

A Basis In Fact

Futures contracts in general and stock index futures contracts in particular have always been misunderstood and viewed with suspicion by the citizenry. Small wonder: Who can look at pictures of futures traders, clad in garish jackets and bad ties, jumping up and down, screaming and shouting, making spastic hand signals, without feelings halfway between revulsion and disdain?

From whence come stock index futures prices, and how can any of us be sure whether these prices are fair in relation to the underlying market?

Who Cares About Indifference?

You should. An investor always has a choice between buying a basket of stocks equivalent to the S&P 500 or other index in the cash market and buying a futures contract. If we buy the cash stocks, we're incurring an opportunity cost, as we could have invested in Treasury bills at no risk instead. Since futures do not require an up-front payment other than their margin payment, they do not incur this opportunity cost, and therefore we should be willing to pay more for futures than for the stocks themselves.

However, the owner of the stock is in line to receive both the dividend and the interest on that dividend, whereas the owner of future receives nothing. This is a holding cost on the future.

In sum, the future should trade at a difference, or "basis" to the cash stock index of the foregone interest cost at rate r less the expected dividends, D :

$$S \& P_{fut} = S \& P_{cash} * (1 + r)^{(d/365)} - \sum_{i=1}^{500} D_i (1 + r_i)$$

At the time of this writing on March 29, the S&P cash is at 1509.14, the risk-free rate is at 6.28% for 79 days, and the S&P 500 stocks are expected to pay out \$3.73 in dividends. The fair value of the future is calculated at 1526.05, a basis of 16.91. Higher interest rates expand the basis, as do lower dividend rates.

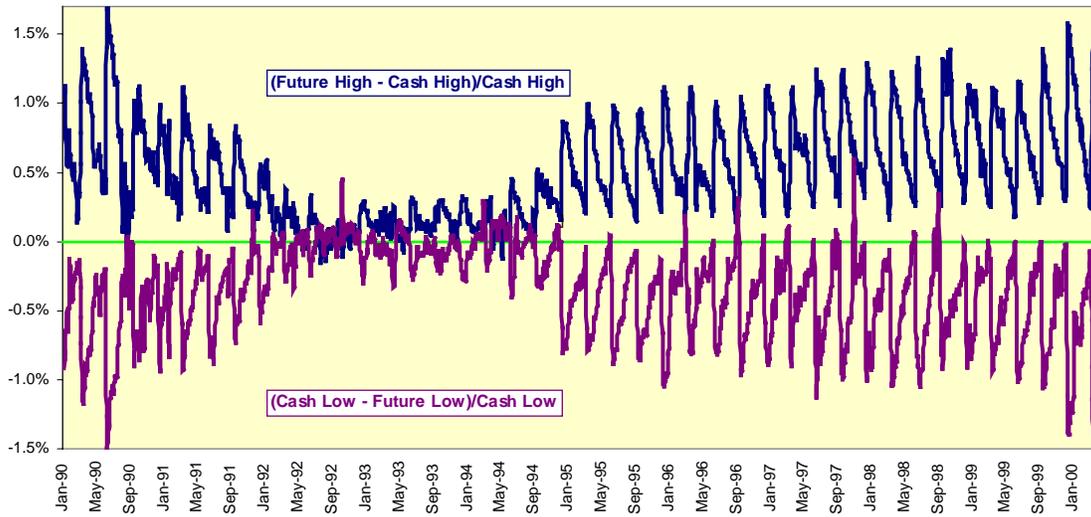
Should this basis rise to a level where we can buy the cash stocks at their offer price and sell the futures at their bid price and cover all of our costs, a "buy program" will commence. Just the opposite will occur if the futures decline to far relative to the cash; arbitrageurs sell the cash stocks and buy the undervalued futures in a "sell program."

Where's The Cash?

U.S. stocks not only trade after exchange hours, but their third-market movements and anticipated movements for the next day are influenced by action in other non-U.S. markets. We are all familiar by now with the wavelike global transmission of buying and especially selling pressure. These movements were particularly pronounced during the 1997-1998 Asian/Russian crises, and it was not at all unusual during this period to see S&P 500 futures down 20 - 25 full points prior to the exchange opening.

The range of the S&P 500 future relative to the cash market range has expanded in recent years after a period of unusual quiet in the early 1990s. Over a rolling five-day time frame, it is typical for the futures price to exceed the cash price by 1.5% early in the life of the futures contract; this number contracts markedly as expiration approaches, as the mechanics of the basis equation dictate.

**S&P 500 Futures Range Relative To Cash Range:
Five-Day Rolling Average**



These range deviations derive from three sources, actual transactions in third markets of major stocks in the index, correlation of the U.S. market to overseas markets, and anticipated movement of U.S. stocks on the opening. This third factor is of particular importance on days of major economic reports. A bullish employment report, for example, may send futures scurrying higher in anticipation of a higher cash market opening.

Index option traders are prominent among these early traders. Since the index options (OEX, SPX, NDX) on the Chicago Board Options Exchange do not open until at least 80% of their constituent stocks are trading, futures often are the only way of controlling losses in early going. Fund managers use futures as well to gain or shed exposure to the market as their cash position dictates.

Let's say a fund manager is in the happy position of receiving \$100 million to invest after the previous day's close. Overseas markets are rising, U.S. stocks on rising on third markets, and all economic data is bullish. The manager will be underperforming his S&P 500 benchmark unless he deploys his cash quickly. Using the following formula:

$$\# \text{ Futures} = \frac{B * \$100,000,000}{250 * \text{Index}}$$

The manager can calculate how many futures to buy to duplicate the index for any desired market beta B; with the underlying index at 1500, a portfolio with a beta of 1.00 -- the index itself -- can be duplicated simply by buying 267 futures. This is a much quicker and cleaner transaction than trying to buy \$100,000,000 worth of the same stocks prior to the opening. Of course, the basis may expand and trigger a buy program on the exchange open. The transaction works in reverse for reducing exposure.

One interesting artifact of this equation is fewer contracts are needed as the value of the index rises, and more contracts are needed as the index falls.