



19th International Conference Enterprise and Competitive Environment 2016, ECE 2016, 10–11
March 2016, Brno, Czech Republic

The Role of China's Real Economic Activity in Oil Price Fluctuations

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Abstract

This paper uses time point decomposition methods of fluctuation factors to analyze the role of China's real economic activity in oil price fluctuations. The research results show that demand shocks attributable to Chinese economy could not affect oil prices in recent years, particularly the hikes in 2008, and they further find that oil specific-demand shocks and the demand shocks of the Organization for Economic Cooperation and Development (OECD) had notable effects on the real price of crude oil. As an alternate explanation, we reveal this phenomenon using the proportion of China's oil consumption to total global consumption. Furthermore, this paper finds that the rise in oil prices was caused by the oil specific-demand shocks but that the fall in oil prices was caused by the oil specific-demand shocks and the OECD demand shocks.

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Peer-review under responsibility of the organizing committee of ECE 2016

Keywords: Structural VAR; oil specific-demand shocks; impulse response functions; oil supply

1. Introduction

On July 11, 2008, West Texas Intermediate (WTI) prices hit record highs at \$ 147.27 / barrel. Unlike the first and second oil crises in the 1970s, the usual shortage of oil production was not found in this oil price hike. Accordingly, economists turned their focus to the demand for crude oil. Meanwhile, economists became more concerned with the demands of Brazil, Russia, India, China, South Africa (BRICS) and other emerging economies, particularly China. Whether the strong oil demand from the rapidly growing Chinese economy caused the 2008 oil price hikes or not has become an issue of much debate. Kilian & Hicks (2013) argued that economic growth of Asia's emerging

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economies, including China and India, caused a rise in oil prices between 2003 and 2008. Hamilton (2009a, 2009b) also showed that the 2008 oil price hikes were caused by the strong demand of China confronting the stagnating world production of oil. In contrast, Du et al. (2010), using the Granger causality test, determined that real economic activity of China had no significant effect on oil prices. The motivation of this study is to confirm whether the Chinese economy has affected the real price of crude oil during the last two decades.

Meanwhile, the recent global economic environment has undergone dramatic change, for example, global liquidity flood, severe price fluctuations of international bulk commodity, rapid rise of emerging economies and so on. This paper explores the economic factors affecting international oil prices and focuses on the role of the real economic activity of China in the 2008 oil price hikes and then perceives the dynamic evolution rule of oil prices. Aside from using the impulse response functions of a structural vector autoregressive (VAR) model, this study also builds the time point decomposition methods of fluctuation factors to observe oil price fluctuations and the cumulative impact of every economic factor on oil prices at arbitrary time points in sample intervals.

To the best of our knowledge, this study is the first to use the real economic activity of China as a single variable in a structural VAR model and to use the share of China's oil consumption in total world consumption to explain its effects on oil prices. Moreover, we gain some awareness of the dynamic evolution rule of oil price fluctuations.

2. Literature review

Since the two oil crises occurred in the 1970s, economists have been studying the relationship between oil price shocks and real economic activity, with a special interest in 2008, when international oil prices hit record highs. Two themes prevail in the empirical papers. One explores the effects of oil price shocks on most oil importing countries, as the shocks led to negative consequences such as stagflation and decreases in real wages. At present, economists stress the study of the mechanisms of these effects and suggest that authorities implement monetary policies to suppress these negative effects.

The other theme investigates the causes of rise in the real price of crude oil. Between September 2003 and July 2008, crude oil prices surged in the international market, a fact that prompted economists to revisit the fundamental issues of where oil price fluctuations originate and which factors affect oil prices. Previous studies, such as Hamilton (1985), commonly attributed increases in oil prices to shortages in supply in the international market prior to 1973. Such shortages, which stemmed from political strife in the Middle East, are exogenous to the global economic system. Since 1973, it has been widely accepted that the real price of crude oil is endogenous to global macroeconomic conditions (Rotemberg & Woodford, 1996; Barsky & Kilian, 2004; Hamilton, 2003). Thus, real economic activity can also affect the real price of crude oil.

Following the study of the international crude oil market, Krichene (2002) observed the low price elasticity of short-run supply before 2002. However, since 2003, the supply of international crude oil has not dropped, even as oil prices continued to increase from 2003 to 2008. According to microeconomic theory, oil prices are determined by the equilibrium point in the crude oil supply curve and demand curve. Therefore, economists have focused on demand in the international crude oil market and on global real economic activity. A large body of empirical literature, including Kilian (2009), Krichene (2002), He et al. (2010), and Frenkel & Rose (2010), discussed the essential cause of oil price changes.

Hamilton (2009a, b) found that the oil price run-up of 2007–2008 was caused by a combination of the strong demand for oil and stagnating world production. These two reasons are widely accepted as the causes behind the oil price changes after 2000. However, while Hamilton (2009b) highlighted China's oil consumption at a high growth rate, but he did not construct an econometric model to simulate the process of China's effects on the real price of crude oil. Furthermore, Hamilton (2009b) could not explain the reason behind the stagnation of world oil production. Frenkel & Rose (2010) suggested that the loose monetary policy in most developed countries was often accompanied by a low real interest rate, which increased demand and reduced supply for oil-producing countries because these countries would rather store oil. As evidence of the loose monetary policy, the prices of other international bulk commodities, such as corn, cattle, copper and platinum also surged during this period.

Kilian & Hicks (2013) used a polynomial distributed lag model to calculate the effects of the economies of China and India as one unit on oil prices. When measuring the impact of the two economies on oil prices, their practical conclusion was that a 0.1% increase in the total forecasts of the GDPs of China and India will result in a

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