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Exploiting commodity momentum along the futures curves

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A B S T R A C T

This study examines novel momentum strategies in commodities futures markets that incorporate term-structure information. We show that momentum strategies that invest in contracts on the futures curve with the largest expected roll-yield or the strongest momentum earn significantly higher risk-adjusted returns than a traditional momentum strategy, which only invests in the nearest contracts. Moreover, when incorporating conservative transaction costs we observe that our low-turnover momentum strategy more than doubles the net return compared to a traditional momentum strategy.

1. Introduction

Several studies document a cross-sectional momentum effect in commodity futures markets. Erb and Harvey (2006) report a return of more than 10% per annum on a portfolio that longs commodity futures with the highest prior 12-month returns and shorts the worst-performing commodity futures. Miffre and Rallis (2007) extend this strategy for different ranking and holding periods up to 12 months and find profitable results for almost all definitions. Shen et al. (2007) also report highly significant positive returns for holding periods up to nine months. In addition, Pirrong (2005) and Asness et al. (2013) investigate momentum in multiple asset classes including commodities. What these commodity studies have in common is that only the nearest futures contracts are used for both the construction and implementation of momentum signals. Often futures contracts of various maturities are available for a given commodity. By considering only the nearest futures contract, the majority of investable deferred futures is not considered. This collection of futures could potentially offer additional information and investment opportunities.[1] We propose alternative cross-sectional momentum strategies utilizing information further along the futures curve. We demonstrate that these strategies perform significantly better than a traditional momentum strategy.[2]

We identify four reasons why the futures curve potentially offers valuable information when exploiting a momentum strategy: contracts further along the curve could (i) exhibit more

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[1] Various theories exist that try to explain the shape of the commodities futures curve. The oldest is the Normal Backwardation theory of Keynes (1930). Cootner (1960, 1967) generalizes the Normal Backwardation theory into the Generalized Hedging Pressure theory, while Kaldor (1939) and Working (1948, 1949) introduce an alternative explanation named the Theory of Storage.

[2] A related stream of literature investigates so-called time-series as opposed to cross-sectional momentum strategies, see e.g. Szakmary et al. (2010), Moskowitz et al. (2012) and Baltas and Kosowski (2013). The main difference is that these time-series strategies construct commodity portfolios with possibly more long than short positions or vice versa, which implies that part of the strategy consists of commodity market timing. In our research, we focus on the cross-sectional 'pure' momentum strategies without any market timing.

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attractive roll yields, (ii) exhibit lower volatility, (iii) expand the opportunity set of our investable universe and (iv) lower the turnover of the portfolios. We will elaborate on these possible advantages in more detail. First, the excess returns of commodity futures can be decomposed in spot and roll returns, where roll return is defined as the yield that an investor captures when the futures price converges to the spot price as the futures contract comes closer to expiration, assuming that the spot price does not change.[3] The standard approach of investing in the nearest contracts might not be optimal in capturing roll returns. Commodity index providers have noticed the possible adverse effects of roll returns because long-only investments suffer from negative roll returns when the futures curve is upward sloping, i.e. is in contango. Miffre (2012) shows that long-only indices developed to minimize the exposure of negative roll returns have performed better than traditional long-only indices which are rolled based on the nearest contracts. Mouakhar and Roberge (2010) investigate the added value of maximizing the roll yield of long-only investments compared to simply buying the nearest contract in each of ten individual commodity futures. They find that buying the futures contract with the largest expected roll yield, as measured by the lowest price slope between two consecutive maturities, adds a return of on average 4.8% per year on top of buying the nearest futures contract. So far, this strand of literature has focussed on enhancing traditional (long-only) indices and on stand-alone roll-yield strategies. However, it is not clear whether there is also added value to achieve on top of active momentum strategies.

Second, besides the possibility of finding more attractive roll yields, Samuelson (1965) argues that the volatility of futures returns decreases when the maturity of contracts increases. An economic argument is that most supply and demand shocks occur at the front-end of the curve. Hence the prices of these front contracts react most heavily to news, while prices further along the curve are influenced less as there is more time to overcome the shocks. Daal et al. (2006) investigate this maturity effect empirically using an extensive futures dataset. They find that the effect tends to be stronger in agricultural and energy commodities than in financial futures. A possible implication of this maturity effect is that the volatility of a momentum strategy could be reduced by investing in futures with a longer maturity.

