Oil price shocks, economic policy uncertainty and industry stock returns in China: Asymmetric effects with quantile regression

Wanhai You [a,*], Yawei Guo [b], Huiming Zhu [b], Yong Tang [a]

[a] School of Economics and Management, Fuzhou University, Fuzhou, PR China
[b] School of Business and Management, Hunan University, Changsha, PR China

ARTICLE INFO

ABSTRACT

This paper investigates the impact of crude oil shocks and China's economic policy uncertainty on stock returns at different locations on the return distributions. Based on monthly data from 1995:1 to 2016:3, we address this issue by employing the quantile regression technique. This approach enables a more detailed investigation in different market circumstances, namely, bearish, normal and bullish markets. Empirical results indicate that the effects of oil price shocks and economic policy uncertainty are asymmetric and highly related to stock market conditions. Moreover, both the nexus of oil- and economic policy uncertainty-stock are changed at the onset of a crisis. Specially, rising oil prices have greater negative effects on stock returns when stock markets are bullish (extreme higher quantiles) before a crisis, whereas the effects are significantly positive under different market conditions after the onset of the crisis. Falling oil prices lower stock returns when stock markets are bullish and normal before the crisis, whereas lower stock returns under different market conditions except extreme bullish after the onset of the crisis. These findings might be related to the optimistic or pessimistic investor sentiments and investors might become more frightened after the crisis.

© 2017 Published by Elsevier B.V.

1. Introduction

The important role of oil in the world economy has motivated the research on the economic and financial consequences caused by oil price changes. In his seminal study on oil price changes and the macroeconomy, Hamilton (1983) finds that an oil price shock is a contributing factor to US recession. Since then, scholars have performed much research on this issue (Jones et al., 2004; Hamilton, 2008; Herrera et al., 2011; Filis and Chatziantoniou, 2014; Salisu et al., 2017, among others). Stock markets act as the barometer for anticipating economic changes in economic activity (Fama, 1990). Oil price is also likely to play an important role in predicting stock prices by at least two channels as follows. On the one hand, since oil is an important input in the production of many goods, oil price changes may affect future cash flows of enterprises. As a result, higher oil prices may increase the production cost of enterprises, dampening corporate profits and thus further depressing stock prices (Sadorsky, 1999; Apergis and Miller, 2009). On the other hand, oil price changes may impact the discount rate. Rising oil prices are often seen as indicative of inflationary

pressures. Central banks typically address it by raising the interest rate (Huang et al., 1996; Miller and Ratti, 2009). Since the link between oil price changes and stock markets has important implications for portfolio management strategies, this issue has attracted considerable attention in recent studies (e.g., Park and Ratti, 2008; Naifar, 2016; Kayalar et al., 2017).

Despite the increased interest in the oil-stock relationships, there are relatively few papers that investigate the time-varying relationships between them (e.g., Chang et al., 2013; Broadstock and Filis, 2014; Joo and Park, 2017). This series of study reflects the importance of allowing the relationships to be variable. However, they do not systematically isolate bearish and bullish markets. Quantile regression is able to describe the entire conditional distribution of the dependent variable and can solve this problem effectively. Applying this approach, Lee and Zeng (2011) argue that the impacts of oil price shocks on real stock returns vary with the stock performances (e.g., bearish and bullish markets). Sim and Zhou (2015) also indicate that oil shocks affect US stock returns depending on market circumstances by using the quantile-on-quantile approach. Moreover, the majority of the existing studies investigate the oil-stock relationships in a linear framework. However, Mork (1989) and Mork et al. (1994) conclude that oil price increases have a negative effect on GDP, whereas oil price decreases have not been found to have a positive impact on output or an impact

of the same degree. Some related works explore the non-linear effects of oil price changes on stock returns (Cong et al., 2008; Park and Ratti, 2008; Ramos and Veiga, 2013; Tsai, 2015; Reboredo and Ugolini, 2016).

In a recent study, Kang and Ratti (2013) argue that the relationships of oil-stock are not formed in isolation from economic policy uncertainty. This is because oil price shocks and economic policy uncertainty are interrelated and jointly influence stock returns. Relatively little attention, however, has been paid to the relationships between economic policy uncertainty and the stock market. Economic policy uncertainty might have an impact on asset prices by many channels. First, policy uncertainty might delay or change important decisions taken by firms and other economic agents, such as employment, investment, consumption and saving decisions (Gulen and Ion, 2016). Second, policy uncertainty might increase spending on financing and production by influencing supply and demand, as well as increasing disinvestment and economic contraction. Third, economic policy might also influence interest rate, inflation and expected risk premiums (Pástor and Veronesi, 2013). A growing number of studies provide evidence that uncertainty affects financial markets, such as equity portfolios and stocks (Anderson et al., 2009; Bekaert et al., 2009; Pástor and Veronesi, 2012; Brogaard and Detzel, 2015; Bekiros et al., 2016), volatility and investment opportunities (Bloom et al., 2007; Bloom, 2009), and energy and metals markets (Reboredo and Uddin, 2016). In particular, given the relationships between oil prices and economic policy uncertainty, if one or both constructs are misrepresented in the model, there is a substantial likelihood that the coefficient of one variable is contaminated by another variable (Arouri et al., 2014).

