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A new approach to measure speculation in the oil futures market and some policy implications ☆

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HIGHLIGHTS

- Use a new speculative ratio to gauge speculative activities in oil futures market.
- Examine the relation between basis and speculative activities.
- The new speculative ratio also works well in the post-2008 oil bubble period.
- Oil futures market is dominated by uninformed speculators in post-financialization in 2003.

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ABSTRACT

We propose using a new relative measure, the speculative ratio, defined as trading volume divided by open interest, to gauge speculative activity in the oil futures market. We apply the speculative ratio to examine the relation between basis and speculative activity in the oil futures market before and after the financialization of the oil market in 2003. Our finding suggests that the oil futures market is dominated by uninformed speculators in the post-financialization period. Our finding carries several practical policy implications, as follows: (1) both the commodity exchange and the regulator should design regulations and trading policies that improve basis risk; (2) on the commodity exchange side, new policies on margin requirements and position limits for speculators should be implemented; (3) margin requirements should be based on the level of basis risk; (4) regulators should speed up implementation of the position limit rule in the Dodd–Frank Act; and (5) stronger and more meaningful enforcement actions by regulators are required to punish and deter market manipulators.

1. Introduction

The sharp increase in oil price from 2003 to 2008 has had major negative impacts on various sectors of the global economy. It also coincided with sharp increases in participation in the oil markets by non-traditional entities (Li, 2015). Hedge funds, endowment funds, and even retail investors are all part of the increase in market activity in the oil futures market (Davis, 2007, 2008; Kruss, 2011). Whether speculative activity and oil price surges are connected is a debate that is largely unresolved but clearly relevant to energy policy. The oil price surge and subsequent sharp decline in late 2008 have provided sufficient anecdotal evidence to further fuel the debate.

Kilian (2009) and Sanders et al. (2010) find no strong evidence of a relation between speculative trading and oil price movement. The findings in Singleton (2011), Du et al. (2011), and Juvenal and Petrella (2012) as well as anecdotal evidence in Master (2008), Sheppard (2011), and Lenzner (2012), however, suggest otherwise. Specifically, Sheppard (2011) and Lenzner (2012) refer to internal research notes by Goldman Sachs (the largest participant in the oil futures market) that reveal the speculative premium in the crude oil futures market to be as high as $21 to $26 a barrel, presumably since financialization started In early 2014, Morgan Stanley decided to exit the oil spot market (Baber, 2014). By late 2014, the crude oil price declined by more than 50% (from $100 in July, 2014 to under $50 a barrel in December, 2014). During that same period, demand and supply data showed no similarly dramatic changes in fundamentals to justify such a drastic decline in price. There are

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only two possible explanations for the price decline: the oil price had been kept artificially high before the sharp decline in recent years, and/or speculators pushed the oil price down below its fundamental value. Either way, the power of speculators to shape oil price movement is clearly evident. Therefore, it is important to be able to capture and identify excessive speculative activity in the oil futures market (or any market).

The objective of this paper is to use a new measure, the speculative ratio (trading volume divided by open interest, further explained in Section 2), to gauge the effect of speculative activity on the effective functioning of the oil futures market as a hedging tool. Specifically, we examine the dynamic correlation between the speculative ratio and the oil futures basis (defined as spot price minus futures price) in the pre- and post-financialization period beginning in 2003 to illustrate use of the proposed ratio in capturing and identifying speculative activity. Several studies, such as Lechthaler and Leinert (2012) and Li (2015), suggest that there is a lower degree of risk aversion and a lower risk premium in the crude oil market after 2003. This anecdotal evidence suggests that there may be a new class of participants (speculators) post-2003. The post-2003 period echoes the findings in Diaz-Rainey et al. (2011) that there is an increase in passive funds going into the energy markets, suggesting that financialization occurred in the oil futures market beginning in 2003.

Our study holds a practical implication because the U.S. government and various institutions use the oil futures price as the benchmark price for several important charges, such as royalties in oil extraction. How speculative activity contributes to oil futures market stability is an important consideration in continuing to use oil futures prices as the benchmark. The challenge is to measure the level of speculative activity in the oil futures market. The proposed speculative ratio fills this void.

