A Trend Factor in Commodity Futures Markets: Any Economic Gains from Using Information over Investment Horizons?

Yufeng Han, Ph.D.
Belk College of Business, University of North Carolina at Charlotte

Lingfei Kong, Ph.D.
Olin School of Business, Washington University in St. Louis

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This paper identifies a trend factor that exploits the short-, intermediate-, and long-run moving averages of settlement prices in commodity futures markets. The trend factor generates statistically and economically large returns during the post-financialization period 2004-2020. It outperforms the well-known momentum factor by more than nine times the Sharpe ratio and has less downside risk. The trend factor is not encompassed by extant factors and is priced cross-sectionally. An analysis of macroeconomic and other market-wide drivers suggests that this trend factor is stronger in periods of low funding liquidity as measured by the TED spread. Overall, the results indicate that there are significant economic gains from exploiting the information content of long histories of commodity futures prices.

Introduction

Trend-following strategies have been widely used by commodity trading advisors (CTAs) and have received extensive attention from academics. Momentum, which utilizes intermediate-term trend signals (usually 6 months or 12 months), is one of the most extensively studied trend-following strategies in the literature (*e.g*., Erb and Harvey, 2006; Miffre and Rallis, 2007; Moskowitz *et al*., 2012; Huang *et al*., 2020). Researchers also find evidence that the momentum factor is a priced factor and generates a significant risk premium cross-sectionally (e.g., Bakshi *et al*., 2019; Sakkas and Tessaromatis, 2020).

However, the momentum factor ignores short-term and long-term price signals, which also help predict commodity futures returns. For example, Han *et al.* (2016) find that 5-day moving average signals can outperform the buy-and-hold benchmark. A combination of short- and long-term trend signals can also be profitable. For instance, Narayan *et al.* (2015) find that multiple trading strategies based on the difference between the short- and long-term moving averages perform well. Bianchi *et al.* (2016) find that a double-sort strategy based on momentum and long-term reversal generates significant returns.

This paper studies the cross-sectional predictive ability of a composite trend signal that incorporates short-, intermediate-, and long-term trend signals in commodity futures markets. The authors evaluate the performance of the trend factor by comparing it with the traditional momentum factor (constructed from past 12-month cumulative returns) that also exploits cross-sectional predictability. We also use time-series and cross-sectional tests to examine the predictive power of the trend factor. Last but not least, we examine how macroeconomic and other market-wide variables affect the profitability of the trend factor.

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The sample period for the analysis is January 2004–December 2020 intentionally because since 2004, speculators (financial institutions and individual investors with no physical exposure to the underlying commodities that trade commodity futures to capture a risk premia) have increased their participation in commodity futures markets. This phenomenon is referred to as the "financialization" of commodity futures (*e.g.*, Tang and Xiong, 2012; Basak and Pavlova, 2016). Algorithmic trading has also gained prevalence.[1] Researchers find that during the post-financialization period, commodity futures markets have been more liquid and have experienced increasing speculative trading (e.g., Gong *et al*., 2021). The highly liquid commodity futures markets during the post-financialization period make the proposed long-short trading strategy more feasible. A further motivation for focusing on the most recent decade is that many factors in the stock market have attenuated in recent years because of increased turnover and liquidity (referred to as "factor crowding"); for instance, the average return of long-short momentum portfolios becomes insignificant after 2001 (Chordia *et al*., 2014).

The paper confirms that the well-known momentum factor has also disappeared in commodity futures markets during the sample period, but the trend factor remains strong. The results suggest that the trend factor performs better when there is lower funding liquidity (as suggested by a wider TED spread) and thus, factor arbitrage is more costly. Kang *et al*. (2021) find that an increase in arbitrage costs (measured both by the TED spread and the repo rate) makes factors less crowded and increases factor returns. Correspondingly, a larger TED spread hinders commodity futures trading strategies based on the trend factor and increases the corresponding return. Our results thus indicate that commodity futures can be attractive alternative assets when funding liquidity in the credit market is low.

Relevance of the Research Question

The research question is important as it relates to ongoing debates about using commodity futures as investment assets, common risk factors in commodity futures markets, and factor crowding. The new trend factor identified by the authors that outperforms the well-studied momentum factor and is not subsumed by extant factors in commodity futures markets ought to be of interest to commodity futures market participants, speculators predominantly but also selective hedgers, and more generally for empirical asset pricing. This is the first study to apply the Han *et al.* (2016) method to commodity futures markets, which jointly considers the short-, intermediate-, and long-term trend signals. The paper contributes to the literature on the source of predictability of trend-based trading strategies by identifying a link between funding liquidity and the profitability of the trend factor.

Data and Methodology

The empirical analysis is based on settlement prices, aggregated open interests, and commercial traders' long and short positions of 35 commodity futures from Bloomberg that cover four main sectors: agriculture (grains and softs), energy, livestock, and metal. There are 8 grains futures (soybean oil, corn, Kansas wheat, oats, rough rice, soybean, soybean meal, wheat), 8 softs futures (cocoa, cotton, ethanol, milk, orange juice, coffee, lumber, sugar), 3 livestock futures (feeder cattle, live cattle, lean hogs), 6 energy futures (WTI crude oil, heating oil, natural gas, gasoline, Brent crude oil, gas oil), and 10 metal futures (aluminum, copper, gold, lead, nickel, palladium, platinum, tin, silver, zinc) in the sample.

