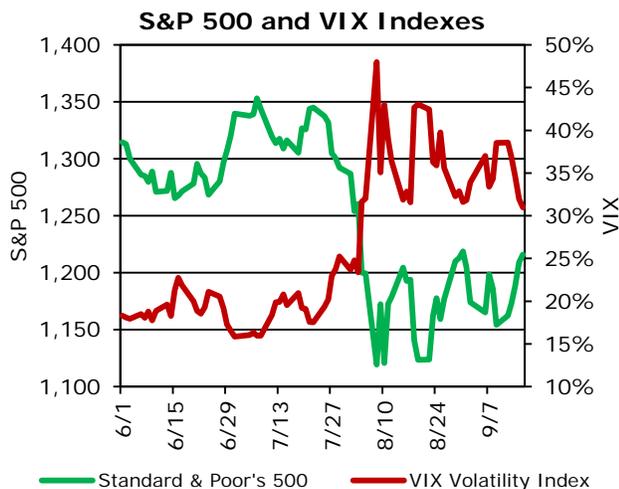


A confluence of market shaking events have come together to introduce significant volatility in the domestic equity and other markets in recent months. These events include the European sovereign debt crisis, the ongoing fiscal debate in the U.S. and a general shift in the nexus of economic activity from the developed to the emerging economies.

As a result, we have witnessed some pricing anomalies in various markets including CME Group's flagship E-mini Standard & Poor's 500 (S&P 500) futures. In particular, the financing rates implicit in the September/December 2011 "roll" or spread in E-mini S&P 500 futures have fallen all the way down to 27 basis points below prevailing LIBOR rates.



This article is intended to review this situation and discuss how one may monitor it using CME Group's Equity Quarterly Roll analyzer.¹

Calculating Roll Value – Many asset managers routinely buy and hold a passive position in stock index futures. This tactic allows one to secure the returns in the underlying stock index such as the S&P 500, which is often regarded as the benchmark or bogey against which asset manager performance may be measured.

Such tactics are commonplace in the context of "portable alpha" programs which attempt to secure core or "beta" returns in the benchmark and, in addition, enhance overall portfolio returns by layering on an additional trading strategy in pursuit of excess or "alpha" returns.

But, unlike equities, futures are not perpetual in nature but rather expire on a periodic basis. Of course, the convention in stock index futures is to provide for a quarterly expiration on the 3rd Friday of March, June, September and December.

Thus, asset managers passively holding long positions in an expiring contract must "roll forward" their positions. This is accomplished by selling the expiring contract and reestablishing their long positions in the next contract month.

"Roll" Forward → Sell Nearby & Buy Deferred Futures

The price at which one may roll forward is easily found in the spread between nearby and deferred futures contracts.

$$Roll = Deferred\ Futures - Nearby\ Futures$$

E.g., assume that Sep-11 E-mini S&P 500 futures are at 1,176.00 while Dec-11 E-mini S&P 500 futures are at 1,170.25. Thus, the roll may be quoted as the spread or -5.75 index points (= 1,170.25 - 1,176.00).

$$Roll = 1,170.25 - 1,176.00 = -5.75\ index\ points$$

Positive and Negative Carry – While the roll may readily be calculated, the next question is whether or not it fairly reflects prevailing market conditions. As a general rule, the "fair value" of a stock index futures contract ($FV_{futures}$) may be calculated by reference to "cost of carry" considerations. In other words, what would it cost to buy and carry until term an equity portfolio that reflects the value of the underlying index ($Spot$).

