Think Before You Spread: Should One Size Fit All?

One reason, unspoken for obvious reasons, behind the unquestioned dominance of technical analysis is its intrinsic simplicity and low barriers to entry. Aspiring fundamental analysts need to school themselves in the actual minutiae of their chosen markets, and this means real work, not just glancing at a few charts or spinning a few numbers through a computer model.

Moreover, technicians can claim pretense to a higher calling, a search for universal truth. And what a reward: Every great discovery in real sciences from $E=MC^2$ on down can be stenciled on a T-shirt and remain there, unassailable forever and globally applicable. Next time, dear reader, you see this situation obtain in the world of finance for any rule other than "buy low, sell high," write it down, and immortality will yours.

A central tenet, if not the entire basis, of technical analysis is self-similarity, the concept of markets having patterns independent of the underlying commodity or the time frame involved. The principle behind this assertion is straightforward and accepted by this author: Market patterns reflect human behavior, which is unchanging. For whatever truth this may have for individual markets, it may not be applicable for the intersection of multiple markets, as we shall see below.

More important, the different market behavior of the different spread classes virtually demands a set of different trading approaches and makes a mockery of singular technical trading approaches.

Spread Taxonomy
Let's begin with both a sop to economic purity and a counterintuitive statement: All trades are spreads, either implicitly or overtly. How so? Every trade involves an opportunity cost against a base case; the purchase of soybean futures, for example, was made against the base case of remaining in cash. Moreover, many apparent outright positions are spreads. The best example of this is currency trading. Buying a Japanese yen future involves borrowing at U.S. dollar rates and lending at Japanese rates, and we always can decompose this transaction into the two separate interest rate trades.

Now let's assign some names to the various types of spreads:

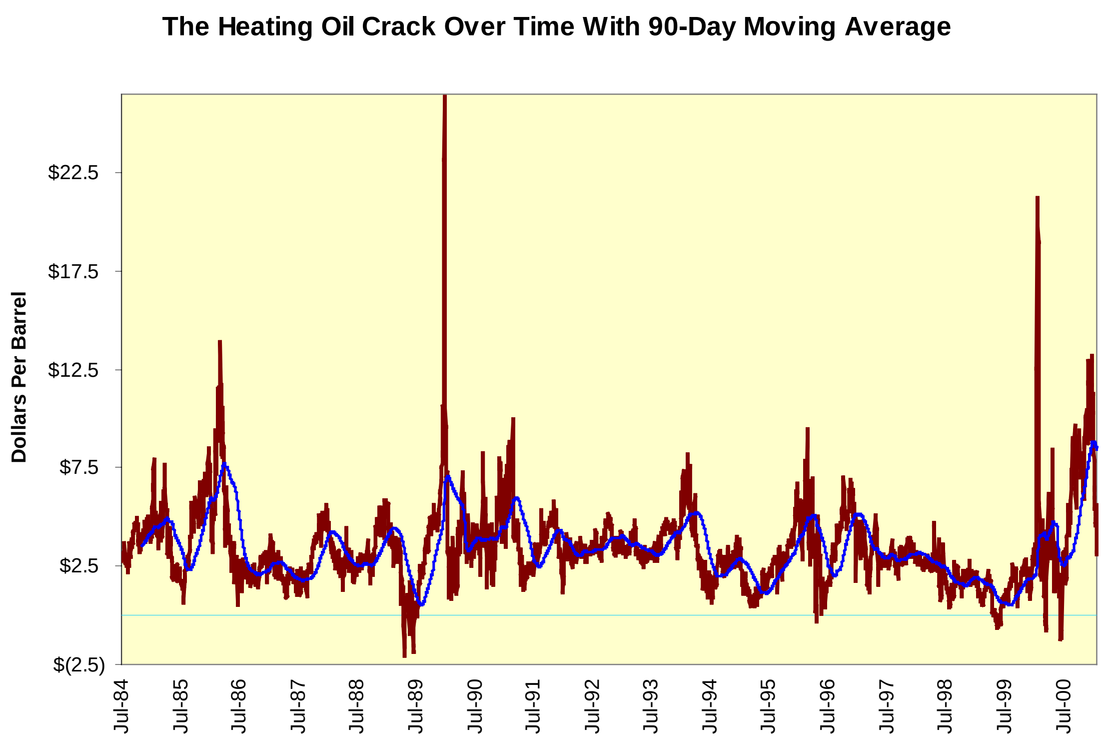
- **Process** spreads involve the transformation of one commodity into one or more other commodities. These spreads include the crude oil crack and soybean, canola, and cattle crush spreads for exchange-traded markets, and a wide host of others in cash markets, including the electricity/natural gas "spark spread."
- **Joint product** spreads involve commodities produced together as part of an economic process. These exchange-traded spreads include heating oil/gasoline and soymeal/soybean oil.
- **Substitution** spreads involve replacing one commodity with another. These spreads are far less common than presumed, and usually are constrained by engineering constraints or quality considerations. Exchange-traded examples include heating oil/natural gas, copper/aluminum, wheat/corn, soymeal/corn, West Texas Sour/West Texas Intermediate crude oil, and cattle/hogs.
- **Related** spreads involve commodities with a general economic relationship that are neither joint products nor substitutes. The S&P 500/NASDAQ 100 spread is a prominent exchange-traded example. All equity matched-pair trades (long Ford/short General Motors, for example) are related spreads.
- **Yield curve** spreads involve borrowing at one maturity and lending at another. These trades reflect the forward rate structure of the interest rate market and its expectations for monetary policy.
- **Intermonth** spreads involve buying one month of a forward curve in physical commodities and selling another. These spreads, which include backwardation (inversion) and contango markets, reflect supply/demand balances, seasonal factors, and the demand for hedging by both producer and consumer.

