CME Group

STOCK INDEXES

Understanding Stock Index Futures

MAY 3, 2013

Financial Research & Product Development

Stock index futures were introduced in 1982 on domestic futures exchanges and have since grown to become perhaps the 2nd most significant sector, after interest rates, within the futures trading community.

Actually, the concept of a stock index futures contract had been discussed and analyzed for many years prior to 1982, but a variety of regulatory and intellectual property rights issues held the concept back. These issues were addressed by 1982, leading to the introduction of futures based on the Standard & Poor's 500 Index (S&P 500) on the Chicago Mercantile Exchange (CME) as well as many other stock index contracts.

The basic model established in the early 1982 for the trade of stock index futures was embraced on a domestic and global basis by many other exchanges. As a result, we now enjoy a vibrant array of stock index futures for access by institutional and retail traders alike.

Mechanics of Stock Index Futures

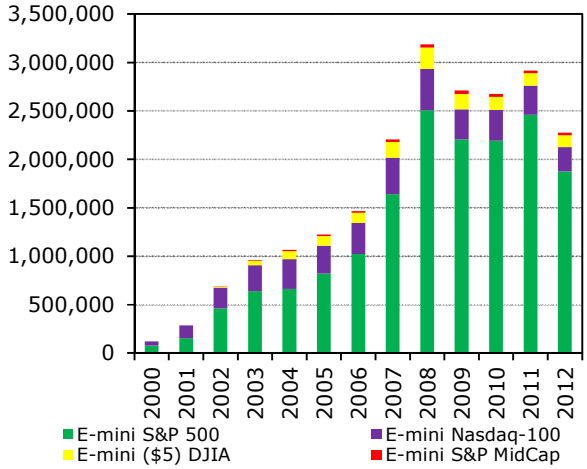
For the most part, our discussion focuses on several extremely successful stock index futures contracts that share common design characteristics. We are referring to the "E-mini" line of stock index futures products as offered on CME Group exchanges beginning in 1997.

These contracts are traded exclusively on electronic trading platforms such as the CME Globex® system and constructed with relatively modest contract sizes relative to the original or "standard-sized" stock index futures based on the particular index.

The original S&P 500 futures contract, introduced in 1982, was based on a value of $500 times the index value. In the intervening years, equities generally advanced in value. Thus, the exchange found it was offering a contract with a high contract value. As a result, the contract was "split" in 1997 such that the contract multiplier was halved from $500 to $250 times the Index.

Still, the contract value was high relative to many other extant futures contracts. Thus, the exchange offered an alternative "E-mini" S&P 500 contract valued at $50 times the index and traded exclusively on an electronic basis, as opposed to in the exchange pits via open outcry, beginning in 1997. The E-mini design was widely accepted and rapidly grew to become the most popular line of stock index futures available today.

Major E-mini Equity Futures ADV



Like all stock index futures contracts, E-minis are valued at a specified contract multiplier times the spot or cash index value. They call for a cash settlement at said value, generally during the contract months of March, June, September, and December (the "March quarterly cycle"). These contracts are traded on electronic trading platforms for most of the 24-hour weekday period beginning on Sunday evenings.

Exhibit 1 in our appendix below illustrates the contract specifications of the four most popular E-mini stock index futures.

Contract Value & Quotation

Stock index futures are quoted in terms of the underlying or spot or cash index value in index points. Exhibit 2 in our appendix below depicts quotations for the E-mini S&P 500 futures contract. But the monetary value is a function of the contract multiplier and quoted index value.

$$Futures\ Contract\ Value = Contract\ Multiplier\ x\ Quoted\ Price$$

E.g., June 2013 E-mini S&P 500 futures contract settled at 1,573.60 index points on April 23, 2013. The monetary value of one contract may be

calculated as $78,680.

$$Futures\ Contract\ Value = \$50\ x\ 1{,}573.60 = \$78{,}680$$

Stock index futures are quoted in a specified minimum increment or "tick" value. The minimum allowable price fluctuation in the context of the E-mini S&P 500 futures contract is equal to 0.25 index points. This equates to $12.50 per tick as shown below.

$$\begin{aligned} &Value\ of\ One\ Tick \\ &= Contract\ Multiplier\ x\ Minimum\ Fluctuation \\ &= \$50\ x\ 0.25\ index\ points = \$12.50 \end{aligned}$$

We may value and define the tick size of the four popular stock index futures mentioned above as seen in Exhibit 3 in our appendix below.

Cash Settlement Mechanism

Stock index futures do not call for the delivery of the actual stocks associated with the stock index. Such a delivery process would be quite cumbersome to the extent that a stock index may be composed of hundreds or even thousands of constituents.

The logistical difficulties are compounded to the extent that it's necessary to weight the delivery of each stock issue by exacting reference to their weights as represented in the stock index. But the industry addressed this problem by introducing the concept of a cash settlement mechanism.

A cash settlement is actually quite simple. After establishing a long or short position, market participants are subject to a normal "mark-to-market" (MTM) like any other day. *I.e.,* they pay any losses or collect any profits daily and in cash. Subsequent to the final settlement day, positions simply expire and are settled at the spot value of the underlying index or instrument.

Domestic stock index futures typically employ a final settlement price that is marked to a "special opening quotation" (SOQ) on the third Friday of the contract month. The SOQ is intended to facilitate arbitrage activity by allowing arbitrageurs to enter market on open (MOO) orders to liquidate cash positions at the same price that will be reflected in the final settlement price. A morning settlement or SOQ procedure was established in late 1980s to avoid the so-called triple witching hour where stocks, stock options, and stock index futures would all conclude trading at the same time of day on the 3rd Friday of the contract month.