We assume that one finances the portfolio at prevailing short-term rates, such as LIBOR rates (R); and, benefits from the accrual of dividend income measured in index points (Div) over so many days ($days$) until futures maturity.

$$FV_{futures} = Spot + Financing - Dividends$$

$$= Spot \times \left(1 + R \left(\frac{days}{360} \right) \right) - Div$$

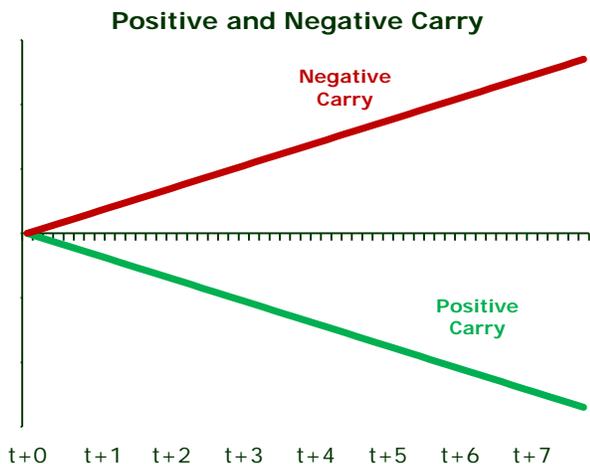
E.g., assume that the S&P 500 is at 1,176.80, short-term LIBOR rates are at 0.39%, there are 112 days until expiration and we expect 7.90 index points of dividend accrual until futures contract expiration. Thus, we may calculate the fair value of a futures contract at 1,170.22.

¹ CME Group Equity Quarterly Roll Analyzer may be accessed at: www.cmegroup.com/trading/equity-index/paceofroll/main.html

$$FV_{futures} = 1,176.80 \times \left(1 + 0.36\% \left(\frac{112}{360}\right)\right) - 7.90 = 1,170.22$$

Where the cost of financing exceeds the expected receipt of dividend income, stock index futures should trade at premium to the spot index value. As a result, deferred futures should generally trade at a premium to nearby futures and the roll is quoted as a positive number. This is a condition known as "negative carry" in futures markets because financing costs exceed dividend receipts. Negative carry is the condition normally expected in stock index futures.

But sometimes, the anticipated dividend stream exceeds financing costs. This is the case currently as short-term interest rates, driven fundamentally by Fed monetary policy, are at historically all-time lows with target Fed Funds at 0-0.25%. As such, deferred futures should trade at discount to nearby futures and the roll is quoted as a negative number. This is a circumstance known as "positive carry" because dividend receipts exceed financing costs.



Implicit Financing – How might one determine whether the "roll" is cheap or rich? One might attempt to calculate the fair value associated with the nearby and deferred futures contracts. Or, one might get to the heart of the matter by calculating the financing rate implicit (*Imp Fin*) in the value of the roll (*Roll*).

In order to calculate this value, we also need to know the price of nearby futures ($Futures_{nearby}$); the number of days between expiration of nearby and deferred futures ($Days_{between}$). Finally, we need to estimate the dividends that will accrue between the expiration of the nearby and deferred futures

($Div_{between}$) as well as dividends that will accrue until expiration of the nearby futures contract ($Div_{to\ nearby}$).

$$Imp\ Fin = \left(\frac{360}{days_{between}}\right) \left(\frac{Roll + Div_{between}}{Futures_{nearby} + Div_{to\ nearby}}\right)$$

E.g., assume the roll is at -5.75 index points, there are 91 days between the nearby and deferred futures contract expiration dates, and nearby futures are at 1,176.00. We estimate that there will be 6.75 index points in dividends accrued between expirations and an additional 1.15 index points in dividends accrued until expiration of nearby futures. The implicit financing rate is calculated as 0.336%.

$$Imp\ Fin = \left(\frac{360}{91}\right) \left(\frac{-5.75 + 6.75}{1,176.00 + 1.15}\right) = 0.00336\ or\ 0.336\%$$

We can compare this implied financing rate of 0.336% to prevailing financing rates to determine whether the Roll appears rich or cheap.

E.g., assume that prevailing rates are at 0.43% while the implied financing rate is at 0.336% or 9.4 basis points below prevailing rates. This suggests that the Roll is rather low or cheap. Thus, it may be an opportunity time to "buy the roll" by buying deferred and selling nearby futures.

E.g., assume that the implied financing rate is at 0.52% while prevailing rates are at 0.43%. This would suggest that the Roll is rather high or rich. Thus, it may be more opportune to "sell the roll" buy selling deferred and buying nearby futures.