With the exception of intermonth spreads, which have been covered numerous times in this series, (see "Backwardation Has Its Price," *Futures*, June 1994, "All In All, Another Trick With A Call," *Futures*, May 1996, or "If The Sky's Not The Limit, What Is?" *Futures*, May 1998) each of these spread's unique characteristics will be discussed in turn. We will then conclude with implications for trading strategies.

Process Spreads
The salient characteristics of this group are asymmetry of the value ranges and general lack of long-term trends. If a refiner, for example, is faced with losses on the crack spread, he will shut down units or eventually go out of business. The opposite is hardly true for large gains; here a refiner or an electricity generator can enjoy extraordinary gains for a sustained period of time before demand for the output subsides. These very same factors combine to keep process

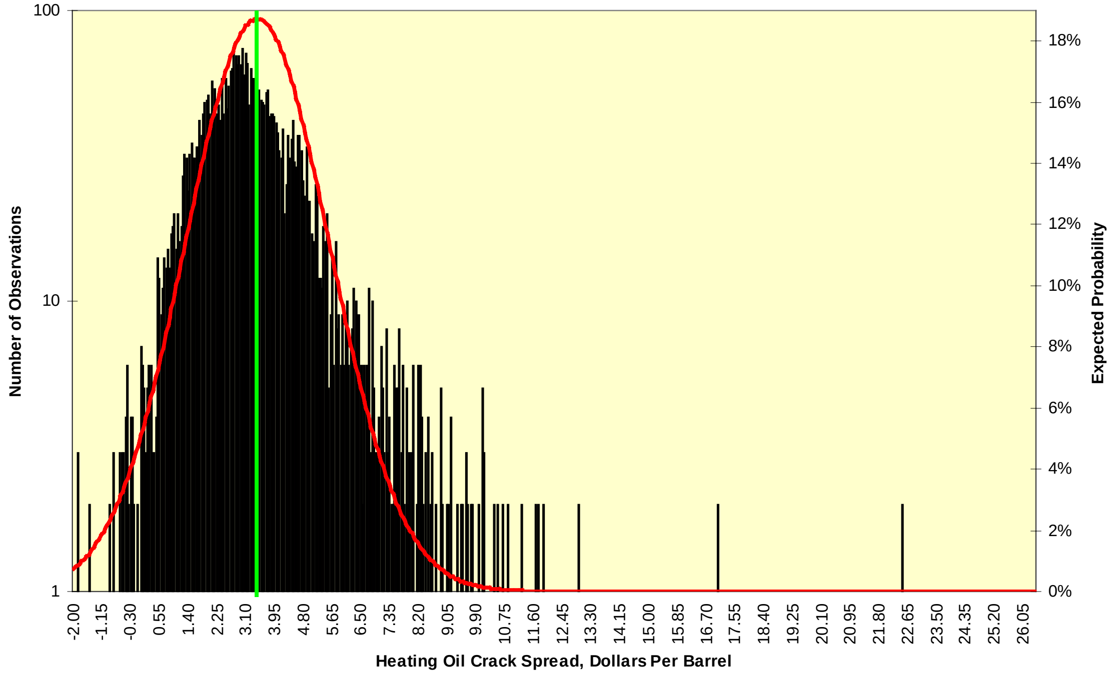
margins within a general range over time (see "No Margin For Error," *Futures*, February 1999 or "Not All It's Cracked Up To Be," *Futures*, July 2000). This combination of bounded losses and open-ended gains for a process spread duplicates the profit profile of a call option on the processing unit, and we can value those units as the expected realization on these embedded calls over time (see "What's The Buzz," *Futures*, July 1996).

