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> ***"It's a poor sort of memory that only works backwards."***
> ***— Lewis Carroll***

Investors and traders use empirical data, whether consciously or not, to make decisions about the future. Theoretical models, charts, statistics and numerous other bits of information are used to explain the past and hopefully predict the future. Problems occur, however, when the present and future no longer behave as they once did.

Many commodity and futures markets in particular are not behaving as they once did. The futures term structure has become persistently steep in many markets, including some commodity products as well as some financial products such as the VIX futures market. This is a new phenomenon in the past several years. Some have commented that global macro risks, Federal Reserve policy, a new post-2008 risk appetite, distortions from China or various other factors have caused this change.

The explanation is much simpler. We believe the recent steepening of the futures term structure in many commodity and volatility markets is predominantly caused by and will persist due to *indexing*. The influence of indexers in these markets has increased to such an extent as to structurally change the dynamics in these markets.

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Standard economic theory states that when inventories of a commodity rise, prices tend to fall. Conversely, tight inventory levels are associated with higher prices. Let us refer to this as Supply and Demand 101.

Another theory in commodity markets is the Theory of Storage. It postulates that low inventories of a commodity should generate a bigger convenience yield for the holders of that commodity. Alternatively, excess inventory reduces the benefit of holding additional units and the convenience yield falls.

The Theory of Storage predicts that commodity and futures markets that have excess supply and/or little demand tend to be in contango (i.e. upward-sloping term structures) and markets with tight inventories and/or high demand tend to be in backwardation (i.e. downward-sloping term structures). This theory explains why practitioners regularly use the futures basis (the spread between futures and spot market prices) as a proxy for inventory levels.

Recently, we have seen somewhat of a breakdown of Supply and Demand 101 and the Theory of Storage. Some commodity markets with large stocks of inventory are associated with higher

prices, while other markets with large and growing demand in the face of tight inventory remain in steep contango. We see such an effect in the VIX futures market as well where there has been limited speculative capital available to supply the increasing demand.

We believe that the changes in market behavior observed in many commodity markets over the last several years can be explained by the large growth in commodity indexing. In 2002, approximately $10 billion was allocated to various commodity indices (GSCI, for example). This figure grew to $90 billion by 2006 and then exploded to $250 billion by 2010.[1]

In the past, before commodity indexing was large relative to the market size or when there was excess supply of a commodity, producers could stockpile inventory to absorb the temporary excess. However, because storing commodities can be difficult and costly, indexers primarily use financial futures and not physical products to gain exposure. Stockpiling is thus being used to physically support indexers' long futures positions as indexing has become more prominent. On top of this, the steep contango encourages physical holders of the inventory to engage in cash-and-carry arbitrage, further increasing stockpiling and the level of inventories…even in the face of increasing prices.

How does the increase in indexing put commodity futures markets in steeper contango? Since indexers' exposure is coming primarily through futures, they generally buy short-dated futures contracts and roll these to longer-dated contracts when expiry nears, avoiding physical delivery. These mechanics result in greater long demand for futures one or two months out and less demand (greater selling pressure) for shorter-term contracts nearing maturity.

Let us quantify this effect. The primary vehicles for investing in commodity indices are provided by investment banks and asset managers. Using the CFTC Commitment of Traders (COT) report, we can gauge what percent of the open interest is due to indexing. The COT reports now break down open interest by "swap dealers", those entities engaging in commodity swap transactions, the type backing investable commodity index products.[2]

The percentage of total open interest captured by the net long open interest of swap dealers is a proxy for the size of indexing in a given commodity. This metric can then be compared to the steepness of the futures term structure (measured by the interest rate-adjusted premium of 6-month over 1-month futures prices). Based on our hypothesis, higher indexing should result in more upward-sloping term structures. This contradicts the Theory of Storage in that greater demand (nearly the same effect as tighter supply) should result in backwardation.

[1] Irwin, S. H. and D. R. Sanders (2010), "The Impact of Index and Swap Funds on Commodity Futures Markets: Preliminary Results", *OECD Food, Agriculture and Fisheries Working Papers*, No. 27, OECD Publishing.

[2] For a smaller subset of products, the CFTC also breaks down open interest into an "indexer" category. For our purposes, we focus on the "swap dealer" category because it exists for all products covered by the CFTC and is correlated to the indexer levels.