The methodology closely follows Han *et al.* (2016). The authors first calculate moving averages (MA) of past settlement prices from 3 days to as many as 600 days (roughly three trading years) for each commodity futures contract. They then run sequential cross-sectional regressions for monthly returns on the different normalized moving averages over a past 5 years. The expected returns for each commodity futures are then obtained as the expected coefficient of the short-, medium- or long- MA signals (where the expectation is proxied by the 60-month window average of the sequential cross-sectional regression coefficient estimates) multiplied by the corresponding commodity-specific normalized moving averages. The trend factor is then constructed by taking long positions in the commodity futures with the highest expected returns and shorting those with the lowest expected returns to exploit cross-sectional predictability.[2] The commodity futures are equally weighted in the long and short portfolios.

The authors conduct time-series and cross-sectional tests to assess whether multifactor models can explain the performance of the trend factor. These include multi-factor models based on portfolio sorts, GRS tests, Fama-MacBeth regressions and panel regressions. To explain the source of predictability of the trend factor, the authors regress the trend factor contemporaneously on the monthly growth rate in industrial production, default spread, term spread, CBOE Volatility Index, liquidity (the TED spread), various stock market factors, and the Baker and Wurgler (2006) investor sentiment proxy.

Main Results

The annualized mean return of the trend factor from January 2004 to December 2020 is 17.19% which is both economically and statistically significant at the 1% level. By contrast, the annualized mean of the well-known momentum factor is 1.9% and is statistically insignificant. Time-series pricing tests reveal that the return of the trend factor cannot be explained by the benchmark multifactor models as borne out by significant risk-adjusted returns (or alphas) of the trend factor. For example, the annual alpha with respect to the Sakkas and Tessaromatis (2020) six-factor model is 15.96% (1.33%×12=15.96%). The GRS tests provide additional support in a joint-regression setting, with F statistics rejecting the null hypothesis that the alphas of the trend portfolios are jointly equal to zero. Additionally, two-pass cross-sectional regressions suggest that the trend factor is priced cross-sectionally. Overall, the results show that the trend signal contains predictability for the cross-section of commodity futures returns.

Multivariate regressions of the trend factor on macroeconomic and other market-wide variables suggests that the TED spread is a significant driver at the 5% level with a positive coefficient. This indicates that when the TED spread is large, there is lower funding liquidity in the credit market which increases arbitrage costs, the trading of the trend factor decreases and the profitability of the trend factor becomes greater. This is in line with the argument in Kang *et al*. (2021) that an increase in arbitrage costs (measured by the TED spread and the repo rate) makes factors less crowded and increases factor returns.

Conclusions

In this paper, the authors put forward a trend signal constructed from the short-, intermediate-, and long-run moving averages of settlement prices in commodity futures markets. A long-short portfolio analysis reveals that the trend strategy proposed outperforms the well-known momentum strategy by generating statistically and economically larger excess returns and exhibiting less downside risk. Time-series and

cross-sectional pricing tests suggests that the trend factor is not subsumed by other extant factors such as the slope of the term structure (or basis), hedging pressure, basis-momentum, and value. Overall, the results indicate that long histories of futures prices contain important predictive information for the cross-section of commodity futures returns.

Endnotes

1 See Haynes and Roberts (2019).

2 A time-series trading strategy involves taking positions based on the security's own past returns. In contrast, the positions in a cross-sectional trading strategy are based on the relative performance of securities. See Goyal and Jegadeesh (2018) for a detailed examination of the difference between time-series and cross-sectional tests of predictability. Miffre (2016) also has an excellent summary of the trend literature categorized by the time-series and cross-sectional tests.

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Author Biographies

YUFENG HAN, Ph.D.
Belk College of Business, University of North Carolina at Charlotte

Dr. Yufeng Han joined the Belk College faculty as an Associate Professor of Finance in 2016. Prior to joining UNC Charlotte, he served as a faculty member at the University of Colorado Denver and Tulane University. Dr. Han's primary research interests are empirical asset pricing, investment, mutual funds, and econometrics. He has published in the *Review of Financial Studies, Journal of Financial Economics, Journal of Financial and Quantitative Analysis, Journal of Banking and Finance, Real Estate Economics* and many other finance and economics journals. Dr. Han received a Bachelor's degree from Tsinghua University (China) and a Ph.D. from Washington University in St. Louis.

LINGFEI KONG, Ph.D.
Olin School of Business, Washington University in St. Louis

Dr. Lingfei Kong is a Postdoctoral Research Associate in Finance at the Olin School of Business, Washington University in St. Louis. Dr. Kong received her Ph.D. in Finance from the University of North Carolina at Charlotte. Her research focuses on empirical asset pricing, return predictability, big data analytics, commodity futures, and product innovation.