This embedded call option and stable values over time – with the rising trend since mid-1999 a conspicuous exception – are visible in a standard time series chart of the heating oil crack, as shown below. The crack spread is calculated using cash market data to eliminate the distortions produced by the expiration cycles and forward curves of the futures market.



If we restate the same data in a histogram of spread values against an expected normal probability density function, the embedded call option becomes even more obvious. We can observe only a handful of negative spread margins, and none less that $2.10 per barrel. On the positive side, however, we have 63 observations – three trading months worth – of observations greater than three standard deviations greater than the mean of $3.43 per barrel, or $9.83.

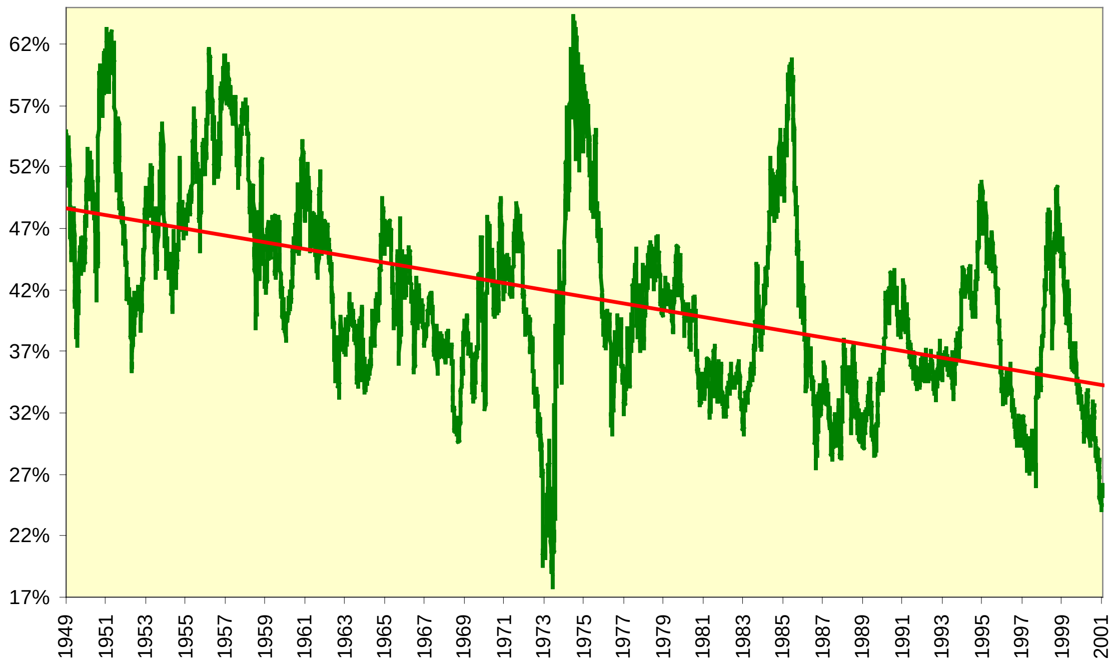
The Embedded Call Option In The Heating Oil Crack