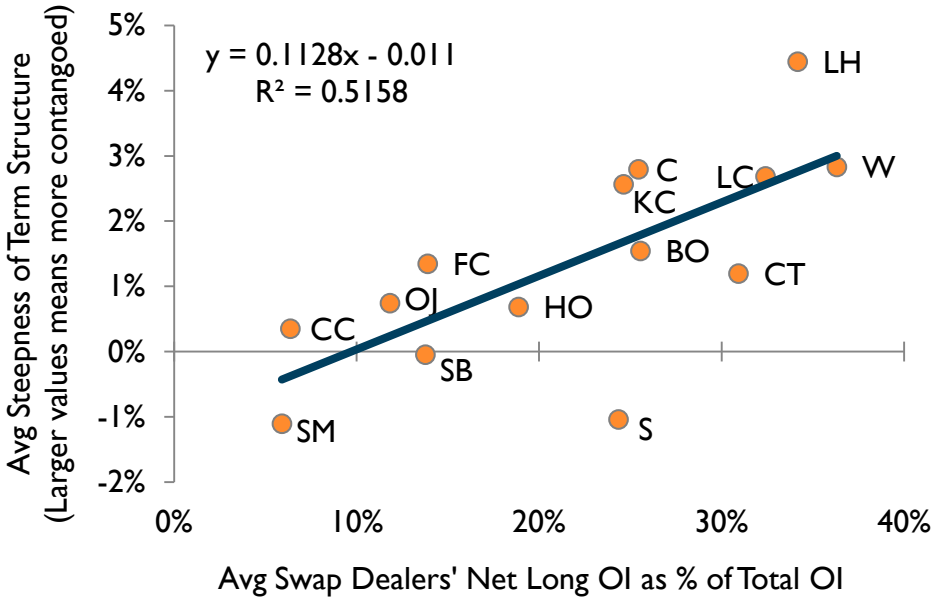


Figure 1: Average steepness of term structure (measured by ratio of 6-month to 1-month futures prices, adjusted by interest rate) versus average swap dealers' net long open interest as a percentage of total open interest by commodity. Data from June 2006 to March 2013.

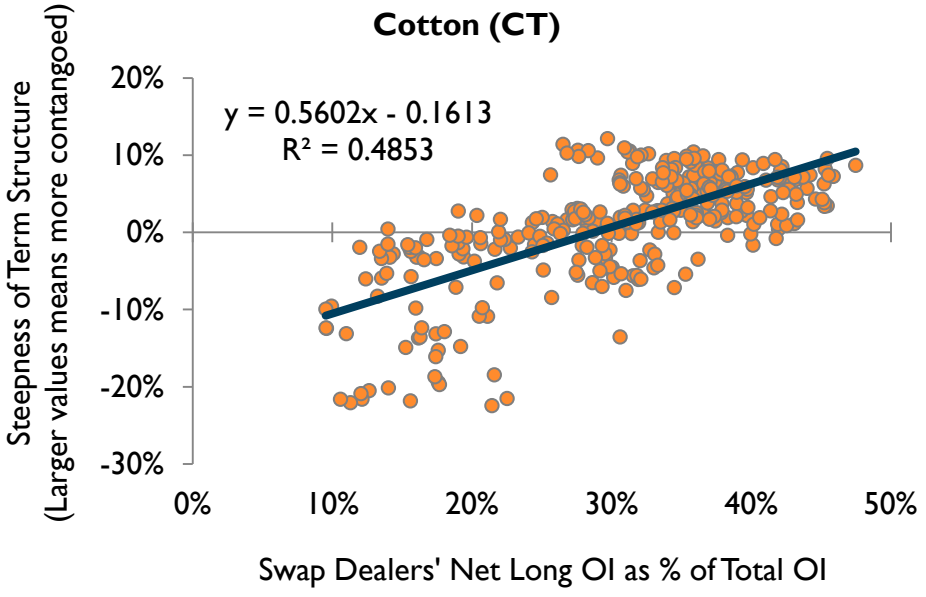


Figure 2: Steepness of term structure of cotton futures (measured by ratio of 6-month to 1-month futures prices, adjusted by interest rate) versus swap dealers' net long open interest as a percentage of total open interest. Data from June 2006 to March 2013.

Figure 1 confirms our hypothesis, illustrating that higher indexing (as measured by our swap dealers' net long metric) results in steeper upward-sloping futures term structures. The R-squared for this relation is a strong 51.6%.

One unintended consequence of this effect is that commodity indexing using futures is now far more expensive. As a single example, returns of the Thomson Reuters/Jefferies CRB Index over the last 5 years have been negative and far below the 10 previous years when indexing was less popular.

The relationship highlighted in Figure 1 also tends to hold within a single commodity. That is, as indexing increases, there is an increasing steepness of the futures term structure. Figure 2 illustrates the results for cotton over the last several years.

In equity derivatives markets, there has been a proliferation of products designed to help investors hedge. For instance, there has been large growth in VIX ETPs such as VXX and TVIX. These products target short-dated VIX exposures via the futures markets. The popularity of indexing in volatility products has had similar effects on the VIX futures market as it had in the commodity markets.

