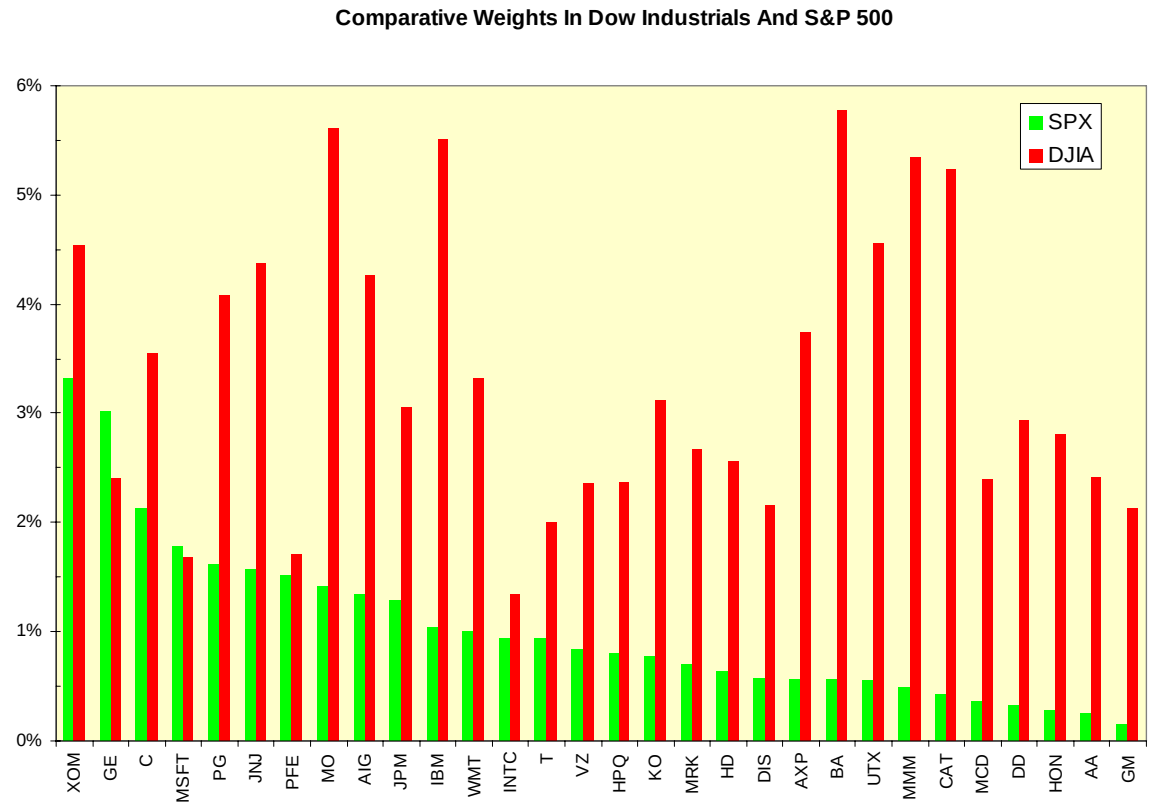
Indices With A Weight Problem

The nation's tabloids are more than eager to discuss the weight problems of Keira Knightley and Kirstie Alley, but do they discuss the problems and opportunities created by different indices' different weighting schemes? The answer, sadly, is "no."

Yet some very real trading opportunities are created by nothing more than the way indices are constructed. The Standard & Poor's 500 index (SPX), the default benchmark for many institutions, is capitalization-weighted. Each stock's weight in the index is based on its price multiplied by number of shares outstanding, divided by the total market capitalization of all stocks in the index. The Dow Jones Industrial Average (DJIA), in contrast, is a price-weighted index. It is calculated by summing the prices of the 30 stocks in the index and dividing by a divisor, now .12493117, that reflects the impact of splits and stock dividends. The more expensive a stock is, the greater its weight in the DJIA.

The relative weights of the 30 DJIA stocks in both indices are presented below.