Joint Product Spreads

These spreads frequently are characterized by a trend in the mean, and for good reason. Let's take the example of soybean oil as a percentage of product value (Oil%). Until we genetically engineer a soybean that is either completely soymeal or completely soybean oil (and good luck exporting it!), we must produce and sell both constituents of the soybean, no matter how cheap or expensive either product becomes. Technological changes and different competitive environments (see "Canadian Content," *Futures*, April 1999) for both products can and do produce secular trends in the spread value, as seen in the chart below. Once again, cash market data from 1949 onwards is used in place of futures data.

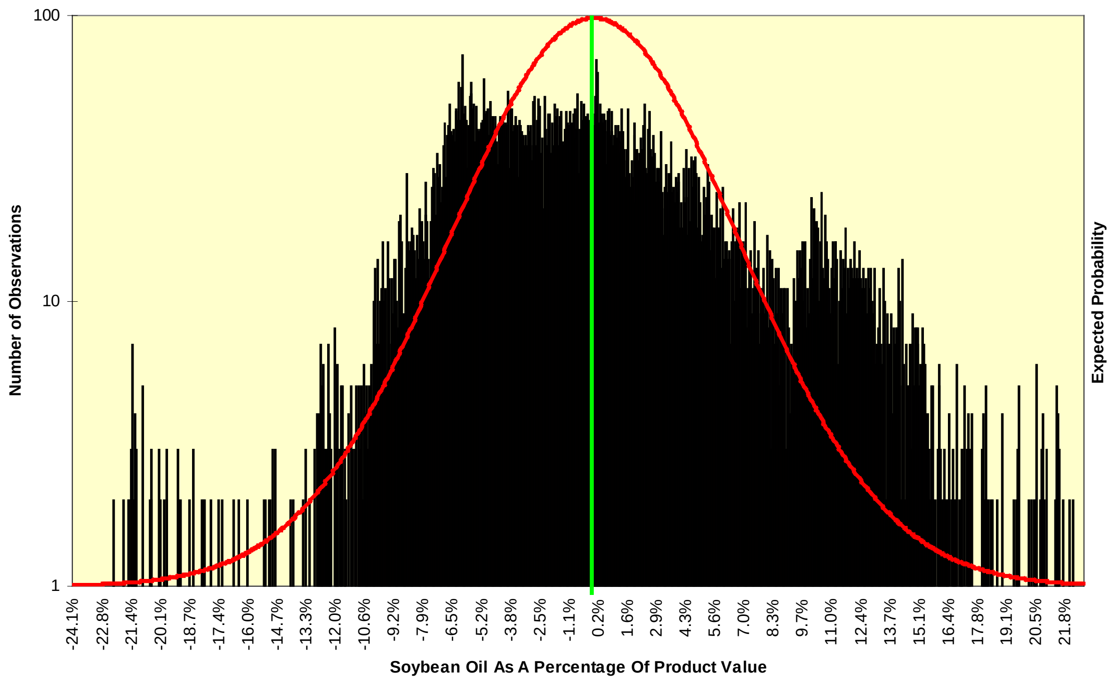
The Oil% Over Time



The trend over time is anything but smooth; it resembles a jump-diffusion process with a very long and irregular reversion to the trendline. Once again, this makes perfect economic sense; the shock of very high soymeal prices in 1972-1973 was met by a flood of competition for animal feed from other sources. The Oil% rebounded rapidly to very high values in 1974. Similar shocks from high Oil% values occurred in 1985, 1996, and 1999.

If we detrend the data by subtracting the trendline therefrom, the greater symmetry of joint product spreads becomes apparent. The frequent and sustained presence of both very high and very low deviations from the trend should not be interpreted in this instance as either embedded calls or embedded puts so much as overbought and oversold regions within a trending market, preludes to sustained periods of mean reversion.