Pricing Stock Index Futures

Stock index futures cannot be expected to trade at a level that is precisely aligned with the spot or cash value of the associated stock index. The difference between the futures and spot values is often referred to as the *basis.* We generally quote a stock index futures basis as the futures price less the spot index value.

$$Basis = Futures\ Price - Spot\ Index\ Value$$

E.g., the June 2013 E-mini S&P 500 futures price was 1,573.60 with the spot index value at 1,578.78 as of April 23, 2013. Thus, the basis may be quoted as -5.18 index points (= 1,573.60 – 1,578.78).

$$Basis = 1{,}573.60 - 1{,}578.78 = -5.18$$

The basis will generally reflect "cost of carry" considerations, or the costs associated with buying and carrying the index stocks until futures contract expiration. These costs include financing costs, per the assumption that one is a leveraged buyer of the equities, and a payout represented by the dividends that are expected to accrue until the futures expiration date. Thus, the futures price may be estimated as follows.

$$Futures\ Price = Spot\ Index\ Value + Finance\ Charges - Dividends$$

Fair Value

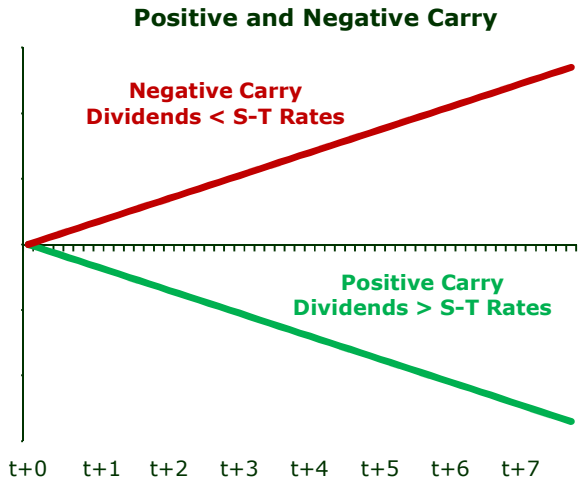
The gap or difference between spot index values and theoretical futures prices is often referred to as *fair value.* This is the level at which futures prices should be expected to trade, albeit not necessarily where they will trade relative to the spot index value.

$$Fair\ Value = Finance\ Charges - Dividends$$

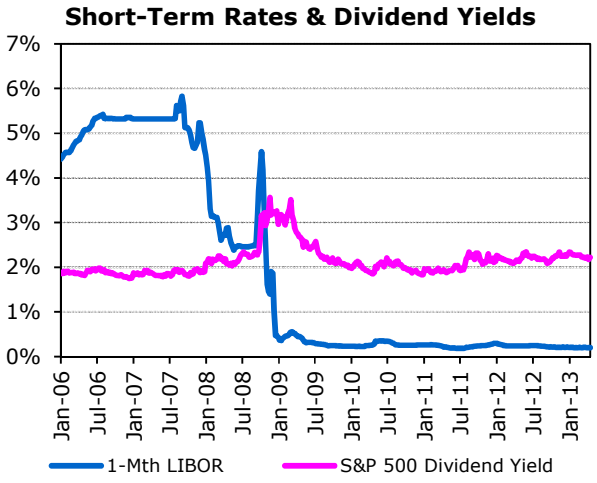
The fair value of a stock index futures contract is normally expected to be positive such that futures prices > spot prices. This is attributable to the fact that finance charges, as reflected in short-term

interest rates such as the London Interbank Offered Rate (LIBOR), normally exceed dividend yields.

Negative carry is said to prevail where short-term interest rates exceed dividend yields. This may be understood by considering that this implies it costs more to finance the purchase and carry of a basket of stocks, as represented in an index, than the payouts associated with the stock basket in the form of dividends.



When negative carry prevails, stock index futures tend to price at higher and higher levels in successively deferred months extending out into the future; and the basis, quoted as futures less spot, is quoted as a positive number.



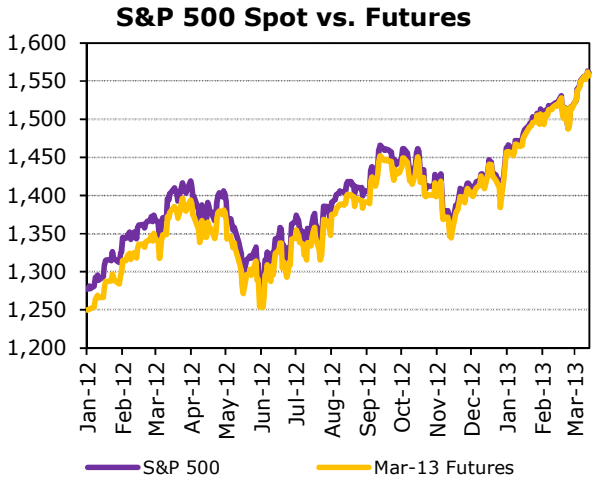
Positive carry is said to prevail under circumstances where short-term interest rates are less than dividend yields. Under these conditions, the payouts or dividends associated with the basket of stocks represented in the index provide a superior return to short-term interest rates. Hence one may earn a positive return by buying and carrying the basket.

Positive carry is not typical as it implies that a corporation offering dividends in excess of short-term rates cannot apply those funds in such a way as to earn a superior return. But it is not uncommon as positive carry prevails as this is being written, noting that the Federal Reserve had eased short-term rates to unprecedented low levels in late 2008.

When positive carry prevails, stock index futures tend to price at lower and lower levels in successively deferred months extending out into the future and the basis, quoted as futures less spot, is quoted as a negative number.

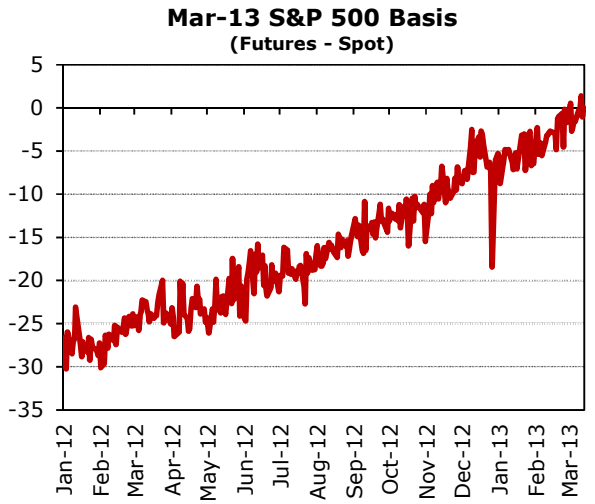
Basis Convergence

Regardless of whether positive or negative carry prevails, the design of a stock index futures contract assures that the basis or difference between futures prices and spot index values will fall to zero by the time futures contract maturity rolls around. This is intuitive to the extent that stock index futures are settled in cash at the spot index value on its final settlement date.



The process by which futures and spot value come together over time is known as *convergence.* Note that, regardless of whether equity prices in general are trending upward or downward, the basis is steadily converging toward zero.

That is not to say that basis convergence is always completely smooth or predictable. In fact, there may be considerable "flutter" in the process on a day-to-day basis. Some of that flutter may be attributed to the fact that stock index futures are often traded some minutes beyond the time of day that the cash stock exchanges close and settle equity values.



CME Group routinely offers stock index futures some 15 minutes after the close of the NYSE on a daily basis. Although 15 minutes is not a terribly long period of time, there is always some probability that breaking news may push futures prices upward or downward to diverge from movements in the underlying stock markets.