Third, even for the same commodity, contracts with different maturities exhibit large differences in returns and risks. For example in our data we find for lean hogs an average annualized return of −6.2% for the first contract, compared to 4.8% for the fifth contract. For WTI crude oil, we see an average annualized volatility of 33.2% for the front contract, compared to 22.2% for the tenth contract. These findings illustrate that non-front contracts behave differently from front contracts and essentially represent different investment opportunities. Therefore just like including more commodities into the universe, including non-front contracts further down the futures curves is expected to expand the opportunity set of our investable universe, which could potentially lead to more refined choices of contracts and better investment results.

And fourth, an interesting feature of buying contracts further along the curve is that these can potentially be kept longer in the portfolio. Contracts bought at the front-part of the curve soon need to be traded to avoid delivery, even though the commodity is still found to be attractive. On the other hand, as the trading volumes of contracts further on the curve are lower on average, the costs for trading a contract at the back-end of the curve could potentially be higher.

To exploit these four possible benefits, we propose three alternative momentum strategies in which we integrate term-structure information when generating and implementing momentum signals. All three strategies aim to reduce volatility by trading further on the curve and furthermore specifically aim to capture one or more of the above mentioned possible advantages. As a benchmark we take a cross-sectional generic momentum strategy that each month longs the commodities with the highest past 12-month returns (winner commodities) and shorts those with the lowest past 12-month returns (loser commodities).

The first alternative strategy that we propose aims to take advantage of the first benefit by maximizing the roll yield. More precisely, for the winner commodities we buy the most backwardated contract on the futures curve and for the loser commodities we sell the most contangoed contract, where we only include futures contracts that expire within 12 months. We show that implementing this roll-yield strategy on top of a traditional long-short momentum strategy generates significantly higher risk-adjusted returns, as the Sharpe ratio increases by more than 30% to 0.96 compared to 0.73 for the traditional front-contract momentum strategy. The improvement is both due to lower risk and higher returns.

The second strategy that we propose expands the traditional cross-sectional momentum strategy with curve momentum information. For each commodity, we first select the contract on the curve with the strongest and weakest momentum. We then cross-sectionally rank the commodities according to the selected contracts and long (short) the contracts with the highest (lowest) momentum. Besides enlarging our investment opportunity set, we implicitly take roll information into account as, even when a parallel shift in the term structure occurs, differences in roll return can cause differences in momentum returns along the curve.[4] We find that incorporating curve momentum leads to significantly higher returns (Sharpe ratios) compared to a traditional momentum strategy, namely 14.48% (0.97) versus 11.43% (0.73).

Our third strategy aims for higher roll returns and a much lower turnover compared to a traditional momentum strategy. We examine a strategy that remains invested in a particular contract even though it might not have the most optimal roll yield anymore. Only when the contract is about to expire or when the commodity switches from the long to the short portfolio (or vice versa) we again determine the most optimal contract. We observe that applying this strategy leads to a reduction in turnover of more than 50% compared to a traditional momentum strategy.

To ensure that the excess returns are not absorbed by transaction costs, we examine the added value that is created when the momentum strategies are actually implemented. Although transaction costs in futures markets are considerably lower compared to stocks, the turnover of momentum strategies is relatively high, which means that the impact of costs could still be substantial. Therefore, we incorporate two different trading cost schemes based on estimates of Szakmary et al. (2010). Additionally, we contribute to the literature on commodity trading costs by proposing a third transaction cost scheme that links transaction costs to liquidity.[5] This ensures that transaction costs are higher for less liquid contracts, a component not covered by existing transaction cost schemes. We find that for all alternative momentum strategies and under all assumptions for transaction costs, alternative momentum strategies deliver higher returns and Sharpe ratios than for the generic momentum strategy. For example, using conservative trading cost estimates of approximately 22 basis points per trade, we observe that net returns increase from an insignificant 3.98% per

[3] This is under the assumption that the shape of the futures curve does not change. Note that it is difficult to ex-post decompose excess returns into spot and roll returns since both the "level" and the shape of the curve might have changed.

[4] Momentum returns are based on excess futures returns, which are a combination of changes in the spot price and the roll yield.

[5] We thank an anonymous referee for this useful suggestion.