



Testing the Masters Hypothesis in commodity futures markets

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ABSTRACT

The 'Masters Hypothesis' is the claim that long-only index investment was a major driver of the 2007–2008 spike in commodity futures prices and energy futures prices in particular. Index position data compiled by the CFTC are carefully compared. In the energy markets, index position estimates based on agricultural markets are shown to contain considerable error relative to the CFTC's *Index Investment Data (IID)*. Fama–MacBeth tests using the CFTC's quarterly IID find very little evidence that index positions influence returns or volatility in 19 commodity futures markets. Granger causality and long-horizon regression tests also show no causal links between daily returns or volatility in the crude oil and natural gas futures markets and the positions for two large energy exchange-traded index funds. Overall, the empirical results of this study offer no support for the Masters Hypothesis.

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1. Introduction

Commodity futures prices spiked in 2007–2008, led by an increase in crude oil futures prices to a new (nominal) all-time high of \$145 per barrel. As the spike developed, concerns emerged that the increase was being driven by inflows into new commodity index investments.² These financial investments are packaged in a variety of forms but share a common goal—provide the investor with long-only exposure to returns from an index of commodity prices.³ For example, the S&P GSCI™ is one of the most widely tracked commodity indexes and generally considered an industry benchmark. It

is computed as a production-weighted average of the prices from 24 commodity futures markets with a relatively heavy weighting towards energy markets.

Hedge fund manager Michael W. Masters is a leading proponent of the view that commodity index investment was a major driver of the spike in commodity futures prices. He has testified numerous times before the U.S. Congress and Commodity Futures Trading Commission (CFTC) with variations of the following argument:

"Institutional Investors, with nearly \$30 trillion in assets under management, have decided en masse to embrace commodities futures as an investable asset class. In the last five years, they have poured hundreds of billions of dollars into the commodities futures markets, a large fraction of which has gone into energy futures. While individually these Investors are trying to do the right thing for their portfolios (and stakeholders), they are unaware that collectively they are having a massive impact on the futures markets that makes the Hunt brothers pale in comparison. In the last 4½ years assets allocated to commodity index replication trading strategies have grown from \$13 billion in 2003 to \$317 billion in July 2008. At the same time, the prices for the 25 commodities that make up these indices have risen by an average of over 200%. Today's commodities futures markets are excessively speculative, and the speculative position limits designed to protect

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² See USS/PSI (2009), Irwin, Sanders, and Merrin (2009), and Pirrong (2010) for detailed discussions of the controversy surrounding the role of index investment in the 2007–2008 commodity price spike.

³ Investors may enter directly into over-the-counter (OTC) contracts with swap dealers to gain the desired exposure to returns from a particular index of commodity prices. Some firms also offer investment funds whose returns are tied to a commodity index. Exchange-traded funds (ETFs) and structured notes (ETNs) also have been developed that track commodity indexes. In the remainder of this paper, the term 'commodity index fund' or 'index fund' is used generically to refer to long-only commodity investments. See Engelke and Yuen (2008) for further details on commodity index investments.

the markets have been raised, or in some cases, eliminated. Congress must act to re-establish hard and fast position limits across all markets.” (Masters and White, 2008, p. 1).

In essence, Masters argues that massive buy-side ‘demand’ from index funds created a bubble in commodity prices, with the result that prices, and crude oil prices in particular, far exceeded fundamental values at the peak. We use the term ‘Masters Hypothesis’ as a short-hand label for this argument.

As highlighted in the above quote the regulatory response to concerns about the impact of index investments in commodity futures markets centers on speculative position limits. Limits on speculative positions in U.S. agricultural futures markets have been set by the CFTC and its precursors for decades.⁴ The CFTC proposed to basically extend this regulatory regime to four energy futures markets in early 2010. The fact that the CFTC received over 8000 responses during the public comment period for the proposed rule-making (Acworth and Morrison, 2010), the second highest number of responses in its 36-year history, highlights the economic importance of the policy debate surrounding commodity index investments. Most recently, the 2010 *Dodd–Frank Wall Street Reform and Consumer Protection Act* granted the CFTC broad authority to set aggregate speculative position limits on futures and swap positions in all non-exempt ‘physical commodity markets’ in the U.S.

From a theoretical perspective, the impact of index funds in commodity futures markets hinges on the predictability of their position changes. If position changes are perfectly predictable, index funds will not have an impact in a rational expectations equilibrium because other market participants will anticipate their activity, trade against them, and thereby negate any potential impact (De Long et al., 1990). If index fund position changes are less than perfectly predictable, a market impact is possible. However, unpredictability of index fund activity is a necessary but not sufficient condition for a market impact. For example, assume index fund position changes are unpredictable but related to changing fundamentals (speculation in the traditional sense) then the changes would be positively correlated with contemporaneous or subsequent changes in commodity futures prices, but this would be a reflection of valuable information on fundamentals rather than a ‘flow’ impact.