As a result, CME Group has implemented a "fair value settlement procedure" on the last day of each calendar month with respect to its domestic stock index futures contracts. On a normal day, the daily settlement value is established by reference to an indicative market price that may have been executable during the final minutes of trade on that particular day.

But the fair value settlement procedure provides that, regardless of where futures prices are in relationship to the spot index value, they will be settled at their fair value (FV). That FV is calculated based on a survey of applicable interest rates and dividends to accrue until expiration date.

E.g., on March 28, 2013, the surveyed short-term rate was 0.350%; there were 84 days between the settlement date of April 3, 2013 to the June 21, 2013 expiration of June 2013 futures; the spot value of the S&P 500 index was at 1,562.85; and, dividends accruing until futures contract expiration were estimated at 7.831 index points. The FV of the June 2013 futures contract was calculated at 6.555 index points below spot.

$$
\begin{aligned}
Fair\ Value &= Finance\ Charges - Dividends \\
&= \left[Rate\ x\ \left(\frac{days}{360}\right)\ x\ Index\ Value\right] \\
&- Dividends \\
&= \left[0.350\%\ x\ \left(\frac{84}{360}\right)\ x\ 1{,}562.85\right] - 7.831 \\
&= -6.555
\end{aligned}
$$

Thus, the contract was settled at a value of 1,556.30, or 1,556.295 (= 1,562.85 – 6.555) rounded to the nearest integral multiple of 0.10 index points. [1]

Enforcing Cost of Carry Pricing

Despite some degree of "flutter," liquid stock index futures markets tend to price efficiently and in reasonable close conformance with their fair values. That is due to the fact that many market participants are prepared to "arbitrage" any apparent mispricing, or pricing anomalies, between spot and futures markets.

If futures prices were to rally much above their fair market value, an astute arbitrageur may act to buy the stock portfolio and sell stock index futures in an attempt to capitalize on that mispricing. These arbitrageurs may attempt to trade in a basket or subset of the stocks included in a stock index. Or, the state of electronic trading systems may provide them the means to trade in all or virtually all of the constituents of a particular stock index as part of the arbitrage transaction.

In the process of buying stocks and selling futures, the arbitrageur may bid up the stocks or push futures prices down to reestablish an equilibrium

[1] The minimum price fluctuation or "tick" size associated with the E-mini S&P 500 futures contract equals 0.25 index points while the tick associated with the "standard" sized S&P 500 futures contract equals 0.10 index points. But both E-mini and standard futures are settled on a daily basis at the nearest integral multiple of 0.10 index points, corresponding to the tick associated with the standard sized contract.

pricing situation where arbitrage is ostensibly not profitable.

E.g., on March 28, 2013, with a settlement one might have bought S&P 500 stocks reflecting the spot index value of 1,562.85 for April 3rd settlement, incurring finance charges of 0.350% or 1.276 index points, carrying the stocks and earning dividends equivalent to 7.831 index points. The net cost is 1,556.30 and, therefore, futures should price at this level.

Buy stocks @ levels reflecting spot index value	(1,562.85)
Incur finance charges @ 0.350%	(1.276)
Receive dividends of 7.831 index points	7.831
Net cost over 84 days	(1,556.30)
Expected futures price	1,556.30

E.g., if futures were to be trading significantly below their fair value, one might sell stocks and buy futures. This arbitrage should have the effect of bidding futures prices upward and pushing stock prices downward to reestablish equilibrium pricing.

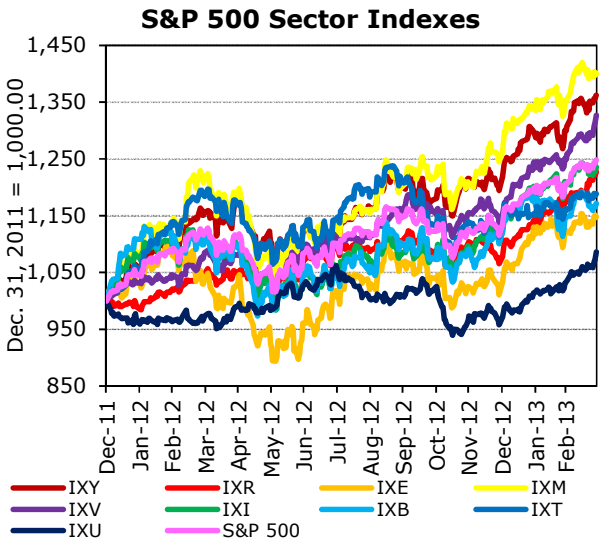
Sell stocks @ levels reflecting spot index value	1,562.85
Invest proceeds @ 0.350%	1.276
Forego dividends of 7.831 index points	(7.831)
Net cost over 84 days	1,556.30
Expected futures price	1,556.30

In practice, one must also consider costs attendant to arbitrage*, i.e.,* slippage, commissions, fees, bid-offer spreads, etc. As such, futures tend to trade within a band that extends above and below the theoretical fair value. When futures fall below that band, one might buy futures and sell stocks; or, when futures rise above that band, one might sell futures and buy stocks.

This band may vary from stock index to stock index, but it would not be unreasonable to assume that the costs attendant to "arbing" S&P 500 futures fall into the vicinity of perhaps 1.25 index points. Thus, futures may very well trend upward and downward within that band, reflecting the influx of buy-and-sell orders, without engendering an arbitrage transaction.

Spreading Stock Index Futures

Speculators frequently utilize inter-market spreads to take advantage of anticipated differentials in the performance of one market vs. another. CME Group E-mini S&P Select Sector Stock Index futures lend themselves nicely for this purpose. [2]



In order to place an inter-market spread, it is necessary to derive the so-called "spread ratio." The spread ratio is an indication of the ratio or number of stock index futures that must be held in the two markets to equalize the monetary value of the positions held on both legs of the spread.