The indexing methodology of these volatility ETPs is formulaic and easily followed by speculators. Figure 3 shows the growth of net long open interest by commercials (indexers) and non-commercials (speculators) as defined in the COT reports.

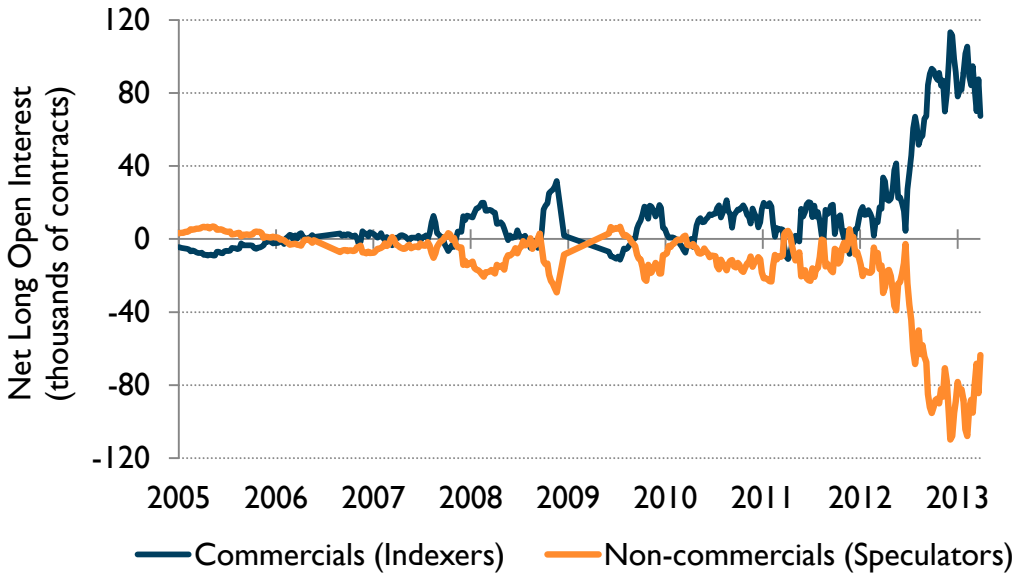


Figure 3: Net long open interest in VIX futures broken down between commercials and non-commercials. Data from January 2005 to March 2013.

The level of open interest held by commercials (indexers) has grown by an order of magnitude in recent years. Most of this increase is the result of assets pouring into volatility ETPs. As demand by indexers has grown, we expect the VIX futures term structure to steepen, and this is precisely what happened. Figure 4 illustrates the recent increase in demand by indexers and the corresponding steepening of the VIX futures term structure.

