indicators or could relate to the time period taken by the market to digest the reported information. Oil specific demand is significant and has the largest effect on real price, causing an 8% increase in the price of oil during the first month.

The results of the impulse response functions suggest a different market structure during the 2008 - 2017 period when compared to the previous SVAR I model with the new structure depending more heavily on global supply shocks and demand shocks from China. This can be explained by China accounting for a third of global growth in energy consumption (Chevillon & Rifflart, 2009), furthermore, Beirne et al. (2013) show that Chinese economic growth will continue to exert a premium on oil price through different scenario simulations until 2030 where China's energy demand growth is triple the rate of the world average for that period.

Figure 4. Response of Real Price of Crude Oil to Structural Shocks after the 2008 financial crisis (SVAR II)



It can be concluded that the oil price quickly rebounded after the financial crisis due to the continued growth in Chinese GDP data implying persistent demand. These results are also supported by Kim (2018) study that finds the downturn in oil price during 2014-2016 interval to be driven by supply forces driven by increasing US shale production.

3.3 Variance decomposition

The real price oil variance decomposition to show the cumulative impact of each of the structural shocks, presented in table 4, affords an understanding of the importance of each variable in determining the oil price movement. For the SVAR I period prior to the 2008 crisis, the results indicate that global demand shocks account for more than global oil supply shocks and Chinese demand shocks combined during the first six periods. It is only after the twelfth period that supply shocks contribute more than global demand shocks in determining the variance of real price of oil. Chinese demand is the least important variable in the system. As expected, the variance in real price of oil is mostly explained by its own innovation.

Table 4. Forward Error Variance Decomposition Results

SVAR I Variance Decomposition of Real Price of Oil

Period	$\varepsilon^{Global\ Oil\ Supply}$	$\varepsilon^{Global\ Aggregate\ Demand}$	$\varepsilon^{Chinese\ Economic\ Growth}$	$\varepsilon^{Real\ Price\ Oil}$
	Shocks			
1	4.99E-05	3.772	0.011	96.216
3	1.634	3.831	1.322	93.212
6	2.003	5.012	2.156	90.827
12	6.958	6.711	5.089	81.239
24	8.002	6.723	5.992	79.351
36	8.051	6.924	5.957	79.066

SVAR II Variance Decomposition of Real Price of Oil

Period	$\varepsilon^{Global\ Oil\ Supply}$	$\varepsilon^{Global\ Aggregate\ Demand}$	$\varepsilon^{Chinese\ Economic\ Growth}$	$\varepsilon^{Real\ Price\ Oil}$
	Shocks			
1	8.611	0.0004	0.052	91.335
3	11.737	3.250	1.151	83.860
6	13.421	3.731	7.191	75.656
12	12.838	4.542	7.803	74.814
24	12.875	4.956	7.890	74.277
36	12.875	4.992	7.890	74.241

The SVAR II forward error variance decomposition analysis (table 4) shows that global supply shocks initially explain just under 9% of oil price variance and quickly passes the 12% mark during the sixth period. Chinese demand shock is the second most important variable, its contribution is just under 8% and is more than global demand, which is under 5%. The real price of oil explains 75% of its own movement. These results are quite different than the values from the SVAR I model.

3.4 Granger Causality Test

The results of the pair-wise Granger causality test are presented in table 5, there is no evidence that any of the variables Granger cause the real price of oil for the SVAR I period, indicating that none of the variables contains information that can help predict the future crude oil price prior to the 2008 crisis. This finding supports the earlier analysis performed for this SVAR I model. In contrast, the pair-wise Granger causality test for the SVAR II period post 2008 presented show that the null hypothesis of Chinese economic growth does not Granger causes the real price of oil is rejected, indicating that Chinese economic growth contains information that can help predict future oil price movement, which is in line with the findings by Klotz, Lin & Hsu (2014).

Table 5. Granger Causality Test Results

SVAR I Granger Causality Test

Null Hypothesis:	Chi-sq	df	P-value
GOS does not Granger cause RPO	19.844	12	0.071
GAD does not Granger cause RPO	8.237	12	0.766
CEG does not Granger cause RPO	7.894	12	0.793

SVAR II Granger Causality Test

Null Hypothesis:	Chi-sq	df	P-value
GOS does not Granger cause RPO	6.069	7	0.531
GAD does not Granger cause RPO	7.095	7	0.419
CEG does not Granger cause RPO	17.871	7	0.012**

Note: ** denotes significance at 5% level

3.5 Robustness Check

The time frame of this study covers China's share of the global economy from 4.4% to 12% in SVAR I, till it is 16% in the SVAR II model.

The robustness test for SVAR I model is performed by increasing the lag length to 24 lags and rerunning the regression to check for consistency with the original model. The impulse response functions exhibit a similar pattern with no change in the confidence intervals. The only difference is that global demand shocks are not significant during the first period and shocks take longer to fade out. To check the robustness of the SVAR II model, the lag length is increased to 12 lags, the impulse response functions exhibit larger confidence intervals but with a similar pattern and are consistent with the original model.

IV Conclusions

The findings show two different oil market regimes with different variables exhibiting significant impact on the real price of oil in each time frame. In SVAR I, extending from January 1992 to September 2008, the impulse response functions indicate that a Chinese economic demand shock does not impact the real price of oil. This is consistent with other previous studies and can be explained by the smaller size of the Chinese economy relative to the world economy during this time frame. The variance decomposition analysis also indicates that Chinese demand shocks contribute the least to understanding the real price of oil when compared to the other supply and demand shocks. SVAR I results also support the finding of other earlier studies that show crude oil supply shocks being insignificant due to the market structure of crude oil consisting of multiple oil suppliers. The two demand shocks with the most significant impact on oil price are from oil specific demand and aggregate global demand shocks.

In contrast, SVAR II suggests a new structural regime for the crude oil market where supply shocks and Chinese economic demand shocks have a significant impact on the real price of oil. The time frame for SVAR II starts from October 2008 and ends in June 2017, covering a period of increased Chinese economic importance in the world economy and new technology innovations in the oil sector that introduced shale oil production into the world market. The impulse response functions reveal global oil supply shocks to have a significant impact during the first month, this is mainly due to the over-supplied market structure. Chinese economic growth is also found to have a significant impact but only after a six-month delay, this is possibly due to the time lag in reporting key economic indicators. The variance decomposition analysis further demonstrates the higher significance of supply shocks and Chinese demand shocks compared to global demand shocks. This can be explained by the expanding footprint of the Chinese economy which is supported by the significant Granger causality test results.

After a relatively short period of uncertainty regarding future oil supply ability to meet the increasing demand, market fundamentals were successful in driving new crude oil supplies that have resulted in steep market corrections of the oil price. SVAR II modelling results indicate a supply driven crude oil market, this is in contrast to the period of a demand driven oil pricing system following 2003 that was led by the impressive economic growth of China and other emerging economies. These two factors have become a major influence as crude oil price determinants. Global demand is observed to be a secondary factor in the oil pricing system; this may be due to the stable economic growth forecasts for most developed and developing countries.

As a consequence of this, the major implications of these findings are: (1) a resurgence of supply driven crude oil market structure; (2) the role of China's economic performance will gain greater significance in crude oil market modelling; (3) Chinese GDP growth figures can help provide guidance on near-term oil price movement; (4) China's future energy policy shift towards renewable energy resources will have a large impact on future crude oil prices.

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