The following formula may be used for this purpose where $Value_1$ and $Value_2$ represent the monetary value of the two stock index futures contracts that are the subject of the spread. [3]

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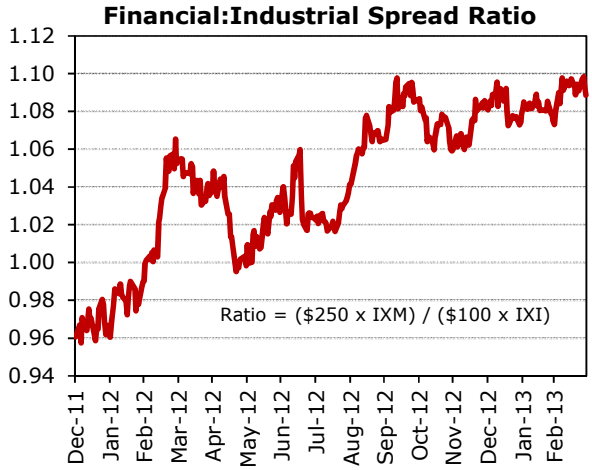
[2] CME Group E-mini S&P Select Sector Stock Index futures (Select Sector futures) were introduced in March 2011. The indexes underlying the nine (9) different futures contracts represent subsets of the Standard & Poor's 500 (S&P 500). Specifically, these indexes represent the consumer discretionary (IXY), consumer staples (IXR), energy (IXE), financial (IXM), health care (IXV), industrial (IXI), materials (IXB), technology (IXT) and utilities (IXU) sectors of the economy. (The info-tech and telecom sectors of the S&P 500 are combined to comprise the technology select sector index.) The associated futures contracts are cash-settled to a value of $100 x Index with the exception of the Financials contract which is valued at $250 x Index.

[3] We reference spot index values and not the quoted futures price for purposes of identifying the monetary value of a stock index futures contract. This convention

$$Spread\ Ratio = Value_1 \div Value_2$$

E.g., on July 16, 2012, the September 2012 E-mini S&P Financial Select Sector futures contract was quoted at 146.15 and valued at $36,537.50 (=$250 x 146.15). The September 2012 E-mini S&P Select Sector Industrial futures contract was valued at $34,410.00 (=$100 x 344.10).



The spread ratio is calculated below at 1.062. This suggests that one might balance 20 Financial index futures with 21 Industrial index futures.

$$Spread\ Ratio = Value_{Financials} \div Value_{Industrials}$$
$$= \$36{,}537.50 \div \$34{,}410.00$$
$$= 1.062\ or\ 20\ financials\ per\ 21\ industrials$$

Thus, if one believed that financials might outperform the industrial sector of the market in mid-2012, one might wish to buy 20 Financial Select Sector futures and sell 21 Industrial Select Sector futures contracts. Or, one might opt to trade the spread in a similar ratio, *e.g.,* 1:1, 10:11, etc.

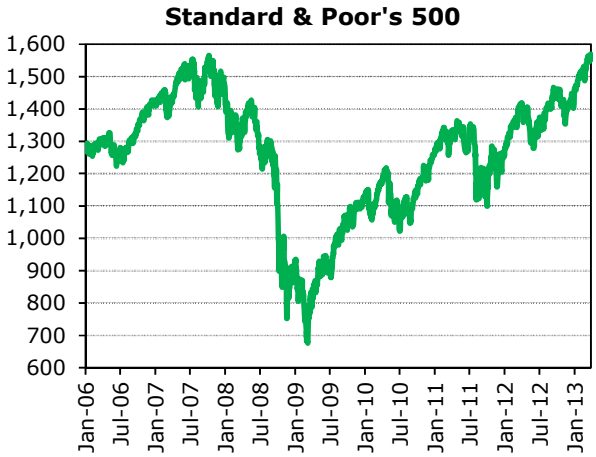
If Financials expected to out-perform Industrials ➔ **Buy 20 Financial & Sell 21 Industrial futures**

The "spread ratio" provides an indication of the appropriate way to construct an inter-market spread. Further, it presents a convenient method for following the performance of the spread over time. Because these ratios are dynamic, one must be aware of the current spread ratio when placing a trade.

This same technique of weighting a spread may be deployed in the context of any stock index futures contracts. While we have suggested a speculative application of a spread here, we further consider the use of spreads in the context of portfolio management applications below.

Risk Management with Stock Index Futures

While domestic equity markets have been very volatile over the past decade, the market has not generally produced sizable positive returns. This creates serious challenges for equity asset managers seeking to generate attractive returns while relegating volatility to acceptable levels.



Thus, we review several popular stock index futures applications including (1) beta adjustment; (2) option strategies; (3) cash "equitization"; (4) long/short strategies; (5) tactical rotation; (6) conditional rebalancing; and (7) portable alpha strategies.

Measuring Risk

There is an old saying – "you can't manage what you can't measure." In the equity market, one generally measures risk by reference to the beta (β) of one's portfolio. But in order to understand β and how it may be used, we must review the foundation of modern financial theory – the Capital Asset Pricing Model (CAPM).

serves to eliminate cost of carry considerations from the calculation.

CAPM represents a way of understanding how equity values fluctuate or react to various economic forces driving the market. The model suggests that the total risk associated with any particular stock may be categorized into systematic risks and unsystematic risks.

$$Total\ Risk = Systematic\ Risks + Unsystematic\ Risks$$

Systematic risk is a reference to "market risks" reflected in general economic conditions and which affect all stocks to some degree. *E.g.,* all stocks are affected to a degree by Federal Reserve monetary policies, by general economic strength or weakness, by tax policies, etc.

Unsystematic risk or "firm-specific risks" represent factors that uniquely impact upon a specific stock. *E.g.,* a company may have created a unique new product or its management may have introduced new policies or direction which will affect the company to the exclusion of others.

The extent to which systematic and unsystematic risks impact upon the price behavior of a corporation may be studied through statistical regression analysis. Accordingly, one may regress the returns of the subject stock (R_{stock}) against the price movements of the market in general (R_{market}).

$$R_{Stock} = \alpha + \beta\,(R_{Market}) + \varepsilon$$

R_{market} is generally defined as the returns associated with a macro stock index such as the Standard and Poor's 500 (S&P 500). The alpha (α) or intercept of the regression analysis represents the average return on the stock unrelated to market returns. Finally, we have an error term (ϵ). But the most important products of the regression analysis includes the slope term or beta (β); and, R-squared (R^2).

β identifies the expected relative movement between an individual stock and the market. This figure is normally positive to the extent that all stocks tend to rise and fall together. β gravitates towards 1.0 or the β associated with the market in the aggregate but might be either greater than, or less than, 1.0.

E.g., if β=1.1, the stock may be expected to rally by 11% when the market rallies by 10%; or, to decline by 11% if the market declines by 10%. Stocks whose betas exceed 1.0 are more sensitive than the market and are considered "aggressive" stocks.

E.g., if β=0.9, the stock is expected to rally by 9% in response to a 10% market rally; or, to decline by 9% if the market declines by 10%. Stocks whose betas are less than 1.0 are "conservative" stocks because they are less sensitive than the market in general.

If β > 1.0 ➔ Aggressive stock
If β < 1.0 ➔ Conservative stock

R^2 identifies the reliability with which stock returns are explained by market returns. R^2 will vary between 0 and 1.0.

E.g., if R^2=1.0, then 100% of a stock's returns are explained by reference to market returns. This implies perfect correlation such that one might execute a perfect hedge using a derivative instrument that tracks the market.