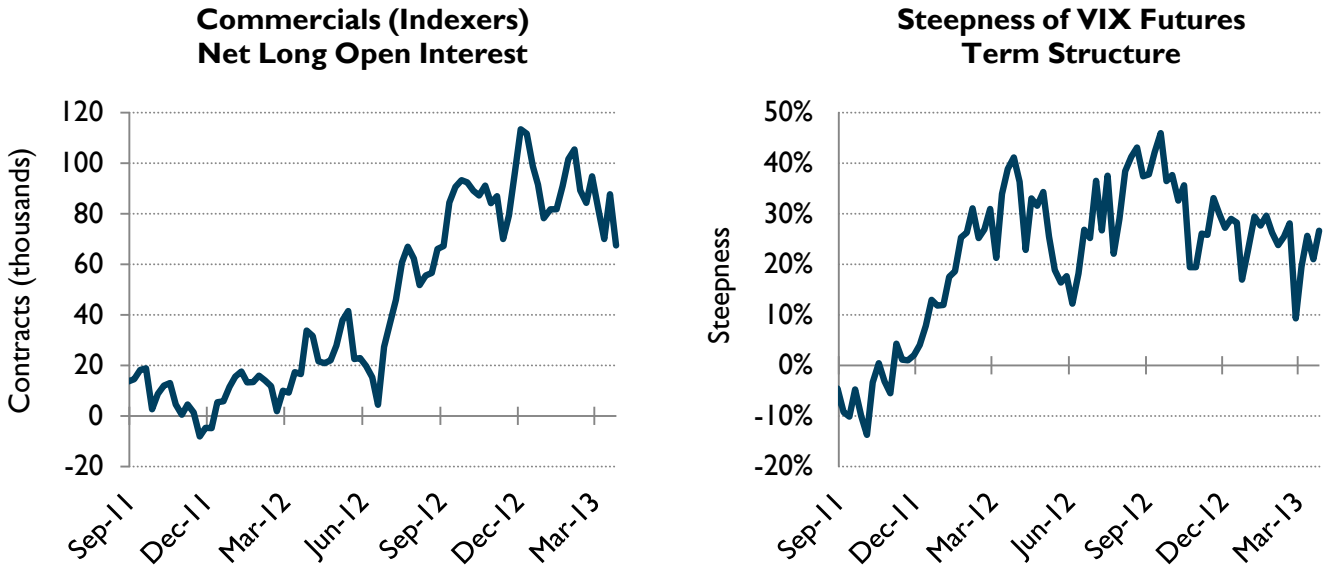


Figure 4: (Left) Net long open interest in VIX futures by commercials. (Right) Steepness of VIX futures term structure (measured by ratio of 6-month to 1-month futures prices, adjusted by interest rate). Data from September 2011 to March 2013.

Similar to the commodity products, there is a positive relationship between high levels of indexing and the steepness of the VIX futures term structure, as shown in Figure 5.

To make matters worse for VIX indexers, there are no natural producers of VIX and hence no natural sellers, unlike a commodity like corn. In my home state of Minnesota, there are no VIX farmers harvesting VIX crops to sell at market. The ability of the market to supply VIX contracts to indexers is limited by the amount of risk capital available to speculators and their desire to do so. To encourage speculators to increase the supply of VIX products (i.e. sell volatility), consumers of volatility (the hedgers) will need to pay a substantial risk premium.

As VIX ETPs and VIX indexed products continue to grow, we expect the futures term structure to remain steep. Similar to the increased cost of indexing in commodities, indexing to a short-term VIX future can be extremely expensive. Unless investors find alternative ways to get long volatility exposure, we expect these costs to remain high for the foreseeable future.

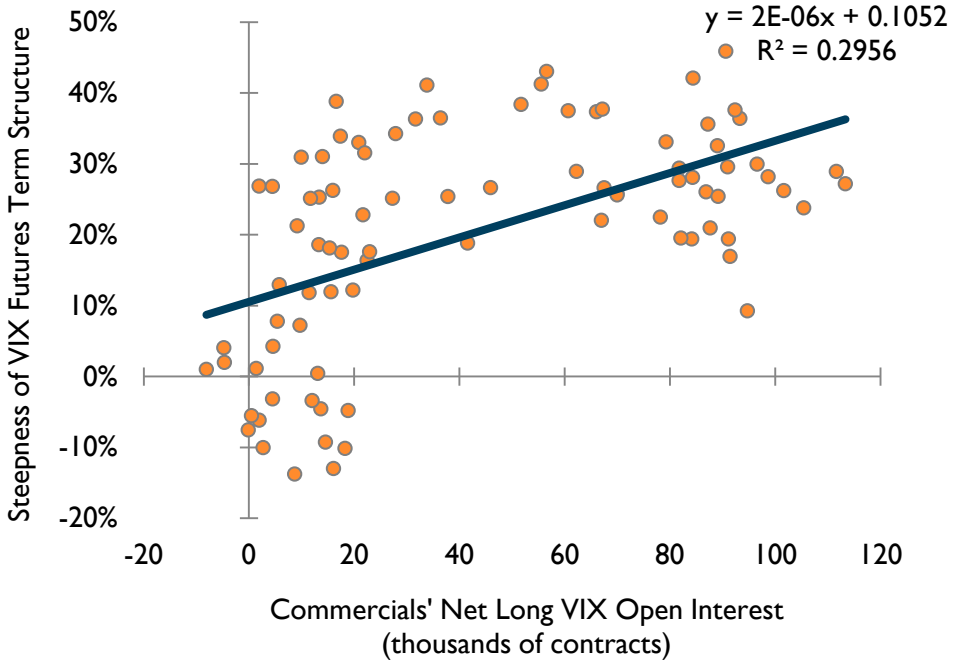


Figure 5: Steepness of VIX futures term structure (measured by ratio of 6-month to 1-month futures prices, adjusted by interest rate) versus commercials' net long open interest. Data from September 2011 to March 2013.

Indexing in both VIX futures and commodity markets results in steeper upward-sloping term structures. Steeper term structures also result in producers stockpiling commodities to engage in more profitable cash-and-carry arbitrage. This stockpiling and increasing inventory can occur even when prices are high or increasing. These effects may be contrary to existing theories on the pricing of futures and commodities but can be explained by the impact of indexers using futures markets to gain long exposure to the underlying instruments.

We do not mean to imply that fundamentals no longer matter. To the contrary, they still do and in a big way. However, it is important to recognize that institutional and retail indexing demand can create price distortions that cloud the fundamental picture. Increased indexing leads to steeper futures term structures, and this results in more costly exposure.

Sincerely,

Scott Kovarik
Managing Partner

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