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Speculative trading and WTI crude oil futures price movement: An empirical analysis

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HIGHLIGHTS

- The instantaneous feedback of speculators on crude oil price proves significant.
- The speculators' impact on oil price has salient linearity but weak nonlinearity.
- The linear influence is symmetric when oil price goes up and down.
- When oil price is in high volatility, speculation has evident linear shock on it.

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ABSTRACT

Based on the historical data of CFTC's Commitments of Traders (COT) reports from 2007 to 2010, this paper empirically studies the influence of speculators' positions on WTI crude oil futures returns. The results indicate that, first, the instantaneous feedback of speculators' position change on crude oil price return proves statistically significant and dominates the linear feedback relationship between them during the sample period although speculation does not appear a significant driver of crude oil price movement in the lead-and-lag sense. Second, the contemporaneous influence of speculators' positions on oil price takes evident linearity but weak nonlinearity. Third, when oil price has high (low) volatility, non-commercials' position change may exert a significant (insignificant) linear shock on oil price returns. And whether crude oil price stays in high or low volatility, the nonlinear influence does not appear significant. Finally, the linear influence appears symmetric when crude oil price goes up and down, but the nonlinear influence takes asymmetric feature; and neither of linear and nonlinear influence is symmetric when crude oil price experiences high and low volatility.

1. Introduction

Since the year of 2003, international crude oil price has experienced striking volatility. The US West Texas Intermediate (WTI) crude oil price reached a record high of over $147 per barrel in July of 2008 and then due to the global financial crisis and sharp decline of global oil demand, WTI crude oil price fell to almost $30 per barrel in the beginning of 2009. And at the end of 2011, oil price rebounded to $100 per barrel again. In fact, it is well-known that international crude oil market proves a complex system and its price dynamics has been found to be affected by numerous risk factors [1–3]. Consequently, we find it hard for traditional market fundamental factors, like the demand and supply of oil, to justify the fluctuation of oil price, and the role of speculation in crude oil futures markets has attracted huge attention in recent years [4].

Due to the continuous high capital liquidity surplus around the world, a number of hedge funds poured into international crude oil futures markets from 2007 to mid-2008. A survey indicated that hedge funds in international crude oil futures market totaled $260 billion in mid-2008, nearly 20 times more than that in 2003 [5]. And according to the statistic of the Commodity Futures Trading Commission (CFTC) in the United States, by July 15 of 2008, reportable non-commercial traders (so-called speculators) had controlled 48% open interest of crude oil futures and options in the New York Mercantile Exchange (NYMEX) [6]. The unprecedented speculative situation displays a high correlation with the drastic upswing of crude oil price, and it is hard to understand that the ever-changing crude oil price is solely based on the oil market supply-and-demand fundamental. As a result, tremendous concerns and criticisms have been attached to those hedge funds for their fierce speculation in crude oil markets.

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In the second half of 2008, suffering from the global financial crisis and economic recession, international crude oil demand expectation saw a continual decline. At the same time, the US government proposed decrees to restrict undue speculative trading in crude oil markets.[1] Consequently, the volume of funds and their speculation extent in crude oil markets shrank a lot. For example, according to our calculation based on the Commitments of Traders (COT) report of CFTC, we find that the average weekly (Tuesday–Tuesday) number of registered non-commercial traders for crude oil futures in NYMEX dropped by 9% in the second half of 2008 compared with that in the first half year; in the meantime, crude oil price experienced a sharp slump.

However, since the year of 2009, the global financial crisis has been gradually recovered and global oil demand has rebounded to some extent. Consequently, the trading liquidity of international crude oil market has been increasingly strengthened, and crude oil price has climbed continuously in a volatile way. Meanwhile, the ever-growing liquidity surplus due to excessive currency supply characterizes the global economy, which mainly arises from the active national fiscal stimulus package and loose currency policies in several giant countries to address the global financial crisis and attract a number of hedge funds to pile into crude oil futures markets in a large scale again; as a result, the COT report shows that the number of speculators in crude oil futures market has increased much steadily since 2009.

In fact, the role of speculation in international crude oil market has generated significant debate not just in academia, but also in policy debates and public perception. Specifically, it has been a long time that much of the blame for international crude oil market turbulence is placed on speculators especially hedge funds, due to their large scales and flexible speculative trading strategies, but there are also some authors arguing against the blame [4]. So we would like to use some more comprehensive approaches and recent samples to question that whether the position change of speculators has significantly affected crude oil price in recent years; if so, what is their interactive mechanisms? These answers are beneficial for investors and related market supervision department: (1) to better understand the influence of speculators during the crude oil price movement; (2) to explore crude oil price dynamics; and (3) to contribute to the ongoing debate whether the policymakers should tighten regulations of all non-commercial participants in crude oil futures markets.