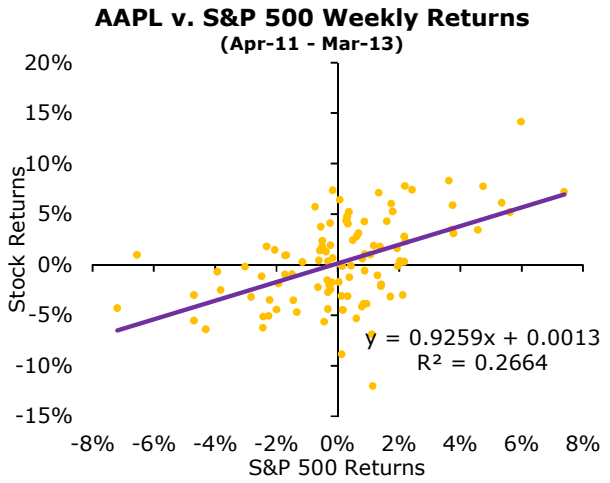
E.g., if R^2=0, this suggests a complete lack of correlation and an inability to hedge using a derivative that tracks the market.

If R^2 = 1.0 ➔ Perfect correlation
If R^2 = 0 ➔ No correlation

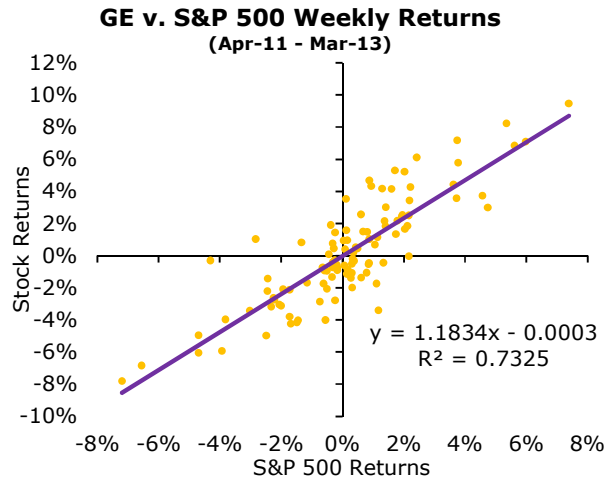
An "average" stock might have an R^2≈0.30 which implies that perhaps 30% of its movements are explained by systematic factors and "hedge-able." Thus, the remaining 70% of unsystematic risks are not hedge-able with broad-based stock index futures. [4]

[4] It is important to establish a high degree of correlation between the hedged investment and the hedging instrument in order to qualify for so-called "hedge accounting" treatment. Statement of Financial Accounting Standards no. 133, "Accounting for Derivative Financial Instruments and Hedging Activities" (FAS 133) generally addresses accounting and reporting standards for derivative instruments in the United States. The Statement allows one to match or simultaneously recognize losses (gains) in a hedged investment with offsetting gains (losses) in a derivatives contract under certain conditions. In particular, it is necessary to demonstrate that the hedge is likely to be "highly effective" for addressing the specifically identified risk exposure. One method for making such demonstration is through statistical analysis. The "80/125" rule suggests that the actual gains and losses

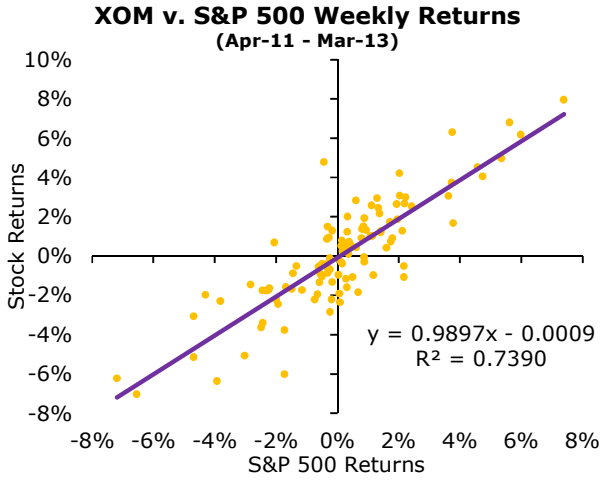
E.g., regressing weekly returns of Apple (AAPL) v. the S&P 500 over the two-year period from April 2011 through March 2013, we arrive at a β=0.9259 and an R^2=0.2664. This suggests that AAPL is a relatively conservative company but with insufficient correlation to the S&P 500 effectively to use equity index futures for hedging purposes.



E.g., General Electric (GE) is an aggressive stock with a β=1.1834. GE exhibited reasonably high correlation with an R^2=0.7325 v. the S&P 500. Still, this correlation may be insufficient to qualify for hedge accounting treatment.



E.g., Exxon Mobil (XOM) represents another very heavily weighted stock within the S&P 500. XOM exhibited a β=0.9897 and may be considered a slightly conservative investment. Its R^2=0.7390 is reasonably high but not sufficiently high to qualify for hedge accounting treatment as a general rule.



Traders frequently distinguish between historical or raw or fundamental betas versus so-called adjusted betas. The historical or "raw" β is calculated based on historical data as depicted above. Adjusted β represents an estimate of the future β associated with a security per the hypothesis that β will gravitate toward 1.0 over time. Adjusted β may be calculated as follows. [5]

$$Adjusted\ \beta = (0.67 \cdot Raw\ \beta) + (0.33 \cdot 1)$$

Thus, Apple's raw β of 0.9259 may be adjusted as 0.9504.

$$Adjusted\ AAPL\ \beta = (0.67 \cdot 0.9259) + (0.33 \cdot 1) = 0.9504$$

Similarly, General Electric's raw β of 1.1834 may be adjusted as 1.1229.

$$Adjusted\ GE\ \beta = (0.67 \cdot 1.1834) + (0.33 \cdot 1) = 1.1229$$

Sometimes the formula is further refined based on the particular economic sector from which the stock originates. As such, the value "1" on the right-hand

of the derivative(s) should fall within 80% to 125% of the gains/losses for the hedged item. This may be interpreted to require an R^2=0.80 or better to qualify for hedge accounting treatment. As such, the typical stock with an R^2 relative to the index of perhaps 0.30 to 0.50 likely cannot qualify for hedge accounting.

[5] The Bloomberg quotation system routinely displays an adjusted β. The raw beta is calculated on the basis of the past 2 years of weekly returns while adjusted β is determined by the formula displayed in the text.

side of the equation may be replaced with the beta associated with the market sector, *e.g.,* financials, technology, consumer durables, etc., from which the stock originates.

