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Capitalizing on Any Curve:

Clarifying Misconceptions About Commodity Indexing

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At Credit Suisse, we believe there are advantages to incorporating commodities into an overall portfolio allocation – commodities may offer attractive risk/return enhancement benefits, may act as an effective inflation hedge and have historically performed best in periods of unexpected inflation. The relationship between commodities and inflation is particularly relevant in the current environment of increased government spending and rising raw material costs. Yet, certain misconceptions may exist when it comes to determining an entry point into the asset class.

One misconception regarding commodity index investing is that, over the long term, investors will profit if a market is in "backwardation" (downward sloping futures curve), and will lose money if a market is in "contango" (upward sloping futures curve). The confusion surrounding this issue stems from misunderstandings about how roll yield, the calculation resulting from rolling one futures contract to another, is measured. In this paper, we attempt to explain how investors can capitalize on their commodity index investments regardless of the shape of the futures curve, and can invest in the asset class whether the market is in backwardation or contango.

A Futures-Based Approach

Purchasing a basket consisting of underlying commodities futures contracts may provide cost efficient, liquid commodities exposure. This is common practice among investors to gain broad exposure to the asset class; however, because an investor does not take physical delivery of the underlying asset, the performance of a futures-based portfolio will not precisely mirror actual gains or losses in the market value of the asset as measured by Spot Prices.

Futures contract prices are generally represented in the form of a futures curve, as illustrated in Figure 1. The term contango represents a situation in which the price of a commodity scheduled for future delivery is higher than the current Spot Price, i.e. the future price of a given

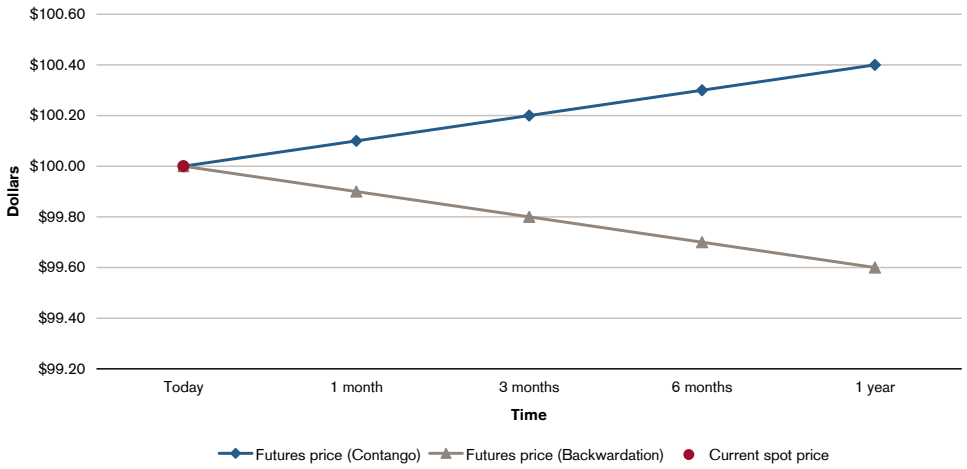
KEY TERMS

Spot Price: The price of raw material for immediate physical delivery.

Futures Price: The price at which a buyer and seller agree to exchange a physical commodity against payment at a set future date. Futures prices inherently take into account the cost of carry associated with trading physical commodities, such as storage costs or transportation costs.

commodity is expected to increase as the maturity dates of the futures contracts are extended further into the future. However, an event, such as a supply shortage, can reverse this price comparison resulting in a state of backwardation.

Figure 1: Sample Futures Curve



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When the futures curve is backwardated, a futures contract closer to its expiration will trade at a higher price than a contract that is further from its expiration. The resulting futures curve will be downward sloping as futures contracts prices fall further below the current Spot Price over time. This scenario typically occurs when investors are willing to pay a premium to take delivery at an earlier date, often because they need to use the commodity immediately (referred to as the convenience yield).