Implicit Financing < Prevailing Rate → **Roll is "Cheap"**

Implicit Financing > Prevailing Rate → **Roll is "Rich"**

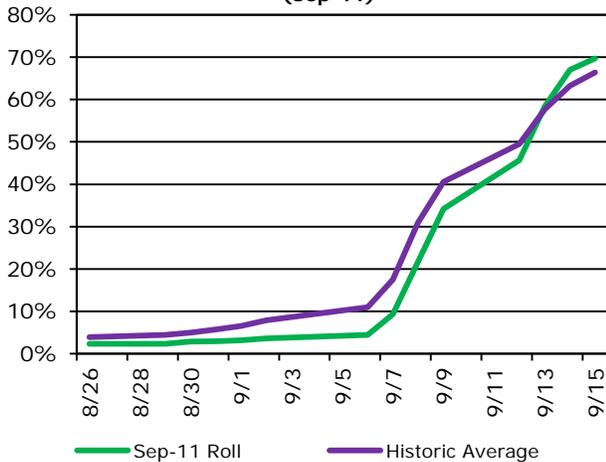
Most Recent Roll – As suggested earlier, asset managers notably including portable alpha managers follow the value and pace of the roll closely. They do so because a passive long strategy requires that they execute a roll transaction on a regular quarterly basis.

Thus, it is often interesting to monitor how much open interest has rolled or transferred from the expiring or nearby contract month to the deferred month. CME Group's Quarterly Roll Analyzer provides this information in graphic form beginning approximately one month prior to the expiration of a quarterly futures contract.

Our graphic depicts how the roll progressed relative to historic averages during September 2011. In particular, we depict the percentage of aggregate open interest held in the expiring and first deferred quarterly contracts that has rolled.

Beyond that, the Quarterly Roll Analyzer provides information regarding the implicit financing rate and compares it to prevailing LIBOR rates. During the September 2011 roll period as open interest transferred from nearby September 2011 to the deferred December 2011 futures contract, we note that implicit financing rates declined sharply during the last few days immediately preceding expiration on September 16th (or the 3rd Friday of the contract month).

Pace of E-mini S&P 500 Roll (Sep-11)

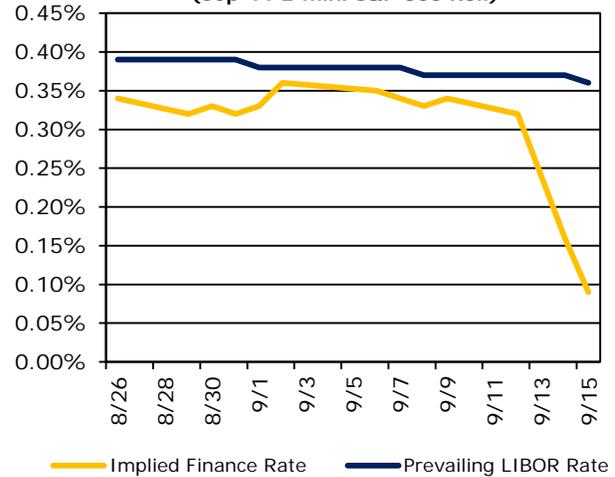


Note that the implicit financing rate fell to some 27 basis points below prevailing LIBOR rates. This suggests that the roll became cheap and presented an opportune moment to buy the roll (buy deferred and sell nearby futures).

Events including the prospects of weak domestic growth on the back of the recent fiscal debate, coupled with flare-ups in the European sovereign debt situation weighed heavily on equity markets during recent weeks. As a result, shorts aggressively sold the nearby contract, pushing

September to a sizable discount to December. Thus, these shorts did not have an opportunity to roll their short positions in December at attractive values.

Implied vs. Prevailing Rates (Sep-11 E-mini S&P 500 Roll)



As such, this situation was reminiscent of conditions in late 2008 and into 2009 near the height of the subprime mortgage crisis when bearish sentiment likewise weighed heavily on the marketplace.

Concluding Note – Once again, we suggest that interested parties consult our website to access our Equity Quarterly Roll Analyzer. Specifically, the tool is found at www.cmegroup.com/trading/equity-index/paceofroll/main.html. It represents a valuable and popular way of monitoring activity during a critical period of market activity.

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