Hypothetical Stock Portfolio
(3/29/13)

Ticker	Shares	Price	Value	Adj Beta
XOM	$90.11	50,000	$4,505,500.00	0.993
AAPL	$442.66	18,000	$7,967,880.00	0.950
GE	$23.12	175,000	$4,046,000.00	1.123
CVX	$118.82	40,000	$4,752,800.00	1.085
IBM	$213.30	12,000	$2,559,600.00	0.926
MSFT	$28.61	100,000	$2,860,500.00	0.912
JPM	$47.46	75,000	$3,559,500.00	1.299
PG	$77.06	56,000	$4,315,360.00	0.638
JNJ	$81.53	60,000	$4,891,800.00	0.656
T	$36.69	50,000	$1,834,500.00	0.750
WFC	$36.99	75,000	$2,774,250.00	1.168
PFE	$28.86	98,000	$2,828,280.00	0.794
KO	$40.44	46,000	$1,860,240.00	0.702
BRK/B	$104.20	34,000	$3,542,800.00	0.875
BAC	$12.18	100,000	$1,218,000.00	1.555
C	$44.24	100,000	$4,424,000.00	1.765
SLB	$74.89	26,000	$1,947,140.00	1.371
ORCL	$32.33	73,000	$2,360,090.00	1.117
INTC	$21.84	107,000	$2,336,345.00	1.013
COP	$60.10	29,000	$1,742,900.00	0.971
PM	$92.71	32,000	$2,966,720.00	0.765
CSCO	$20.90	107,000	$2,235,765.00	0.986
WMT	$74.83	38,000	$2,843,540.00	0.585
VZ	$49.15	54,000	$2,654,100.00	0.705
MRK	$44.20	61,000	$2,696,200.00	0.792
HPQ	$23.84	45,000	$1,072,800.00	1.212
QCOM	$66.94	31,000	$2,075,140.00	1.051
GS	$147.15	10,000	$1,471,500.00	1.244
DIS	$56.80	37,000	$2,101,600.00	1.127
OXY	$78.37	16,000	$1,253,920.00	1.361
MCD	$99.69	21,000	$2,093,490.00	0.650
UTX	$93.43	18,000	$1,681,740.00	1.120
ABT	$35.32	30,000	$1,059,600.00	0.684
UPS	$85.90	19,000	$1,632,100.00	0.888
CMCSA	$41.98	54,000	$2,266,920.00	1.072
MMM	$106.31	14,000	$1,488,340.00	0.984
CAT	$86.97	12,000	$1,043,640.00	1.321
HD	$69.78	32,000	$2,232,960.00	0.959
Portfolio			**$100,010,954**	**0.988**

Power of Diversification

Only a fraction of the risk associated with any particular stock is traced to systematic risks while a larger proportion of the attendant risks may be unsystematic in nature. As such, stock index futures generally represent poor hedging vehicles for individual stocks.

However, the CAPM underscores the power of diversification. By creating a *portfolio* of stocks, instead of limiting one's investment to a single stock, one may effectively excise, or diversify away, most unsystematic risks from the portfolio. The academic literature suggests that one may create an "efficiently diversified" portfolio by randomly combining as few as 8 individual equities.

The resulting portfolio, taken as a whole, may reflect market movements with little observable impact from those firm-specific risks. That may be understood by considering that those unsystematic factors that uniquely impact upon specific corporations are expected to be independent one from the other.

E.g., consider a hypothetical stock portfolio depicted in our table. This portfolio was created using several of the most heavily weighted stocks included in the S&P 500. The portfolio has an aggregate market value of $100,010,954 as of March 29, 2013.

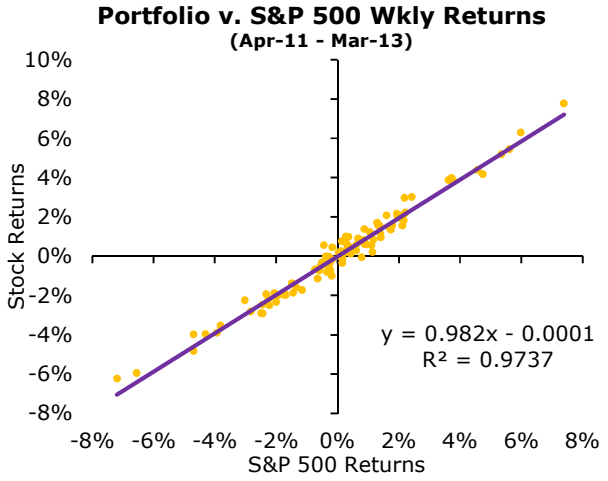
The portfolio's raw $\beta=0.982$ is based on a regression of weekly returns for a two-year period between April 2011 and March 2013. This implies an adjusted $\beta=0.988$. These figures suggest that the portfolio is very slightly conservative and will tend to underperform the market. Finally, note that its $R^2=0.9737$, suggesting that 97.37% of its movements are explained by systematic market factors.

Replicating Core or Beta Performance

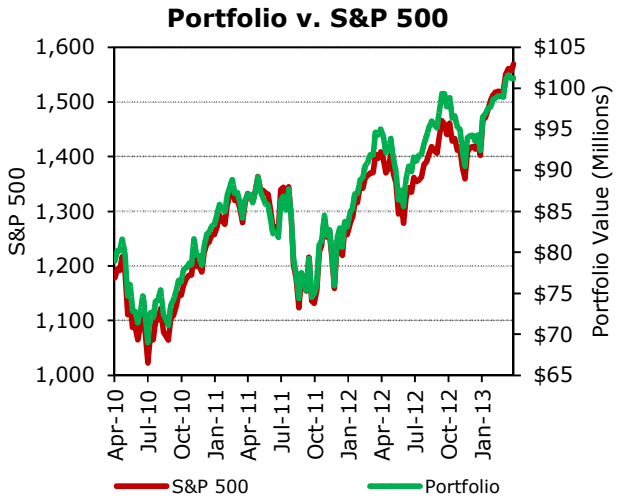
We generally look to a particular stock index to serve as the standard measure, or "benchmark," or "bogey," against which the performance of equity asset managers may be measured. The S&P 500 stands out as the most popularly referenced benchmark of U.S. equity market performance. This is evidenced by the estimated $6 trillion in equity investment that is benchmarked, or bogeyed, or otherwise tied to, the performance of the S&P 500.

Asset managers frequently conform their "core" equity holdings to reflect the performance of the benchmark index, *e.g.,* S&P 500. Subsequently, they may alter the characteristics of the portfolio to seek enhanced return above the core "beta" returns reflected in the index. Those enhanced returns may be referred to as "alpha" returns. Strategies in

pursuit of this goal are often referred to as "enhanced indexing" strategies.