Rolling for Dollars: The Commodity Roll

Considering a futures contract is a commitment to purchase a certain quantity of a commodity at a future date, in order to ensure that physical delivery of an asset is never taken, it is necessary to sell these contracts as they approach expiration, and in turn replace them with contracts further from expiration. At some point prior to the maturity of a futures contract, commodity indices must migrate their exposure from the near term contract into a deferred contract specified by the index further out on the futures curve. This migration, known as the commodity roll, occurs by selling a near term futures contract and purchasing a futures contract maturing at a later date. The maturity date of the new contract and the timing of the roll will be dictated by the specific index methodology. For both the Dow Jones-UBS Commodity Index ("DJ-UBS") and the S&P Goldman Sachs Commodity Index ("S&P GSCI"), this roll process occurs from the fifth business day of each month to the ninth business day of each month. Please note that not all commodities sectors participate in the roll process every month and different indices may roll to different contracts for a particular commodity.

One of the most common misconceptions that exists about commodity indexing is that rolling futures in a contango environment will result in a loss because as contracts are rolled forward, replacing them becomes more expensive. This is a situation where investors will experience negative roll yield; however, as we illustrate in this report, negative roll yield does not represent an actual loss for an investor, and in fact, there are no actual losses incurred within the index by rolling from one contract to another.

The underlying math is similar to selling 100 shares of stock ABC for $10 each and subsequently purchasing 50 shares of stock XYZ for $20 each. By purchasing the higher priced stock, you are not losing value as both the sale and purchase are worth $1,000. The only difference is

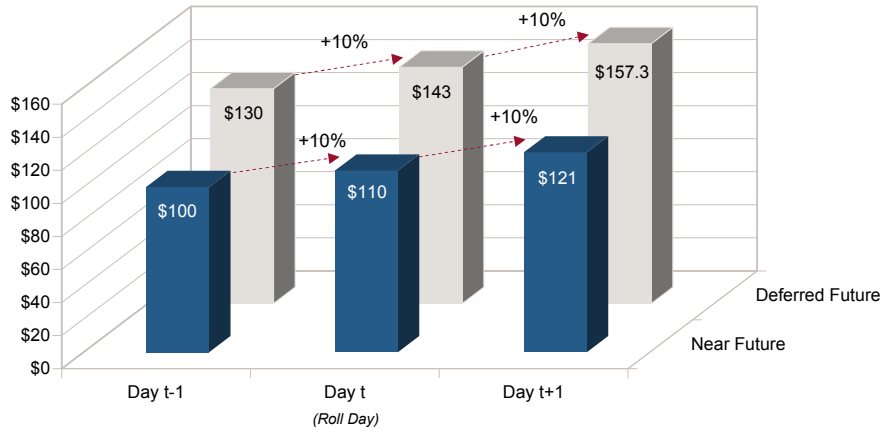
that you now hold fewer shares of stock. Before calculating the impact of roll yield on an investment, please note the differences between the three index types calculated by commodity index providers, as defined on the right.

Determining the Impact of Roll Yield

One way to calculate roll yield is to take the difference between the return of the Spot Index, which represents the static prices of the next-to-delivery futures contracts, and the return of the Excess Return Index, which takes into account the impact of rolling forward futures contracts.

We demonstrate this concept using the example in Figure 2, which provides the hypothetical Spot Index prices of both the near-term and deferred futures contracts for Commodity XYZ over a specified time period. In this case, the near-term contract is approaching expiration, and thus needs to be rolled into the deferred futures contract which is further from expiration. The market in this scenario is in contango, as futures contract prices are rising over time. The assumption in this example is that during the roll period, the notional amount of near-term contracts being sold equals the amount of deferred contracts being purchased.

Figure 2: Spot Index Prices, Commodity XYZ



Day	Near future price	Day over day change	Deferred future price	Day over day change
t-1	$100.00	-	$130.00	-
t (Roll Day)	$110.00	+10%	$143.00	+10%
t+1	$121.00	+10%	$157.30	+10%

For illustrative purposes only.

1. Despite its name, the Spot Index does not represent current Spot Prices, and changes to the Spot Index do not represent changes to the current price of the commodity in the spot market, but rather changes to the nearest to-delivery futures contracts of the Spot Index.
2. It is not possible to calculate the Total Return Index by adding the risk-free rate to the Excess Return Index because the Total Return Index takes into account the reinvestment or withdrawal of interest rate earnings and losses.