One might expect actual index position changes to be highly predictable since most funds track well-known commodity indexes and publish their mechanical procedures for ‘rolling’ to new contract months. However, this ignores the fact that positions also change due to investment flows into and out of index funds and these may be quite large. A more plausible scenario is one where index fund position changes are largely unpredictable and unrelated to market fundamentals, since portfolio diversification is a main driver of investment in index funds (Stoll and Whaley, 2010) and this has the effect of making index positions “...insensitive to the supply and demand fundamentals” (Masters and White, 2008, p. 29). Prices could be impacted for several reasons under this scenario:

- (i) The commodity futures market may not be sufficiently liquid to absorb the large order flow of index funds. This implies prices are temporarily pushed away from fundamental value. Since the impact is temporary, contemporaneous index fund position and price changes are positively correlated and current position changes and subsequent price changes are negatively correlated. This is the classic problem of illiquidity arising from the asynchronous arrival of traders to the marketplace (Grossman and Miller, 1988).

- (ii) Index investors are in effect noise traders who make arbitrage risky. This opens the possibility of index investors ‘creating their own space’ if their positions are large enough (De Long et al., 1990). Once again a positive contemporaneous correlation is implied between index position changes and price changes; however, subsequent price changes may be positively or negatively correlated with the current position change depending on whether prices are pushed above or below fundamentals.

- (iii) Other traders in commodity futures markets have difficulty distinguishing signals from noise. The large order flow of index funds on the long side of the market may be seen as a reflection of valuable private information about commodity price prospects, which has the effect of driving the futures price higher as other traders subsequently revise their own demands upward (Grossman, 1986). This increase in the expected future cash price leads to an increase in inventories and also raises current cash prices (Hamilton, 2009). Index position changes are positively correlated with contemporaneous price changes, and possibly, subsequent price changes if the reaction of other traders to index order flow is not instantaneous.

However plausible from a logical standpoint, it is nonetheless an empirical question whether these types of impacts are discernable in actual market observations.

Several recent studies test whether there is a statistical link between market positions of index funds and commodity futures price movements.⁵ Gilbert (2009) reports evidence of a significant relationship between index fund trading activity and returns in three commodity futures markets: crude oil, aluminum, and copper. He estimates the maximum impact of index funds in these markets to be a price increase of 15%. In subsequent work, Gilbert (2010) finds evidence of significant relationship between index fund trading and food price changes. Singleton (2011) estimates a regression model of crude oil futures prices and finds that index investment flows are an important determinant of price changes along with several other conditioning variables. His estimates indicate that a 1 million contract increase in index fund positions in WTI crude oil over the previous 13 week period results in a 0.272% increase in nearby crude oil futures prices in the next week. Both Gilbert (2009, 2010) and Singleton (2011) rely on measures of index positions in energy markets imputed from positions held in agricultural commodities.

Alternatively, Brunetti and Buyuksahin (2009) conduct a battery of Granger causality tests and do not find a statistical link between swap dealers positions (a proxy for commodity index fund positions) and subsequent returns or volatility in the crude oil, natural gas, and corn futures markets. Stoll and Whaley (2010) also use a variety of tests, including Granger causality tests, and find no evidence that the position of commodity index traders impacts prices in agricultural futures markets. Sanders and Irwin (2010, 2011a, 2011b) report similar results for agricultural and energy futures markets. Buyuksahin and Harris (2011) do not find a statistical link between swap dealers positions and changes in crude oil futures prices. Buyuksahin and Robe (2011) show that index fund activity (again, as measured by swap dealer positions) is not associated with the increasing correlation between commodity and stock returns.

Irwin and Sanders (2011) survey this literature and conclude that the weight of the available empirical evidence tilts against the Masters Hypothesis. However, proponents of the Masters Hypothesis sharply criticize the data and methods used in the studies that fail to

⁴ A detailed history of position limit regulations in U.S. commodity futures markets can be found at: <http://www.cftc.gov/PressRoom/SpeechesTestimony/berkovitzstatement072809.html>.

⁵ Other studies investigate the impact of speculation in the recent commodity price spike without directly testing for statistical linkages between index fund positions and price movements (e.g., Einloth, 2009; Kilian and Murphy, 2010; Phillips and Yu, 2010; and Tang and Xiong, 2010). Conclusions are mixed with regard to the impact of speculation or whether a price bubble occurred.

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