Distribution Of The Detrended Oil%

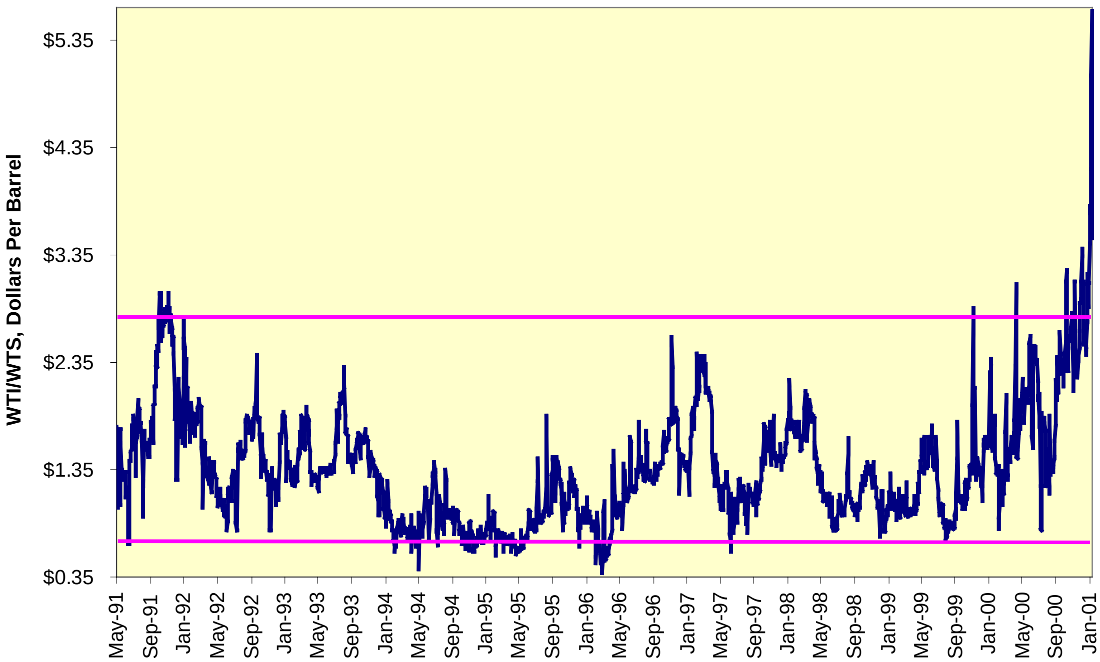


Substitution Spreads

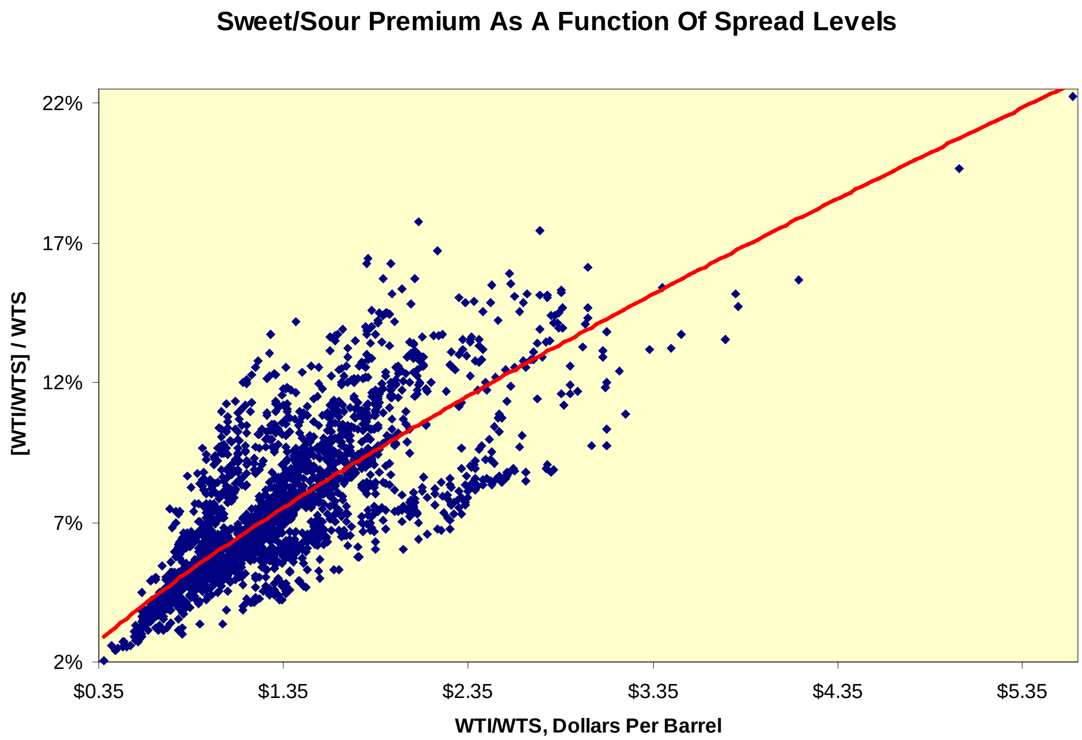
Bounded distributions and spread values that are functions of the underlying price characterize these spreads. The logic behind the spread bounds is simple; a high price for one commodity encourages substitution with the other. The price-dependent patterns of these spreads are a result of processors adding and subtracting incrementally more expensive processing units into their operations. In addition, the spread tends to trend from one substitution point to the other as the industry stays in a preference cycle. Unlike the joint product spreads, substitution spreads seldom exhibit a secular trend within their mean-reversion process.

Let's take a look at the spread between West Texas Sour (high-sulfur) and Intermediate ("sweet," or low-sulfur) crude oils. Since sour crude oil is cheaper, sophisticated refineries capable of desulfurization employ it first; as refinery utilization rates rise, simpler units only capable of handling the more expensive sweet crude are brought on stream. Of course, if refinery capacity becomes strained, as it has since mid-2000, the spread can erupt out of its historic bounds, as seen below.

Sweet/Sour Crude Oil Spread Over Time



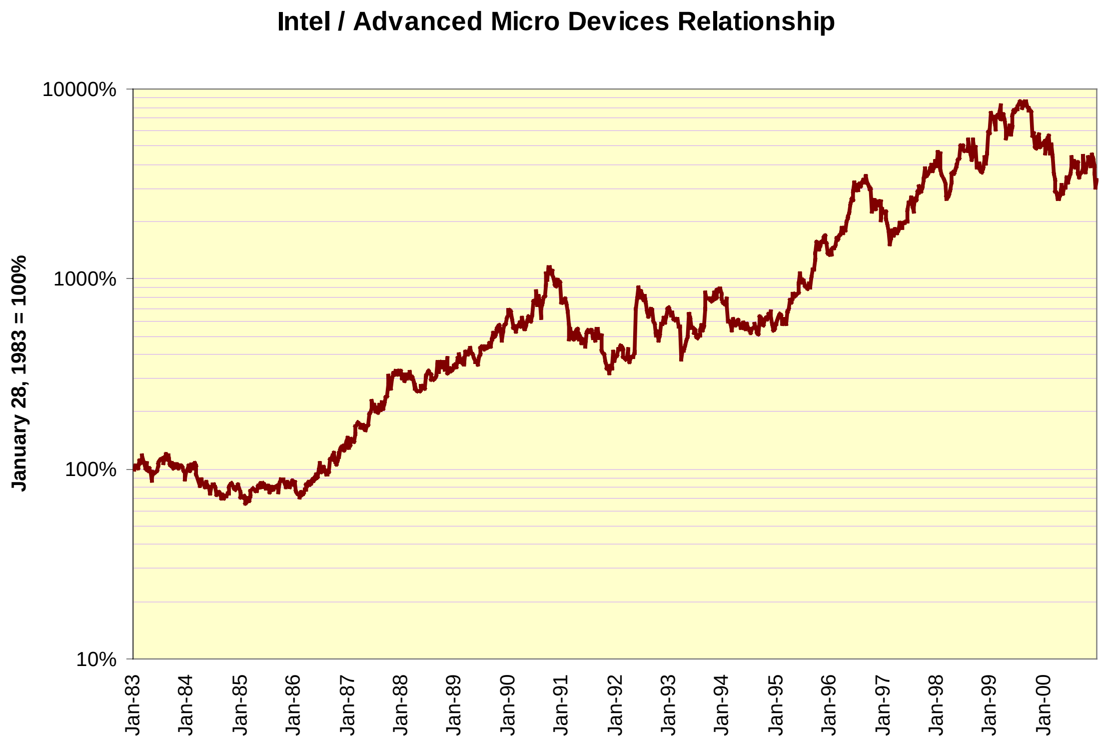
Once again we can restate the data in the spread to take a closer look at some underlying economic relationships. If we compare the sweet/sour spread as a percentage of the underlying sour crude oil price to the ordinal level of the spread itself, an exponential pattern emerges. This suggests both a decreased ability and willingness of refiners to run additional sweet crude oil barrels and an incentive to add new sour crude oil processing capacity. Given the typical industry pattern of everyone seeing the same signals at the same time, we shouldn't be surprised to see a collapse in the sweet/sour spread within a few years.



