Investor demand, market efficiency and spot-futures relation: Further evidence from crude palm oil

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\textbf{ABSTRACT}

This study examines the hypothesis of Tilton et al. (2011) that assert investor demand affects commodity prices when spot and futures prices are closely correlated during strong contango in a hard commodity like copper. However, using daily data of crude palm oil (CPO) spot and futures prices from January 2000 to July 2016, after taking into account the variance of the increments in a random walk as measured by variance ratio, our study finds that spot and futures prices are highly correlated during backwardation period. It is further observed that: First, investor demand on the futures market is highly correlated with spot and futures prices during backwardation, but lesser during weak contango, and the least correlated during strong contango. Second, the efficiency of the futures market is related to the degree of correlation between spot and futures price changes. High efficient information transmission in the futures market is linked to a high correlation between spot and futures markets and vice versa. Therefore, we extend the hypothesis that the preference of holding a long position in the futures market is due to the anticipation of insufficient supply of CPO which happens during the backwardation period.

1. Introduction

Explaining the relationship between commodity spot and futures prices has been a long-standing agenda in financial economics. Such price relationship either price level in the long run or price changes in the short run is frequently determined by investor demand, in part because not all market participants are involved in producing or consuming a commodity, but also due to their expectation to make a profit by holding physical stock of a commodity from subsequent hike in the price. For those who have such expectation, they tend to intervene in the futures markets by selling futures contracts with higher prices to those who wish to acquire stocks or inventories. As a consequence, producers or stock owners are required to pay a high premium in the form of a difference between spot and futures prices at maturity of the contract.

To protect income, producers make decisions by pushing a commodity price until the futures price is sufficiently higher than the spot price. To obtain riskless profit, rational arbitrageurs who recognize this inefficient market tend to buy a commodity in the spot market and sell it in the futures market simultaneously to cover net carrying costs. Their participation in the futures markets as a counterparty of hedging strategy theoretically enhances market liquidity and improves the prediction of future spot prices based on futures prices (Sanders et al., 2010; Sanders and Irwin, 2010, 2011a, 2011b). In contrast, a change of spot price due to information flow from the futures market gives opportunities for investors to implement non-standard transactions through over-the-counter markets. Therefore, it is noted that the futures market can facilitate the entry of speculators, thereby affecting the spot price of a commodity.

According to Loayza et al. (2007), speculative will result in price variation which is disproportionate to the underlying changes in supply and demand that reduce investment and economic growth. Such price variation due to speculation will potentially disrupt the pattern of spot-futures convergence in the long run. Therefore, a pressing question is to ascertain how the difference of market transition contributes to the investor demand and causes the commodity price to oscillate beyond its normal range? This question has been of utmost importance to participants in the spot and futures markets to offset their position in strengthening their portfolio investments.

There is no clear-cut conclusion on the spot-futures relation, depending on types of commodities, market features and perceived...
risk among market participants toward the nature of a commodity. For crude palm oil (CPO), there is a growing demand for biofuels and foods in the emerging countries. The government has implemented some national policies on energy and food and influenced the consumption pattern on CPO. For example, being the world’s second largest producer of CPO, Malaysia has implemented the National Biofuel Policy on March 21, 2006 to promote the use of biodiesel derived from palm oil as environmentally friendly and sustainable energy source in order to reduce dependency on fossil fuels. It also aims to stabilize and boost palm oil prices through export, research and development activities (Gain Report, 2014).

On the other hand, the National Agro-Food Policy has been launched on September 28, 2011 to solve the issue of inequality of income distribution and poverty. It aims to ensure steady and resilient food related industries through the development of agricultural sector. This, in turn, would increase farmers’ revenue and directly curb inflation to maintain sufficient amount of food supplies for consumption in the country (Ministry of Agricultural and Agro-Based Industry Malaysia, 2014).

Tilton et al. (2011) and Östensson (2011) state that shifting investor demand for the supply of commodity spot varies when the market transits from contango to backwardation or vice versa. However, examining the relationship between spot and futures prices without taking into account the efficiency as measured by the variance of the increments of a random walk for futures pricing could result in finding a spurious relationship between investor demand and commodity price. In this regard, correlation coefficients between spot and futures price changes during strong contango, weak contango and backwardation periods by given convenience yields of 0%, 1%, 2.5%, 5% and 10% are tested. The degree of efficient futures pricing is measured using variance ratio.