TYPES OF COMMODITY INDICES

Both DJ-UBS and S&P GSCI each publish three different commodity indices: The Spot Index, the Total Return Index and the Excess Return Index to reflect various types of returns.

The **Spot Index** represents the prices of the nearest to-delivery futures contracts within the index.[1] **The Spot Index return does NOT represent an actual return available to investors** because, during the roll cycle, the futures contracts used to calculate the Spot Index are simply replaced by the next nearest to-delivery futures according to an index methodology. The change in the Spot Index resulting from this migration does not represent an investable return because it does not include the costs or benefits from holding a commodity in one period through another. Thus, the Spot Return cannot be replicated, and it is therefore not an appropriate basis or benchmark for investment.

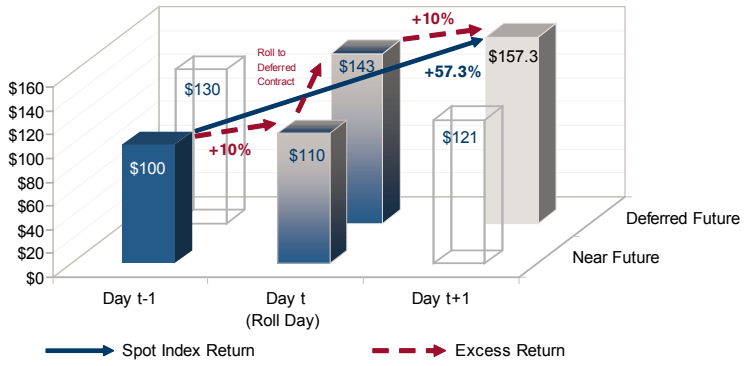
Both the **Excess Return Index** and the **Total Return Index** represent achievable returns available to investors as they reflect the return from investing in a series of futures while periodically rolling near-term contracts into deferred contracts. The Excess Return Index measures the returns accrued from an uncollateralized commodity futures investment, while the Total Return Index represents the returns accrued from a fully-collateralized investment, i.e. it takes into account the interest earned on the investment collateral (typically the risk free rate).[2] Please note that the return of the Total Return Index will be significantly different than the return achieved from purchasing physical commodities, which is the Spot Return minus transportation, financing and storage costs.

Using this example, we can measure the impact of roll yield on an investment in Commodity XYZ as well as calculate the overall profit potential of such an investment by determining the difference between the Spot Index return and the Excess Return.

The Spot Index return for this period is represented as the difference between the Spot Index price of the near-term contract on Day t-1 and the Spot Index price of the deferred contract at Day t+1. The return calculation in this case would be: (157.3/100) – 1 = 57.3% (as illustrated in Figure 3).

As previously discussed, it is NOT possible to achieve the 57.3% Spot Index Return because it would require an investor to sell the near futures contract at the same price at which they purchase the deferred futures contract on the same day during the roll cycle (Day t). This is impossible because on Day t, the deferred contract ($143) is priced 30% higher relative to the near future contract ($110). As a result, the Spot Index return is unattainable.