Does an extension such as seen in the sweet/sour crude oil spread suggest an embedded call option, or simply durable shocks that will revert to a long-term trend, as was the case with the Oil%? In all likelihood, both processes are operating. Since perfect substitution is rare, one leg of the spread is likely to be both more expensive and more volatile. Being long the more volatile leg in a rising price market will produce instances of extraordinary return, subject to the diminishing rates noted above, and this will approximate call option behavior (see "Going To Kansas City," *Futures*, May 1997, or "Springtime For Bran Flakes," *Futures*, March 2001). On the other hand, industry substitution behavior suggests a more normal state of reversion to a non-trending mean, except in times of industry stress.

Related Spreads
These spread are characterized by long periods of trending behavior derived from an underlying economic relationship (see "Aren't You Precious," *Futures*, April 1998, or "Every Spread Tells A Tale," *Futures*, December 2000). They have no defined economic bounds, no substitution constraints, no market-clearing price to revert to, and no process constraints. In other words, they can move anywhere for any period of time without ever becoming overvalued or undervalued in any meaningful sense.

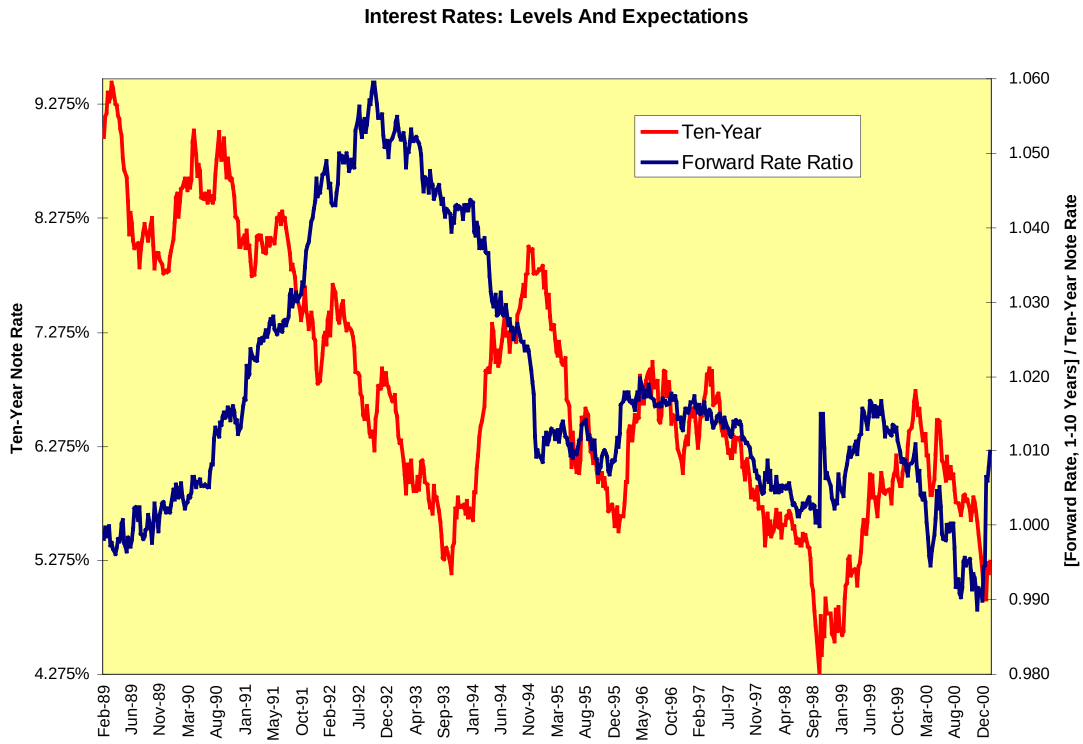
On the chance single-stock futures become the success for which the exchanges hope, let's take a look at the Intel/Advanced Micro Devices spread. These two companies have an interesting relationship: Many of the more active technology stocks of recent years achieved their stratospheric valuations by claiming a franchise, a unique market niche replete with "networking effects" and other New Economy nonesuch, and therefore really have no direct competition.