Because stock index futures may be based directly upon the benchmark utilized by an equity asset manager, they may be used to replicate the performance of the benchmark; or, to manage the systematic risks associated with a well-diversified stock portfolio.



Stock index derivatives must offer "efficient" or "true" beta to serve as an effective risk-management vehicle. Efficient beta is implicit when the contract offers two important attributes including (1) low tracking error; and (2) low transaction costs. This point is a recurring theme in our discussion.

Beta Adjustment Strategies

Equity asset manager often seek alpha by adjusting portfolio beta to reflect future market expectations. Thus, an asset manager may diminish portfolio beta in anticipation of a bear market; or, increase portfolio beta in anticipation of a bull market.

The former strategy conforms to the textbook definition of a "hedge," *i.e.,* a strategy applying derivatives to reduce risk in anticipation of adverse market conditions. While the latter strategy may not qualify as a textbook hedge – accepting additional risk, as measured by beta, in pursuit of alpha – it is nonetheless equally legitimate.

Fund investment policies may permit portfolio managers to adjust portfolio beta within a specific range centered around the beta implicitly associated with the benchmark. *E.g.,* one may maintain a β=1.0 but may be be allowed to adjust beta within a range bounded by 0.80 and 1.20 in pursuit of alpha.

Practitioners may identify the appropriate "hedge ratio" (HR), or the number of stock index futures required, effectively to achieve a target risk exposure as measured by beta as follows.

$$HR = (\beta_{target} - \beta_{current}) \; x \left(\frac{Value_{Portfolio}}{Value_{Futures}}\right)$$

Where β_{target} is the target beta of the portfolio; $\beta_{current}$ is the current beta of the portfolio; $Value_{portfolio}$ is the monetary value of the equity portfolio; and, $Value_{futures}$ is the nominal monetary value of the stock index futures contract used to execute the hedge transaction.

E.g., assume that the manager of our hypothetical $100,010,954 portfolio believed that the market is overvalued and likely to decline in the near term. Thus, the investor may take steps to reduce beta from the current 0.988 to 0.900. June 2013 E-mini S&P 500 futures were quoted at 1,562.70 on March 29, 2013. This implies a futures contract value of $78,135 (=$50 x 1,562.70). Thus, one might sell 113 E-mini S&P 500 futures effectively to reduce portfolio beta from 0.988 to 0.80.

$$HR = (0.900 - 0.988) \; x \left(\frac{\$100{,}010{,}954}{\$78{,}135}\right) = -113$$

E.g., assume that the equity manager believed that the market is likely to advance and wanted to extend the portfolio beta to 1.10. This requires the purchase of 143 futures.

$$HR = (1.100 - 0.988)\ x\ \left(\frac{\$100{,}010{,}954}{\$78{,}135}\right) = 143$$

Stock index futures may be used to adjust the effective portfolio beta without disturbing the portfolio's core holdings. Of course, this process is most effective when one is assured that futures offer efficient beta with low tracking error and low transaction costs.

Sell 113 futures ➔ **Reduces β from 0.988 to 0.900**

Buy 143 futures ➔ **Increases β from 0.988 to 1.100**

Option Strategies

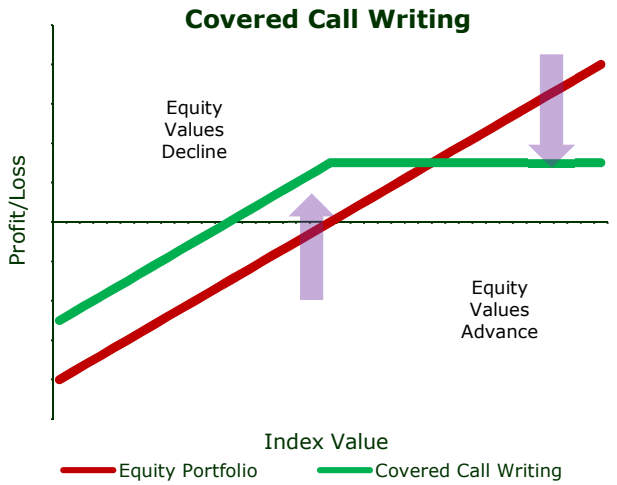
In addition to offering stock index futures, CME also offers options that are exercisable for a variety of our stock index futures contracts. Options add an important and flexible element to an equity asset manager's risk management toolbox.

One may wish effectively to restructure an equity portfolio by augmenting income possibilities, establishing a floor value in addition to simply reducing risk with the use of futures. These and other possibilities are achievable with the use of options on stock index futures.

Covered Call Writing – Assume that an asset manager holds a stock portfolio and believes that the market will be stuck in a neutral holding pattern for the foreseeable future. Under these circumstances, the asset manager may wish to engage in a strategy referred to as "covered call writing" – or to sell call options against the equity portfolio. The call writer or seller is "covered" in the sense that the potential obligation to sell futures on exercise of the options is essentially offset by the long stock holdings.

The short call options will provide the asset manager with income, through the process of time value decay, if the market should remain at current levels. This augments portfolio returns even in an environment where the equity prices are static.

If the market should decline, the short calls fall out-of-the-money and will be abandoned if held to expiration by the call buyer. Thus, the call seller or writer retains the original option price or premium, counting it as income.



But if the market should advance, the call options go in-the-money. They will be exercised by the call buyer, compelling the call seller to sell futures at the strike or exercise price even though they are trading at a higher level. The losses that accrue upon exercise are, however, offset by the advancing value of the stock portfolio. Thus, the covered call writer locks in a ceiling return in the event of advancing equity values.

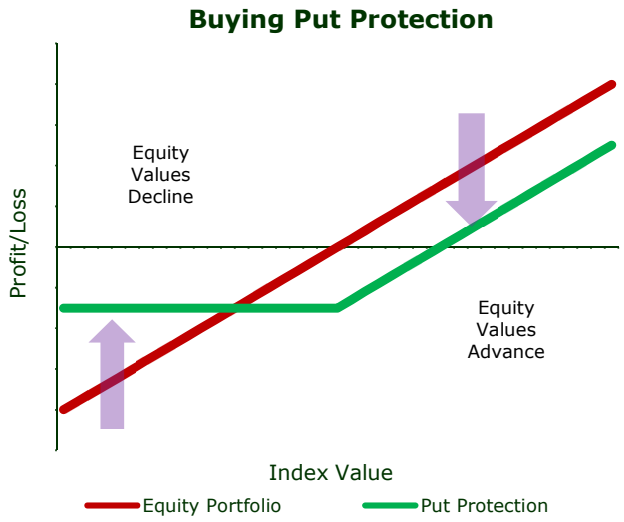
Sell Call Options ➔ **Augments income in neutral market at risk of limiting upside potential**

Locking in a Floor – As an alternative to a covered call writing strategy, an asset manager may seek to purchase put options. The net effect of this strategy is to create a "floor return" for the stock portfolio. In effect, the put buyer is buying "price insurance" on the value of the portfolio. But this insurance comes at the cost of the option premium.