Figure 3: Spot vs. Excess Index Returns, Commodity XYZ



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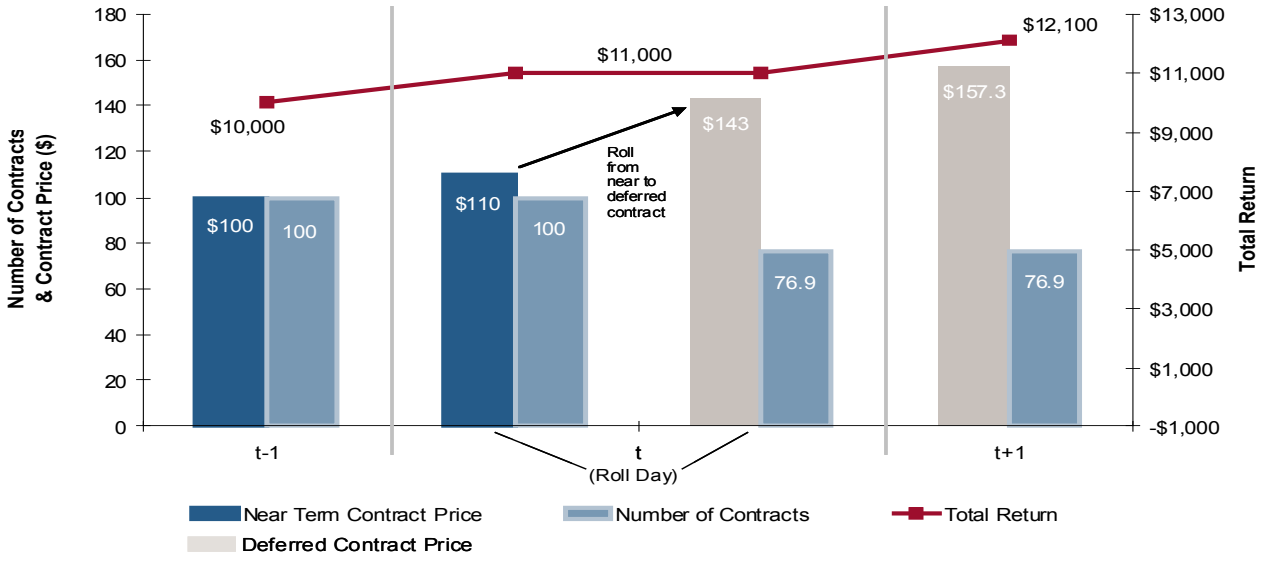
In order to determine the impact of rolling from the near future into the deferred future on Day t, we refer to the Excess Return for Commodity XYZ, which is illustrated in Figure 4.

Figure 4: Excess Return Calculation, Commodity XYZ



Buy: Day t-1 Allocation t-1 / Price of Near Future t-1 = Number of Contracts purchased	$10,000 / $100 = 100 contracts
Sell: Day t Number of Contracts * Price of Near Future t = Total Value t	100 contracts * $110 = $11,000
Buy: Day t Allocation t / Price of Deferred Future t = Number of Contracts purchased	$11,000/$143 = 76.9 contracts
Sell: Day t+1 Number of Contracts * Price of Deferred Contract t+1 = Total Value t+1	76.9 * $157.3 = $12,100
Excess Return (Total Value-Initial Allocation) / Initial Allocation = Excess Return	($12,100 - $10,000) / $10,000 = 21%

For illustrative purposes only.

As Figure 4 demonstrates, assuming an initial investment amount of $10,000, we can purchase 100 contracts of Commodity XYZ at the near-term contract price of $100 on Day t-1. As the near-term contract grows closer to maturity, we roll forward into the deferred contract on the roll day (Day t), i.e. we reinvest our initial investment, as well as the profit generated on the initial investment, a total of $11,000, into the deferred contract during the roll.

As the deferred contract is priced at a premium to the near-term contract on Day t, our overall number of contracts will decrease from 100 to 76.9 contracts on Day t. Upon maturity of the deferred contract (Day t+1), we are holding 76.9 contracts worth $157.30 each, and the total value of our investment is $12,100. Please refer to Figure 4 for a step by step calculation.

The Excess Return generated as a result of investing in and rolling futures contracts in this case is $2,100, or 21% of our initial allocation. In this example, the difference between the Spot Index Return of 57.3% and the Excess Return of 21% represents a roll yield of -36.3%; however, this does not represent an actual loss of 36.3% because the 57.3% return of the Spot Index was never an achievable return. In fact, we have accrued a profit of 21% on our overall investment while the market is in contango.

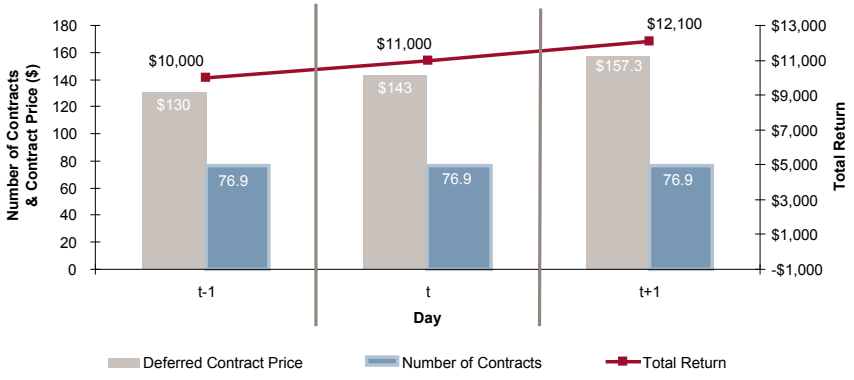
We can also test the impact of the roll cycle on an investment by comparing it against the returns we would have generated if we initially bought the deferred contract on Day t-1 and held to expiration without rolling forward the futures contracts. We illustrate this point in Figure 5.