Intel enjoyed years of relative dominance due to both technological and marketing leadership; anyone so foolish to have shorted Intel and bought AMD between 1986 and 1999 would have had little to show for the effort but massive losses. No portfolio manager could have substituted AMD for Intel and proclaimed he had exposure to the semiconductor sector. The strategy of buying strength and selling weakness would have worked over this period until a fundamental change in AMD's outlook swung the relationship in its favor in beginning in September 1999.

Yield Curve Spreads

These spread have been bounded historically, but these bounds are not derived from any absolute economic limits. They can assume both extremely positive and extremely negative shapes depending on central bank policies and the market's inflationary or deflationary expectations. They are not mean-reverting as there is no normal shape of a yield curve at any base level of interest rates, but neither do these spreads exhibit continuous log-normal behavior. Yield curves tend to instantly capitalize to the extreme the slightest changes in the economic outlook, and therefore can change quite extremely and abruptly.



The interest rate market, to put it charitably, does not do a very good job of forecasting interest rates on a day-to-day basis. As all bond traders know, it jumps around in a chaotic fashion in the short-term. Longer-term, however, the market tends to get the general direction of rates right, and yield curve trades are instrumental in this process. First we must calculate the ratio of the forward rate between one and ten years to the ten-year note rate itself, which we can refer to as the FRR (see "Great Expectations," *Futures*, April 1997):

$$FRR = \frac{\left[(1+TenYear)^{10} \Big/ (1+OneYear) \right]^{(1/9)}}{TenYear}$$

This produces a series that moves both counter to and parallel to the course of ten-year rates themselves. The FRR can trend over prolonged periods, such as the big yield curve steepening period between 1989 and 1992, and the subsequent flattening period between 1992 and 1994. An odd characteristic of yield curve trades is that when we combine two different yield curve trades, each a product of a jump-diffusion process, into a single currency trade, we can get the very trendy, very well distributed currency markets.

Different Tools For Different Tasks

Let's summarize: Process spreads are dominated by embedded call options and little in the way of secular trends. Joint product spreads have pronounced trends and enduring mean reversion processes. Substitution spreads have economic bounds, tend to trend between these bounds, and these bounds can collapse during times of industry stress. Related spreads have no bounds, no embedded options, but can trend for very long periods of time. Yield curve spreads are very noisy in the short-term, but carry a strong signal in the long-term. They have no mean reversion processes or natural bounds. Intermonth spreads, not discussed in detail here, have definite trends, can have economic bounds, and definitely contain embedded options.

Given these different characteristics and properties, why do so many traders try to jam these very different underlying processes into singular technical trading systems? Why don't we, in homage to one of the great teeth-gritting phrases of all time, celebrate their diversity, or at the very least proclaim *vive le difference*?