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Should Financial Investors Expect to Earn Spot Return When Physical Market Participants Cannot?

Between the end of 2015 and August 31, 2016, WTI Crude Oil spot contract prices increased by 20.7% going from $37.04 per barrel to $44.70 per barrel. Meanwhile, a hypothetical investment in the Bloomberg Commodity Index WTI Crude Oil Sub-index, which holds near-term futures contracts and rolls them to a deferred contract, would have returned -6.36%. Several articles in the media have indicated that this deviation has made futures-based investments unattractive, as a contango – or upward sloping curve/term structure – in crude oil has resulted in negative returns for futures-based investments in commodities. While returns in crude oil futures investments have certainly been negative, this has not been due to contango, but rather to changing market expectations.

First, the notion that an investor can expect a return similar to that of the change in the spot price in crude oil is erroneous. Achieving a spot-like only return is akin to getting a "free lunch". An investor who buys oil in the spot market would pay in cash for the physical oil (forgoing any interest that one expects to earn on the cash), pay to store the oil and insure it against any losses. This represents the cost of "carrying" the oil over time. Carrying costs are those costs typically paid by physical market participants to have immediate access to the physical oil. In order to justify a market participant's purchase of the physical commodity today in order to store for the future, the *"expected"* future spot price should factor in its carrying costs, which must be lower than the difference between spot price and the expected future spot price:

Spot Price + Interest on Cash + Costs (e.g. Insurance, Storage) < Expected Spot Price in the Future[1]

If the expected future spot price were equal to, or lower than, the cost of buying the oil and the costs associated with holding it, the physical market participant would not purchase and store the hard commodity. Instead, the market participant should be better served earning interest on that capital and buying the commodity in the future. A financial investor should not expect a different outcome. When the media discusses the physical spot price return, they generally do not accurately represent the entire picture. Looking at the "total return" of investing in spot oil and subtracting any associated carrying costs is an accurate depiction of real world returns as opposed to just observing "spot returns", which are unattainable.

The next erroneous concept often expressed in the media relates to backwardation being positive and contango being negative for returns. Some articles conclude that one should not invest in contango markets but only in backwardated commodities. They make the assumption that when markets are in contango, one buys a futures contract that is priced higher than the current spot price, and, as one holds the contract throughout time, the futures price converges downward to the spot price, hence the negative return. As illustrated in the crude oil example above, it is actually the spot price that is expected to converge up to the futures price. Otherwise physical buyers would never be incentivized to hedge in advance and would instead wait for prices to fall.

Commodity futures contracts, like any other futures contracts or financial instruments, discount any publicly available information into their price. Therefore, (ignoring any potential risk premiums for now) an investor in commodity futures should be indifferent as to where they invest along the futures curve because the futures price is assumed to have discounted any "expected" changes. As a result, the expected total return from buying and rolling the futures contract should be zero, irrespective of whether the term-structure is in backwardation or contango.

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[1] When this equation is true, it incentives arbitrage by purchasing the physical commodity and selling a future. This should theoretically cause the physical price to rise and the futures price to fall until the two sides of the equation reach equilibrium, thus closing the arbitrage window. As a result, in a steady environment, contango should be limited to the marginal cost of available storage.

However, what happens when these articles assume that the futures price converges down to the spot price in contango-like markets? When returns are non-zero, as these articles suggest, they introduce the assumption that, at some point within the holding period, expectations suddenly changed (negatively in this instance).

At the beginning of 2016, oil markets were already in contango. However, throughout the first quarter of 2016, expectations shifted as inventories in Cushing, Oklahoma continued to increase. The slope of the forward curve term structure changed as the oil curve exhibited deeper contango and near-term prices declined. As storage capacity began to fill up in Cushing, the markets became fearful of having insufficient storage. As a result, near-term prices became even more discounted. Throughout the second quarter, unforeseen supply outages in the Middle East and Canada caused oil prices to rally. In both the first and second quarters, the drivers of returns were changes in supply expectations, rather than contango markets.