The connection between commodity futures prices and speculative activity may be of more interest to policy makers, futures exchanges, and true hedgers, who use commodity futures to hedge price risk. Thus, true hedgers will be more interested in the impact of speculation on basis volatility, because they are concerned about basis risk exposure. Therefore, we examine the connection between speculative activity (using the speculative ratio as a proxy) and basis risk by utilizing a dynamic conditional correlation-general autoregressive conditional heteroskedasticity (DCC-GARCH) model. This model captures the time varying property of correlation between two variables to show the relation (correlation) between the speculative ratio and oil futures market basis. We demonstrate that our proposed speculative ratio is able to capture the impact of an increase in speculative activity in the oil futures market.

This leads to several energy policy implications. First, for hedgers in the oil futures market, basis risk is a major element in the hedging consideration. Basis risk increases as speculating activity surges. Our proposed new measure offers hedgers some guidance in terms of accurately depicting levels of speculative activity, allowing changes in basis risk exposure. Thus, hedgers can take appropriate actions to adjust their hedging strategies when speculative activity is high. Second, the proposed new measure allows futures exchanges to effectively gauge the level of speculative activity over time, allowing them to change margin requirements and position limits in response to changing levels of speculative activity. Appropriate responses from futures exchanges can lower futures market volatility. Third, for regulators, the proposed new measure provides information that facilitates detection of speculative activity, which improves surveillance and enforcement actions.

The remainder of this paper proceeds as follows. Section 2 presents a brief literature review, describes the speculative ratio, and sets forth our research methods. Data description and results are presented in Section 3. Section 4 provides some discussions. We conclude with policy implications in Section 5.

2. Methods

2.1. A brief literature review

One key function of futures markets is to provide price discovery for spot markets. If the market is efficient, the futures price should be an unbiased estimate for the spot price (Gülen, 1998). Any abnormality of this relation would provide arbitrage opportunities and attract speculators to exploit the inefficiency. Keynes (1930) argues that speculators are more informed than hedgers, and thus are able to profit on their speculative trades such that they help the market become more efficient.

Keynes' assertion that speculators are more informed than hedgers has been challenged in the literature. Bessembinder and Seguin (1992, 1993), Chang et al. (1999), Fung and Patterson (2001), and Mazouz and Bowe (2006) provide evidence that the effect of speculative activity on price volatility in the futures and spot markets shows mixed results.

A main challenge is to identify which trades were executed by speculators and which trades were executed by hedgers (Johnson, 1960). Bessembinder and Seguin (1993) suggest that open interest, which represents total contracts outstanding, be used as a proxy for market depth. Essentially, the intuition behind using open interest to gauge hedging activity is that hedgers sit on futures positions longer because they have underlying positions and they are less likely to take short-term profit. In contrast, these authors suggest using trading volume as a proxy for speculative activity because speculators seldom sit on futures positions overnight and their trading spikes trading volume. They suggest that incorporating open interest with trading volume data may shed insight into the price effects of market activity generated by informed and uninformed traders. The empirical studies that follow show a significant, positive effect on volatility associated with trading volume, particularly in the oil futures market (e.g., Bessembinder and Seguin, 1993; Forster, 1995; Fung and Patterson, 2001; Lautier and Riva, 2008).

Working (1953a, 1953b), however, suggests that the line between a hedger and speculator might not be clear cut. A speculator who sees opportunities for arbitrage between the spot market and the futures market may hold inventories of the underlying asset and go short on the futures position. Johnson (1960) suggests that expectation of relative and absolute price change in the future can affect positions of speculators. That is, a speculator might be more interested in the variability of the basis (basis risk) than just the futures price variability alone. Thus, using open interest and trading volume as proxies for hedging and speculative activity has weaknesses.

The sharp increase in the oil price from 2003 to 2008, and the subsequent sharp decline in late 2008, sparked renewed research interest in the oil futures market. Kilian (2009) and Kilian and Murphy (2011) find little evidence to support a correlation between speculative activity and price increases in the oil futures market. Their findings suggest that speculative activity may actually be price-stabilizing. However, their results could be a product of utilizing less efficient econometric models. Larsson and Nossman (2011) and Arouri et al. (2012) find that non-stochastic volatility models may not be able to capture the pricing dynamics in oil markets. Using more efficient models, Singleton (2011), Du et al. (2011), and Juvenal and Petrella (2012) find that speculative activity plays a role in driving up the oil price.

More recently, Lechthaler and Leinert (2012) test for and find a structural break around 2003 in the oil futures market, which