The empirical finding of this study provides implications for market participants to adjust their response to their making decisions under market transition. For investors, if the futures market is found to be efficient, they can adjust their decisions in executing inter-temporal arbitrage strategies between spot and futures markets by trading liquid and physical stocks of the commodity. Furthermore, both stocks and futures are treated as precautionary instruments. They can relate the efficient futures market to their precautionary behavior towards output and price risk under a certain market condition. The efficiency of futures price allows them to adjust their decisions of holding stocks in obtaining convenience yields in the future using futures contracts as hedging instruments.

Section two reviews the literature. The subsequent section provides the explanation of data and methodology, followed by findings and empirical results. The last section concludes the discussion and suggests the implication.

2. Literature review

In the following section, past findings on speculative bubbles in commodity prices are discussed. Then, the arguments on linkages between market transition and investor demand/supply by Tilton et al. (2011) and Östensson (2011) are briefly explained. Finally, a review of market efficiency for the respective commodity spot and futures markets is outlined.

2.1. Financial speculation in commodity markets

Numerous studies look at the aspect of whether investors in the futures markets act as a major force that distorts and drives up commodity prices in a variety of situations. There are some studies that support the existence of such speculative pressure. For instance, Kocagil (1997) tests the hypothesis of speculation that stabilizes spot prices for copper, gold, silver and aluminum. From the sample period of 1980–1990, the author’s result provides an evidence to reject this stabilization hypothesis for all four markets. Kaufmann and Ullman (2009) consider the roles of hedges and speculators in the West Texas Intermediate (WTI), Brent-Blend, Maya, Bonny Light and Dubai-Fateh crude oil markets. Their result supports that speculation activities are likely to exacerbate the market fundamentals when high fluctuations in futures prices happen as opposed to spot prices.

Among twenty-eight commodities traded in the United States, Emekter et al. (2012) use a duration dependence test on the stochastic interest-adjusted basis and find evidence of rational speculative bubbles in eleven commodity markets. Bos and Van der Molen (2012) develop and use their own non-parametric test and an empirical model to examine the impact of futures speculation on prices of coffee in the Arabica for the sample period of 1989–2008. They find that factors such as harvest sizes, inventories, futures market microstructure and price elasticity of demand enhance the impact of futures speculation on rising coffee price. They also suggest that speculation is one of the contributors of input for the other commodities.

With the application of unit root and cointegration tests, Lucey and O’Connor (2013) detect the possibility of a rational speculative bubble in the gold price during the sample period of 1989–2013. They use Markov switching augmented Dickey-Fuller tests to account the periodically collapsing bubbles. Their adequate result based on the imposition of a constant variance in two regimes provides evidence of existing bubble for 2, 3 and 12-month lease rates.

Similarly, Zhang (2013) uses linear and non-linear approaches to detect such bubble in the case of WTI market for the sample period of 2007–2010. As a result, he finds that an instantaneous feedback of speculators’ position change on crude oil return appears significantly in the linear form than the non-linear form. This linear feedback appears symmetrically across the sample period with different crude oil volatilities, but the non-linear feedback that takes asymmetric feature does not exist.

Following the study by Mabialik et al. (2014) in the case of Indian commodity markets during 2005–2008, they find that the effect of past innovation in the futures market on spot volatility happens frequently in the agricultural future index, energy future index and aggregate commodity index. Guilleminot et al. (2014) find a high correlation between speculative and index positions during periods of liquidity stress, providing that a strong impact of index flows on prices for twelve traded agricultural commodities in the United States. Taking multiple periods of price changes for these agricultural commodities during 1970–2011, Etienne et al. (2014) find that 1.5–2% of them belong to episodes of price bubble. They further find 80–90% of bubbles are short-lived that usually last fewer than 10 days, accounting for more than one-third of the explosive episodes.

Using a momentum threshold autoregressive approach in testing speculative bubbles in the United States during the sample period of 1993–2012, Adämmer and Bohl (2015) find that speculation has a reinforcing influence on wheat prices. However, their empirical results provide inconclusive finding for corn and soybean. Additional, Brooks et al. (2015) estimate fundamental values based on convenience yields and macroeconomic factors. Along with these estimated values, they use a switching regression approach. Their result provides a reliable evidence of pure speculation to be unsustainable in causing the extreme price movement for crude oil and feeder cattle over a 40-year period since the late 1960s.

Furthermore, Huchet and Fam (2015) report that coffee, sugar, corn and wheat returns during the sample period of 1998–2013 are systematically modified by speculative transactions in futures markets. The speculative pressure from futures markets seems to...
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