The remainder is organized as follows. Section 2 reviews related research on speculative activities in crude oil markets. Section 3 describes data definitions and empirical methodologies. Section 4 presents empirical results and analysis. And Section 5 concludes the paper.

2. Literature review

The influence of speculative trading on crude oil price is a hot topic but not a new one [7]. Especially in recent years, a considerable body of related research has been emerging but the findings do not appear consistent [8].

Some authors support the hypothesis that speculative trading is an important impetus to oil price movement. For instance, Citigroup [9] surveys 36 types of commodities in the US, including agricultural, energy and financial commodities and finds that the largest speculative positions arise from natural gas and crude oil and the increment of speculative positions is the main factor of commodity price rise. Meanwhile, Liu [10] holds that international crude oil price has entered an era with severe speculative bubbles, due to the evident influence of funds. Similarly, Eckaus [11] argues that there is no reason based on current and expected supply and demand that justifies the current oil price, and the oil price is a speculative bubble. Through empirical study based on the CFTC data from January 2000 to July 2009, Möbert [12] claims that the belief dispersion of speculators has significant influence on crude oil price in NYMEX and its volatility, which confirms moreover the role of speculation as a precursor to price movement. However, in my opinion, in the year of 2000 or so, the US was facing economic recession due to the high-tech bubble collapse; and it still needs solid evidence to support whether there was surplus capital liquidity to sustain tremendous speculation in crude oil market at that time. Therefore, a more reasonable sample period probably needs to be singled out to investigate the relationship between speculators' position change and oil price fluctuation. Cifarelli and Paladino [13] state that the growing presence of financial operators in the crude oil markets has led to the diffusion of trading techniques based on extrapolative expectations, and strategies of this kind foster feedback trading that may cause considerable departures of prices from their fundamental values. Therefore, they investigate this hypothesis through empirical research. The results validate the existence of positive feedback in crude oil market and identify a significant role played by speculation in the oil market; specifically, speculatively driven high prices can persist for a considerable time before fundamentals bring them down to fairer values. So they claim that actions that monitor speculative activities in oil markets more effectively are to be welcomed.

Additionally, Kaufmann and Ullman [14] suggest that the rise of crude oil price towards the end of the sample period (March 2008) was generated by both changes in oil market fundamentals and speculation. And Hamilton [15] claims that a low demand price elasticity, strong demand growth, and stagnant global production induced upward pressure on crude oil prices and triggered oil speculation from 2006 to 2008. Recently, Kaufmann [16] argues that speculation plays a significant role in the recent rise and collapse of oil price based on three indicators: (1) a significant increase in private US crude oil inventories since 2004; (2) repeated and extended break-downs (starting in 2004) in the cointegrating relationship between spot and far month futures prices that are inconsistent with the law of one price and arbitrage opportunities; and (3) statistical and predictive failures by an econometric model of oil prices that is based on market fundamentals.

However, some studies assert that speculation has a limited role or no role to play in the oil market. For instance, Weiner [17] analyzes the Gulf Crisis of 1990–1991 and examines the behavior of the international oil market during a period of unprecedented volatility. The results suggest that a combination of political events and market fundamentals, rather than speculative trading, was behind oil price volatility. By analyzing the COT report data of CFTC, Sanders et al. [18] find that the change of non-commercial trader positions does not lead to oil price change in general, although positive oil futures returns may Granger cause the increase in the net long positions held by non-commercials. Similarly, Du [19] examines the relationship between non-commercial traders' net long positions of crude oil futures and oil price in NYMEX from 2002 to 2007, and concludes that the influence caused by non-commercial traders' net long position on oil price change appears significant but the extent is fairly weaker. The economic theory tells that if the price is above the level at which the demand from end-users is equal to production, there is an excess supply and that supply has to be going into inventories; therefore, if crude oil is not building up in inventories, there cannot be a bubble in the spot price. Considering the theory above, Krugman [20] holds that during several years before 2008, crude oil inventory of OECD countries does not see a significant increase but keeps a regular level,

[1] The US Senate passed a bill on July 22, 2008, called "Stop Excessive Energy Speculation Act of 2008". This bill was aimed at amending the Commodity Exchange Act and authorizing the CFTC to prevent excessive price speculation with respect to energy commodities.