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# Financialization and the returns to commodity investments

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A B S T R A C T

Commodity futures investment grew rapidly after their popularity exploded—along with commodity prices—in the mid-2000s. Numerous individuals and institutions embraced alternative investments for their purported diversification benefits and equity-like returns. We investigate whether the “financialization” of commodity futures markets reduced the risk premiums available to long-only investors in commodities. While energy futures markets generally exhibit a decline in risk premiums after 2004, premiums in all but one non-energy futures market actually increased over the same time period. Overall, the average unconditional return to individual commodity futures markets is approximately equal to zero before and after financialization.

## 1. Introduction

Several influential studies published in the last 15 years (e.g., Gorton and Rouwenhorst, 2006) concluded that long-only commodity futures investments generate equity-like returns.[1] This undoubtedly contributed to the rise of commodity futures from relative obscurity to a common feature in today's investing landscape. Blue-ribbon investment companies now view commodities as a potentially valuable alternative investment that should be considered in any serious discussion about the portfolio mix for investors. These investments include commodity index funds, commodity-linked notes, and Exchange Traded Funds (ETFs), all of which track broad commodity indices as well as those focused on particular market segments or individual commodities. Large institutional investors generally gain long exposure to commodities through direct holdings of futures contracts as well as the use of over-the-counter derivatives and swaps.

The popularization of commodities as an investment is commonly referred to as the “financialization” of commodity futures markets (e.g., Tang and Xiong, 2012). The magnitude of the financialization wave since the mid-2000s certainly was impressive in its scale. For example, the U.S. Commodity Futures Trading Commission (CFTC) estimates that commodity index investments in U.S. and non-U.S. futures markets totaled $144.4 billion as of December 31, 2014, a very large figure by historical standards.[2] There has been much discussion whether the scale of financialization was large enough to reduce the historical risk premiums in commodity futures markets.

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[1] Earlier studies also found evidence of positive returns to commodity futures portfolios (e.g., Bodie and Rosansky, 1980; Fama and French, 1987; Greer, 2000).

[2] *Index Investment Data* report for December 31, 2014: http://www.cftc.gov/ucm/groups/public/@marketreports/documents/file/indexinvestment1214.pdf.

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The traditional Keynesian theory of normal backwardation predicts that long speculators in commodity futures earn a risk premium from short hedgers in the form of an embedded downward bias in futures prices before maturity. Theoretical models developed by Acharya et al. (2013), Etula (2013), Brunetti and Reiffen (2014), Hamilton and Wu (2015), and Basak and Pavlova (2016) demonstrate how buying pressure from commodity investors can exert downward pressure on risk premiums, or equivalently, upward pressure on commodity futures prices before expiration. Hamilton and Wu (2014) report empirical evidence in the crude oil futures market of a decline in risk premiums when comparing 1990–2004 with 2005–2011. The timing of the change in premiums observed by Hamilton and Wu is consistent with the start of the financialization wave of commodity investments around 2004 (e.g., Tang and Xiong, 2012). To the best of our knowledge, this is the only evidence to date of a reduction in risk premiums consistent with the prediction of theoretical models.

The purpose of this paper is to provide a comprehensive analysis of the impact of financialization on risk premiums available to long-only investors in commodity futures markets. We first use the cost-of-carry model for storable commodity prices to show how long returns are driven by risk premiums. We next use daily futures prices for 19 commodity futures markets over January 1961–December 2014 to determine whether financialization pressures drove risk premiums downward in recent years. While energy futures markets generally exhibit a decline in risk premiums after 2004, premiums in all but one non-energy futures market actually increased over the same time period. Overall, the average unconditional return to individual commodity futures markets is approximately equal to zero before and after financialization.

### 1.1. Risk premiums and the cost-of-carry model

We focus on the underlying dynamics of commodity futures prices at the individual market level. The "cost-of-carry" model is a well-developed theoretical framework for pricing storable commodities (e.g., Pindyck, 2001). We use the same version of cost-of-carry model as in Bessembinder et al. (2016) to analyze the expected behavior of returns in commodity futures markets.[3] To begin, let $P_t$ represent the spot price at date $t$, $F_t(m)$ represent the futures price at date $t$ for delivery at $t + m$, and $C_t$ is the per period cost-of-carry which includes interest and other storage costs. The basic no-arbitrage cost-of-carry relationship between spot and futures prices can be expressed as follows,

$$F_t(m) = P_t e^{C_t m}. \tag{1}$$

Using (1), the market-implied cost-of-carry per period can be expressed in terms of the relative price of a distant futures contract (delivery date $t + n$) and a nearby futures contract (delivery date $t + m$),

$$C_t = \frac{ln\left[\frac{F_t(n)}{F_t(m)}\right]}{(n-m)} \tag{2}$$

where $C_t$ consists of forgone interest ($r_t$), physical storage costs ($c_t$), and the convenience yield ($y_t$) associated with having stocks on hand, such that $C_t = r_t + c_t - y_t$. As noted earlier, $C_t$ normally is dominated by interest and physical storage costs ($r_t$+$c_t > y_t$) in which case the futures market is in a normal carry or contango ($F_t(n) > F_t(m)$ and $C_t > 0$). Other times, the convenience of having stocks on-hand dominates such that ($r_t$+$c_t$ $y_t$) in which case the futures market is inverted ($F_t(n) < F_t(m)$ and $C_t < 0$). In all cases, the cost-of-carrying inventory is revealed by the term structure of the futures market.[4]

The return on the spot commodity net of storage costs can be expressed as

$$U_{t+1} = ln\left[\frac{P_{t+1}}{P_t e^{C_t}}\right] = \pi + \varepsilon_{t+1}. \tag{3}$$

Bessembinder et al. (2016) call $U_{t+1}$ the *ex post* premium. It has two components: (i) the *ex ante* risk premium ($\pi$), which is the return that holders of the commodity expect to earn as compensation for risk, and (ii) the *ex post* price shock ($\varepsilon_{t+1}$), which includes unforeseen supply and demand shocks. The forces of arbitrage imply that *ex post* price shocks should average zero, and therefore, the *ex post* premium is, on average, determined by the risk premium.[5] For example, if traders expect demand for the commodity to increase in the future, then they will hold some of the commodity off the market to store in anticipation of higher future prices. This action will cause current prices to rise and eliminate any excess returns from storage.

Equations (1)–(3) can be used to express the continuously compounded returns to holding spot and futures positions,

[3] The Bessembinder et al. (2016) version of the cost-of-carry model is found in the appendix to their paper.

[4] There is an important exception to this result. Garcia et al. (2015) show that the futures term structure provides a downward-biased measure of the cost-of-carrying inventory when the market price of physical storage exceeds the maximum storage rate allowed by the delivery terms of the futures market. This situation actually occurred frequently over 2006–2010 for grain futures markets, and Garcia et al. show how this explains the much-discussed episodes of non-convergence that plagued the markets during this time period.

[5] Formally, this statement applies to the mean of the exponential rather than the level of $U_t$. In a rational expectations equilibrium, the expected price next period equals the current price plus the price of storage and the *ex ante* risk premium, i.e., $E(P_{t+1}) = P_t e^{\pi + C_t}$, which implies $E(e^{U_{t+1}}) = e^{\pi}$ and, from Jensen's inequality, $E(U_{t+1}) < \pi$.