Aside from changes in expectations that drive spot and commodity futures returns, other potential drivers of returns also include **normal backwardation** and **convenience yields**. Normal backwardation is a market condition where futures contract prices trade at a level that is lower than *expected* future spot prices. Hence, if one were to buy the futures contract at a discount and hold it to near its maturity, there would be the potential to garner a risk premium. This condition may persist as a result of the asymmetric risk profile between commercial producers and consumers. It can also occur if commodity term structures exhibit contango or backwardation. When normal backwardation occurs in a contango market, it simply means that although prices further out along the curve are higher than current spot prices, they are still priced lower than where the market truly expects prices to be at expiration. If an investor purchases a contract under these conditions, the expectation is that the contract can be sold at a later date after it has converged up closer to the true expected price.

In efficient markets, the needs of sellers and buyers are offset, and the expected benefit for either is zero. However, in reality, the preferences of commercial buyers and commercial sellers may not align. Consider an oil producer whose sole revenue source comes from oil production. The producer is most likely concerned with locking in the price of oil through the sale of futures contracts or forward agreements to minimize the revenue volatility associated with moving oil prices. On the other hand, a commercial consumer, such as an airline, has other costs in addition to oil (e.g. jet fuel) and therefore may be less likely to hedge price risk, or they can pass off the changing input costs to the actual end consumer (e.g. the traveler). As a result of the imbalance of more sellers versus buyers of futures contracts, normal backwardation may persist to induce "other" market participants (usually speculators) to participate in the market by buying futures contracts, which provides producers with insurance against price risk. In this instance, if the speculator purchases the contract that potentially exhibits normal backwardation, it may garner a risk premium as futures prices converge to expected spot prices in the future. If enough speculative market participants join the market, then this risk premium may erode as the amount of normal backwardation diminishes. However, we do not believe that this is currently occurring.

The convenience yield is another phenomenon that can be priced into commodity futures. Sometimes commodities may reflect a higher convenience value in certain parts of the term structure, representing a situation in which a consumer is willing to pay more today rather than waiting until a future date when prices are lower. For example, March Natural Gas futures contracts are typically priced at a premium relative to April contracts as there tends to be an immediate inventory need in March due to winter heating demand. If consumers need to heat their homes in March, they are not going to shiver until April just so they can buy at lower prices in April. Consumers receive an immediate benefit (i.e. warmth) from consuming the natural gas in March. While a convenience yield is mostly associated with backwardated term structures, it is a condition that may also persist in contango term structures as well (particularly at higher interest rates). The value of the convenience yield can create a backwardated term structure under certain circumstances, such as when there are severe near-term supply shortages, pronounced seasonal

differences or conditions of intense weather disruptions. Conceptually, the convenience yield can be viewed as a negative storage cost, incentivizing sales by physical holders while there is still a specific segment of buyers that are willing to pay a premium to meet immediate demand needs.

Now, referring back to the aforementioned articles, some authors assert that returns can only be earned in backwardated environments. The assumption is that since the curve is downward-sloping, one can buy a contract that is lower in price and rising in value as it converges to the spot price. As we argued above, the value of convenience is an intrinsic value for a particular contract for a certain delivery time, based on the need for immediate access, and the value diminishes over time. Using the prior example, it is unlikely that a market participant will eventually pay March prices for Natural Gas if the participant decides to purchase April (or summer) contracts. Therefore when one buys a longer dated contract and the price gravitates higher, it implies that 1) expectations have changed, and 2) the value of convenience for that contract has increased.

Futures Return = Changes to Price Expectations in the Future + (Changes in Storage Costs, including Convenience Yield) – Changes in Normal Backwardation

Thus, many of these articles lead investors to believe that term structures determine whether returns are positive or negative. However, futures contracts take into account expected changes to spot prices in the future. As a result, our conclusion is that prices are not driven by contango or backwardation. Instead, the biggest drivers of futures-based returns are 1) unexpected changes to the market, 2) the persistence of normal backwardation and 3) changes in value of any costs (including convenience yield) priced into the contract.

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