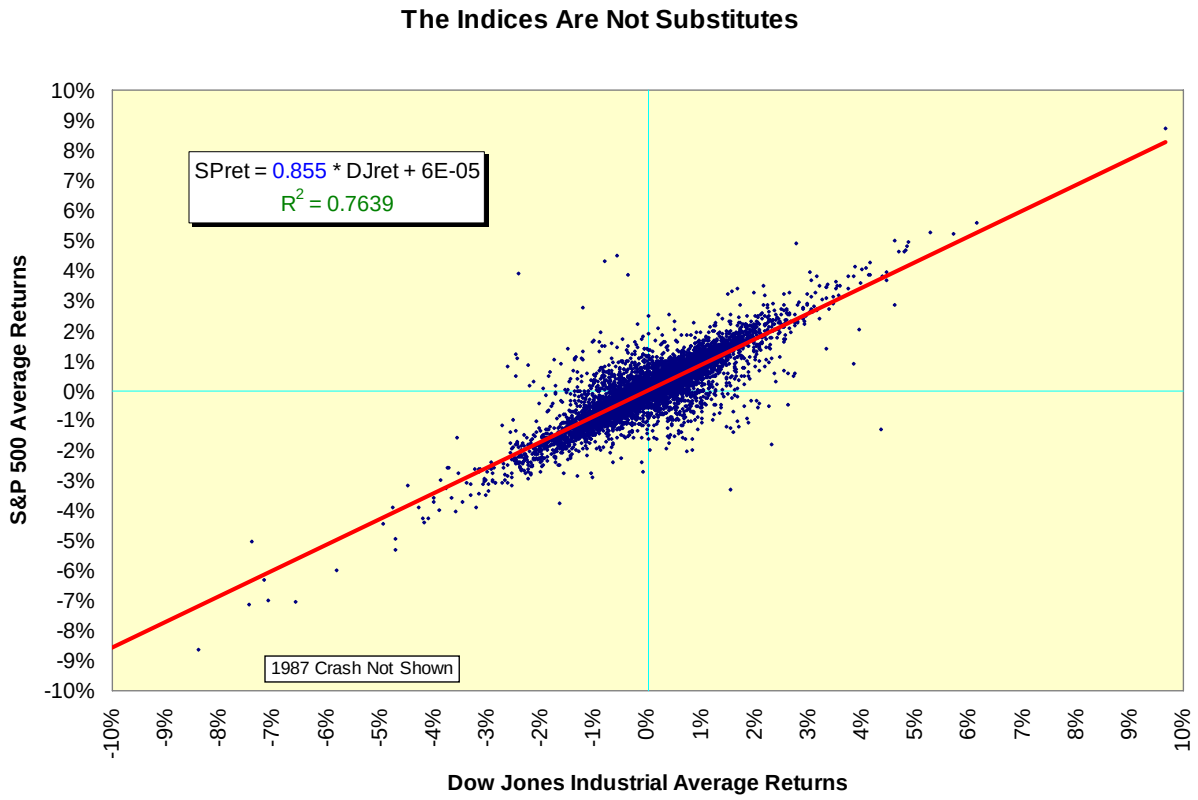
What is the impact of the different weighting schemes? The stocks with the highest and lowest prices in the DJIA are Boeing and Intel, which closed on Friday, July 7, at $79.99 and $18.56, respectively. If both stocks rise by $1.00 per share, they have an equal impact on the DJIA. However, Intel accounts for 0.9426% of the SPX and Boeing for 0.5584%, meaning its impact will be 1.69 times as large.

If one of the DJIA stocks has a big move higher or lower, as 3M did on July 7 or Altria did on July 6, the disparate impact on the indices is noticeable. The $7.29 drop in 3M accounted for 58.4 points of the DJIA's loss of 134.63 points, or 43.38% of the index' move. On the same day, 3M accounted for 0.607 points of the SPX' 8.60 point loss, or 7.06%.

The Embedded Option

The systematic impact of differential weighting over time should lead to a higher actual volatility for the DJIA, and it does. Its standard deviation of returns since August 1974 has been 1.021725 times as great as that of the SPX; we will use this number in a trade illustration below. And even though the indices track each other remarkably well

over long periods of time considering their significant differences, they should not be viewed as substitutes for one another on a daily basis. If they were, we should expect both the regression coefficient and the r-squared to be far closer to one than the .855 and .7639 shown.



If the SPX' historic volatility is systematically lower than the DJIA's historic volatility, can we capture this by owning a DJIA strangle - long an out-of-the-money (OTM) call option and an OTM put option - against a short SPX straddle, short both the at-the-money (ATM) call and put options?

Let's use the two index ETFs, the SPY and DIA, to trade the two indices. On July 7, the SPY closed at $126.61 and the DIA at $110.96. We can use the August 126 strike for the short SPY straddle and let's use the August 109 puts and 113 calls for the long DIA strangle.