At present, only a few, albeit important paper, have investigated the effects of oil price changes on stock markets accounting for economic policy uncertainty (Kang and Ratti, 2013, 2015; Arouri et al., 2014; Kang et al., 2017). The papers, however, neglect the distributional heterogeneity of stock returns and do not take account into the non-linear effects of oil price changes. Reboredo and Ugolini (2016) argue that stock prices reactions to oil price changes may be complex and the reactions may be depending on whether a market is bullish or bearish. Moreover, Chang et al. (2015) argue that the effects of economic policy uncertainty may be different depending on whether the stock markets are bullish or bearish phases. Besides, the possible effects of market turmoil or financial crisis must be considered because the relationships may change at the onset of the crisis. The global financial crisis is believed to have significant influence on oil prices as well as other markets such as stock and exchange rate markets.[1] Chen and Lv (2015) examine whether the relationships between the crude oil market and the Chinese stock market are changed by a crisis and conclude that the Chinese stock market exhibits stronger external dependence with the oil market during the subprime crisis. Luo and Qin (2017) also explore the role of the 2008 financial crisis in the oil-stock nexus in China. Ignoring crisis may render inappropriate or inaccurate estimation.

Additionally, we focus on China due to the rapid rise of emerging markets and increasing importance of developing countries. Developing countries have not received sufficient research attention compared with developed ones. Furthermore, oil consumption in China has dramatically increased since its economic reforms are initiated in 1978. According to the Energy Information Administration (EIA, 2014), China took the place of the US as the largest net importer of crude oil and other liquids in September 2013. Lu et al. (2015) discuss China's energy consumption structure in detail and present the trend of the profits of new energy companies in the Chinese stock market over the period 2002 to 2010. Additionally, the uncertainty in the oil market or economic policy may cause greater effects on developing countries due to the immature financial policies and investors. The

relationships between oil price changes and the stock market for China have attracted scholars' attention (Cong et al., 2008; Zhang and Chen, 2011; Broadstock et al., 2012; Wang et al., 2013; Fang and You, 2014; Li et al., 2017; Bouri et al., 2017). As regards to the relationships between economic policy uncertainty and stock returns in China, the related studies include Arouri et al. (2014), Kang and Ratti (2015), Li et al. (2016) and so on.

To the best of our knowledge, no study has established the relationships between oil price changes, economic policy uncertainty, and stock returns in China accounting for distributional heterogeneity in a panel quantile regression framework. Thus, our contribution is complementary to this research. More specific, we add to the extant literature from the following aspects: (a) we examine the joint effects of oil price changes and economic policy uncertainty on stock returns in China, both before and after the global financial crisis. The theoretical literature is aware of a possible joint effect of oil price changes and economic policy uncertainty on stock returns, but few empirical studies have analysed this issue satisfactorily; (b) to study the non-linear effects of oil price changes, we separate positive shocks from negative ones by defining two auxiliary variables. Dramatic oil increases could depress national economic growth, but little evidence proves that an oil price decrease could accelerate economic development. For this reason, there might be non-linear effects of oil price shocks on the stock markets; (c) by employing a panel quantile regression model, we extend the earlier analysis by exploring the impacts of factors not only on the mean but also on the shape of the conditional distribution of stock returns. In particular, we examine whether oil price changes and economic policy uncertainty affect stock returns under different market circumstances, including bearish (lower quantile) and bullish (upper quantile) ones, which has implications for investors in terms of risk management and the predictability of stock prices.

The remainder of the paper is organized as follows. Section 2 reviews the literature. Section 3 outlines the methodology. Section 4 describes the data used in this paper. The empirical results of panel quantile regression model are presented in Section 5. Section 6 concludes the paper.

2. Literature review

Oil is one of utmost important natural resources in the modern economy. Following the major oil price shocks of 1970s, the bulk of article has studied the relationships between oil price shocks and economic activity. In a pioneering work, Hamilton (1983) finds that oil price shocks are responsible for US recession. Oil prices might affect economy by the real balance channel, income transfer channel and allocate channel (Fang and You, 2014). Although the documentation that oil price shocks have significant effects on economic activity, relatively less work has appeared on the oil-stock relationships, and the results are inconclusive. Jones and Kaul (1996) conclude that oil price increases have a significantly negative effect on aggregate stock returns in the post-war period. By using 1947–1996 monthly data, Sadorsky (1999) indicates the negative effects of oil price shocks on stock prices. Similar conclusions have been documented by Papapetrou (2001), Park and Ratti (2008), Cunado and de Gracia (2014), Filis and Chatziantoniou (2014), and Mensi et al. (2017). In contrast, Sadorsky (2001), El-Sharif et al. (2005), Gogineni (2007), Yurtsever and Zahor (2007), Chen and Lv (2015), and Zhu et al. (2016) indicate that there exists a positive connection between oil price shocks and stock returns. In addition, Huang et al. (1996), Apergis and Miller (2009), and Sukcharoen et al. (2014) do not find a significant relationship between oil futures prices and stock returns. In light of these contradicting results, more detailed investigation of the impacts of oil price shocks on the stock market deserves particular attention.

There is a growing literature focusing on the time-varying relationships between oil price shocks and stock returns (e.g., Sadorsky, 2012;

---

[1] The discussion of the global financial crisis makes sense since it may have significant influence on oil prices as well as other markets such as stock and exchange rate markets. We thank an anonymous referee for noting this issue.