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Relationships between oil price shocks and stock market: An empirical analysis from China ☆

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ABSTRACT

This paper investigates the interactive relationships between oil price shocks and Chinese stock market using multivariate vector auto-regression. Oil price shocks do not show statistically significant impact on the real stock returns of most Chinese stock market indices, except for manufacturing index and some oil companies. Some "important" oil price shocks depress oil company stock prices. Increase in oil volatility may increase the speculations in mining index and petrochemicals index, which raise their stock returns. Both the world oil price shocks and China oil price shocks can explain much more than interest rates for manufacturing index.

1. Introduction

The aim of this paper is to investigate the relationships between oil price shocks and stock market. Unlike most of the existing literature, which are focused on the United States or European countries, we analyze the impact of oil price shocks on Chinese stock market. The case of China is interesting for several reasons. First, China's role in the world oil market becomes more and more important. Since 2003, China has taken the place of Japan to be the second world oil consumer.

Fig. 1 shows that in 2006, China's oil demand reached 9% of the world's total demand. With high-speed development in its economy, China's role in oil market will be more and more important. Second, the connection between international oil market and China has become more and more stronger. Since 1996, China has become a net importer of crude oil. Fig. 1 shows that since 2004, the import dependence has exceeded 40%. So China is inevitably affected by the international oil price shocks.

Since 2002, the international crude oil price has risen rapidly. In November 2007, prices of both WTI crude oil and the Brent crude oil went beyond $90 per barrel. This resulted in great fluctuations in the international market, causing China's domestic oil price to increase, which in turn pushed the energy price up for coal and electricity. As a result, China's nationwide retail commodity price index also raised to some extent. In the meantime, owing to the appreciation of the RMB against the dollar, and in anticipation of expansion in the Chinese economy during the Olympics Games, the Chinese stock market has steadily increased since 2006—which, as a consequence, has attracted investors worldwide.

As a result, observing whether the shocks in energy price are transmitted to Chinese stock market will receive considerable attention from investors. While it has been widely accepted that rising oil prices are bad for stock markets of oil-importing countries, there has been relatively little empirical work done to analyze the relationships in China. It might be argued that this relationship partly reflects the informational efficiency of the Chinese stock market, in that an informationally efficient stock market reflects all the current, available information, including oil price shocks.

The paper is structured as follows. We begin with a literature review in Section 2, followed by a data description and a brief introduction of the VAR model in Section 3. Section 4 presents the empirical results. In Section 5, we discuss the results within the context of the Chinese situation and obtain some conclusions. Finally, possible future work is presented.

2. Literature review

Extant researches have taken a broad perspective to more detailed analysis of relationships between oil price and a country's macro economy. Research on the relationship between energy price and the macro economy is mainly focused on the relationship

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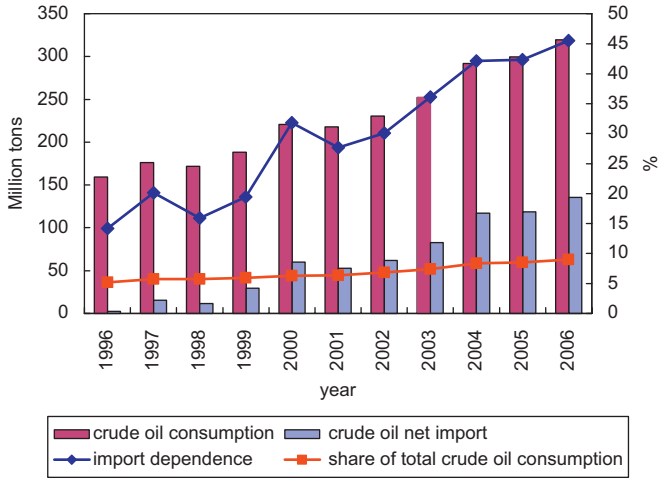

Fig. 1. China's crude oil consumption, crude oil net import, dependence on import and share of world crude oil consumption during the period 1996–2006. *Note*: Data are from BP (2007) and General Administration of Customs of China (2007).

between crude oil price and GDP/GNP, and the channels through which crude oil price influences the macro economy (Brown and Yucel, 2002).

In the former, the majority of scholars have found a reverse relationship between oil price and GDP/GNP in some developed countries, such as the United States, United Kingdom, Canada, and so on, which meant rising oil price would depress GDP/GNP (Darby, 1982; Hamilton, 1983; Darrat et al., 1996). In the mid-1980s, however, the linear reverse relationship became not so evident. Various scholars studied the asymmetric relationship between oil price and macro economic activities in their samples, including Mork (1989) for US and Mork and Olsen (1994) for some OECD countries.