In this scenario we purchase the deferred future on Day t-1 ($130) and hold the contract until its expiration on Day t+1 ($157.30). With our initial allocation of $10,000, we can purchase 76.9 contracts at $130 each and, upon expiration, we will sell these same 76.9 contracts for $157.30 each (the price of the deferred contract on Day t+1). In this case our total profit would be $2,100, representing an excess return of 21%.

In both of these instances, our excess return totaled 21%, regardless of whether we purchased the deferred future during the initial transaction or rolled forward into the deferred contract during the roll cycle. This also illustrates that while we adjust the total number of contracts we hold during the roll cycle, we do not alter our return potential, and in effect the actual number of contracts held is irrelevant to overall return. The value of a commodities investment should not be measured by the number of contracts purchased, but rather by the total dollar exposure maintained.

In both of these examples, the Excess Returns were the same, yet the attribution was different. In the absence of percentage price change differences between different maturity contracts, one should be indifferent to investing in a strategy that rolls often versus one that rolls infrequently, or between a strategy that maintains exposure in the front or deferred part of the futures curve.

Figure 5: Excess Return Calculation, "Buy and Hold" Strategy



Buy: Day t-1 Allocation t-1 / Price of Deferred Future t-1 = Number of Contracts purchased	$10,000 / $130 = 76.9 contracts
Sell: Day t+1 Number of Contracts * Price of Deferred Future t+1 = Total Value t+1	76.9 contracts * $157.3 = $12,100
Excess Return (Total Value-Initial Allocation) / Initial Allocation = Excess Return	($12,100 - $10,000) / $10,000 = 21%

For illustrative purposes only.

Whenever a commodity exhibits a contango curve, the Excess Return will underperform the Spot Return, while the opposite is true when the curve is backwardated. However, the outperformance of the Excess versus Spot Returns in a backwardated market does not represent a gain, just as the underperformance in a contango environment does not represents a loss, as there is no actual cost that is incurred within the index by rolling from one contract to another.

Within this paper, we describe how neither contango nor backwarded markets create an investable return strictly from rolling commodity contracts, and thus there is no "free lunch" for predicting investable commodity returns by curve shape. However, a skilled investment manager can benefit from correctly predicting and positioning for particular changes in the shape of the forward curve regardless of curve shape. We believe there may be opportunities to take active, tactical steps to add alpha compared to a benchmark that rolls contracts during exact times of a given month if an investment manager can determine better roll points.

"We believe the primary difference between a market in contango and one in backwardation is that an investor's sensitivity to per dollar price changes will be reduced when a market is in contango because the investor may be holding fewer contracts."

Andrew Karsh
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Conclusion

The issue of contango versus backwardation has long perplexed investors. The notion that investors will only profit if a market is in "backwardation," is based on misconceptions about the mechanics of the roll cycle.

When reviewing the impact of roll yield on an investment we determined that it is not appropriate to view the negative roll yield experienced in a contango environment as a loss, as the Spot Index return is unattainable, and that there is no loss incurred by rolling from one contract to another during the roll cycle in a contango environment. We believe the primary difference between a market in contango and one in backwardation is that an investor's sensitivity to per dollar price changes will be reduced when a market is in contango because the investor may be holding fewer contracts.

As an asset class, commodities may provide investors with a wide range of benefits. We believe commodities will continue to contribute positively to overall returns, add significant diversification benefits and offer inflation protection when incorporated into a diversified investment portfolio. As discussed in this paper, the opportunity to capitalize through an index approach may exist regardless of the shape of the curve.

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