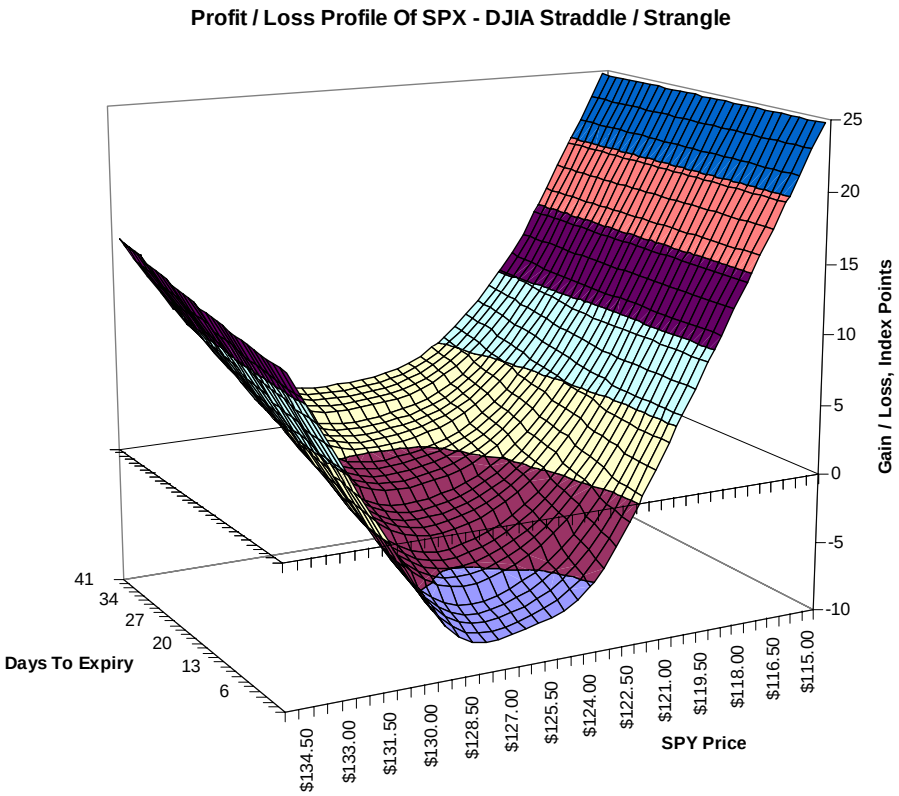
Now comes the tricky part. Given the larger dollar value of the SPY, we should trade 1.14 times the exposure on the DIA to make them dollar equal. And the net delta, or expected movement of the option price against the stock prices, should be as close to zero at initiation as possible. The idea is to trade volatility, not stock price movement. The initial deltas of the options are:

SPY 126 call: .6006 SPY 126 put: -.4163
DIA 113 call: .3606 DIA 109 put: -.3195

As a short SPY 126 straddle would have an initial delta of -.1843 and the long DIA strangle would have an initial delta of .0411, we would be taking a net short directional position on the market if we did not trade more DIA strangles. Adding the size and delta factors together, we should do the following trade:

Buy 5 Aug 113 DIA calls and 5 Aug 109 DIA puts at a net debit of 5 * ($1.05/call + $1.15/put) * 100 = $1,100
Sell 1 Aug 126 SPY call and 1 Aug 126 SPY put at a net credit of 1 * ($3.00/call + $1.70/put) * 100 = $ 470

What will this trade look like over price and time, assuming a continuation of the 1.021725 elasticity and constant implied volatilities for both the SPY and DIA? It should look like a long straddle as any move away from the current $126.61 price of the SPY will lead to expected higher gains on the DIA strangle. It also should suffer from time decay as expiration approaches. In the illustration below, both factors apply.



You may say to yourself with good reason this seems to be a trade with a lot of moving parts just to catch an expected move in volatility. But it has several advantages over the alternatives such as trading VIX derivatives, which I discussed here in June, not the least of which you are trading a fundamental relationship with two underlying assets and a predictable outcome if you are correct in your opinion.

I used to stress one attribute of the standard option pricing models. The strike is fixed, so we can ignore it in trade analysis. Price, interest rates and volatility can move both up and down, and at unknown rates. Time, the fifth variable, can only move in one direction and at a known rate. If you walk into the office and find out it is yesterday, your option book is the least of your problems.

In the above trade the relative volatilities of the SPX and DJIA are known, but not fixed. We should expect the DJIA to be more volatile by virtue of its weighting scheme. That is a head-start on a trade; how many of those do you get in the course of a day?