In the latter, it is generally assumed that oil price influenced the macro economy at the demand and supply levels. As to the demand level, on the one hand, Cunado and Perez (2005) found that the rise of oil price could cause inflation in some Asian countries. Uri and Boyd (1997) found that the oil price shocks also suppress people's consumption and investment in Mexico. On the other hand, the rise in oil price may transfer wealth from oil-importing countries to oil-exporting countries (Sachs et al., 1981). As regards the supply level, as oil is a major material for production, the rise of oil price will raise production costs and cause industries to scale down or transfer to low energy-intensive industries. This, in turn, may affect production and increase unemployment according to Uri (1996)'s research on US and Uri and Boyd (1997)'s research on Mexico. So the rise of oil price influences various industries in different ways. Fan et al. (2007) researched the impact of rising international crude oil price on China's GDP, investments, consumptions, import, export, and so on.

As shown above, scholars have extensively researched the relationship between oil price shocks and a country's macro economy. However, because oil price shocks are not the only factor which affects the stock price, and oil price shocks influence various industries' stock prices differently, the relationships between oil price shocks and the financial markets are complicated and not clear for many countries. And there is relatively little research on the relationship between oil price shocks and the stock markets—the exception being those focusing on developed countries.

For example, Jones and Gautam (1996), based on a standard cash flows/dividends valuation model, researched the stock market of US, Canada, Japan, and England. They found that the change of oil price had a decisive effect on the four countries' real stock returns. Sadorsky (1999) identified that oil price shocks, and its volatility, played an important part in explaining US real stock returns and the movement of oil price explained more than interest rates for the forecasting variances. Papapetrou (2001) researched the Greek stock market. Likewise, he also found that oil price played an important component in explaining stock price movements; and positive oil price shocks suppressed real stock returns. Ciner (2001) concluded that a statistically significant relationship existed between real stock returns and oil price futures, but that the connection was non-linear. Ewing and Thompson(2007) also examined the cyclical relationships between industrial production, consumer prices, unemployment, and stock prices using time series filtering methods. But they found that crude oil prices were lagging the US stock market. Based on the analysis to the US and 13 European countries, Park and Ratti (2008) found that the impact of oil price shocks on oil-importing countries' stock market are negative while the impact on oil-exporting countries' stock market are positive.

Several scholars showed that oil price shocks influenced various industries' stock price differently. A common held view is that oil price shocks are beneficial for oil companies upstream, yet has an adverse effect on companies downstream and other industries. For example, Huang and Masulis (1996)'s research, based on correlative coefficient method and a VAR model, used the S&P 500 index, 12 US industries' stock price indices, and three oil company stock prices. They found crude oil future returns had significant abilities to explain oil companies' stock returns, which could be seen as their lead index, but had little effect on the total market. Faff and Brailsford (1999) used an enlarged market model to research several industry returns in the Australian stock market. They found that oil price had an effect on stock prices, and the oil and gas industry and diverse resources industry had positive sensitivities, while papermaking, packing, and transportation industry had negative sensitivities. Using Johansen cointegration test, Aleisa et al. (2003) found 1-month to 4-month WTI oil future price shocks explained oil extracting, refining, and marketing companies' stock price movement. Sadorsky (2001) chose Canadian companies as an example. Using the stock market index, energy price, interest rates, and exchange rates as explanatory variables, he found the rise of the stock market index and oil price had a positive effect on oil companies' returns, while the rise of interest rates and exchange rates had a negative effect. Hammoudeh et al. (2004) used VECM and GARCH models to analyze indices of oil stock price in S&P 500, WTI energy price, and 1-month to 4-month future prices in NYMEX. He found that there was no cointegration among variables. After introducing oil price, however, there was cointegration. Moreover, the movement of oil future prices explained oil companies' stock price shocks. Lanza et al. (2005) used VAR/VECM models to research the relationships among six large oil companies, various stock markets, and the spread of crude oil future and spot price. He found that the greater the spread, the higher the oil companies' stock prices. Park and Ratti (2008) found oil price shocks had a negative impact on stock markets in US and many European countries, while Norway as an oil exporter showed a positive response of stock market to the rise of oil price.

In summary, it can be stated that there are relationships between oil price and the stock market, which have been tested in several developed countries. Whether these relationships exist in China is the focus of this paper. This study estimates the effects of oil price shocks and oil price volatility on the real stock returns of China over 1996:1–2007:12. To better identify the general impact we consider two composite indices, 10 classification indices, and four oil companies' stock prices. Because of its ability to capture