If prices decline, the put options go in-the-money. The profits that accrue on the put options are, however, offset by the losses associated with the declining value of the stock portfolio. Thus, the put buyer locks in a floor return.

If the market should advance sharply, the put buyer benefits from the advancing value of the stock portfolio. But having paid the option premium,

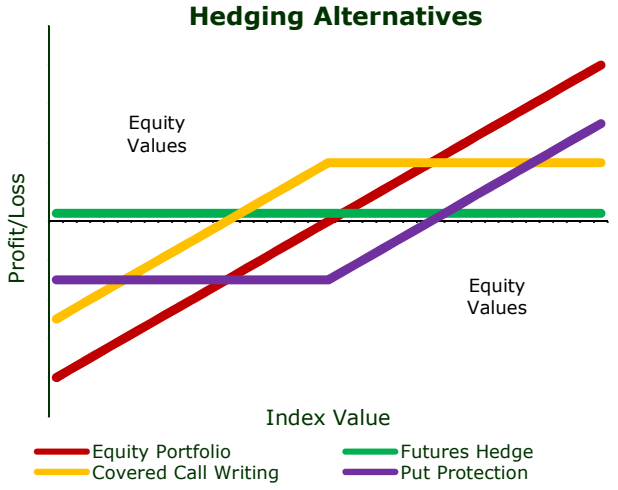
those profits are reduced by the value of the premium.



Finally, if the market should remain essentially neutral, the value of the portfolio remains unchanged. Still, the put buyer has forfeited the original value of the put options, which serves to reduce the value of the stock portfolio accordingly.

Buy put options → Locks in "floor return" in bear market but limits upside gains

Hedging Alternatives – Options serve to increase the range of risk management or hedging alternatives available to equity asset managers. But these instruments should be deployed judiciously and in concert with the asset manager's expectations regarding possible future market directions.



Clearly, a short futures position serves the asset manager best in a strongly bearish market environment. A covered call writing strategy serves well in a neutral market. Finally, while the optimal strategy in a bull market is clearly to remain unhedged, the purchase of put options is the most attractive of the hedging strategies under these circumstances.

Bear Market → Sell Futures
Neutral Market → Sell Calls
Bull Market → Buy Puts

In other words, it behooves the asset manager to coordinate strategy with a forecast of market movements in order to achieve optimal results. The flexibility of options, as a supplement to futures hedging strategies, provides added dimensions to the astute manager.

Cash Equitization

Passive index investment strategies have become very popular over the past 20 years. This is evidenced by the size of the assets under management (AUM) held by passive index mutual funds as well as the success of various Exchange Traded Funds (ETFs), including SPDRs ("SPY") and others designed to replicate the performance of the S&P 500.

Mutual funds typically offer investors the opportunity to add or withdraw funds on a daily basis. As such, equity managers are often called upon to deploy additions or fund withdrawals on short notice. They could attempt to buy or sell stocks in proportions represented by the benchmark. But execution skids or slippage may cause fund performance to suffer relative to the benchmark.

Or, they can utilize stock index futures as a temporary proxy for the addition or withdrawal of funds. *I.e.,* buy futures effectively to deploy additions of capital; sell futures to cover withdrawals. This "cash equitatization" strategy provides the equity asset manager with time to manage order entry in the stock market while maintaining pace with the benchmark.

Some asset managers may utilize futures as a long-term proxy for investment in the actual stocks comprising the index to the extent that the leverage

associated with futures frees up capital for redemptions or distributions.

Buy futures	**➔**	**To deploy new capital additions**
Sell futures	**➔**	**To cover capital withdrawals or distributions**

Consistent with our recurring theme, the successful execution of cash equitization strategies is dependent upon the degree to which futures deliver efficient beta, *i.e.,* low tracking error and low transaction costs.

Long-Short Strategies

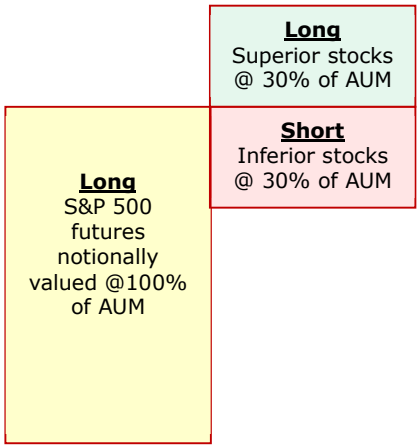
There are many strategies deployed in the equity markets involving a combination of long and short positions designed to create alpha returns.

One of the most common of long/short strategies is known simply as "130/30." [6] The equity manager begins by distinguishing stocks that are expected to generate superior returns vs. those that are expected to generate inferior average returns.

Thus, the asset manager could distinguish superior from inferior stocks by rank ordering all the constituents of the S&P 500 from best to worst based on some selection criteria. The manager buys the superior stocks with 130% of the fund's AUM, funding the excess 30% long position by shorting/selling inferior stocks valued at 30% of AUM. [7]

To the extent that the fund's goal is often stated as outperforming the S&P 500, core fund holdings may mimic the holdings of the S&P 500. *I.e.,* one may deploy 100% of AUM in stocks or derivatives that mimic the benchmark index. Frequently, stock index futures are deployed to generate those core or beta returns.

130/30 Strategy with Futures



A core beta investment created with stock index futures provides fund managers with flexible cash management capabilities including the ability to deploy additions or fund withdrawals quickly and efficiently. But, again, this strategy is only effective provided that futures offer efficient beta.

Buy-and-hold futures	**➔**	**Replicate core or beta portfolio performance with cash management flexibility**

Sector Rotation Strategies

Equity asset managers will generally allocate their funds across stock market industry sectors and individual stocks. In many cases, they may conform the composition of the portfolio to match that of the benchmark or bogey. This strategy assures that the performance of the portfolio generally will parallel performance of the benchmark.

E.g., the Standard & Poor's 500 is the most popularly referenced benchmark for U.S. equity asset managers. It is comprised of securities drawn from ten well defined industry sectors as indicated below.

However, asset managers may subsequently re-allocate, or rotate, portions of the portfolio amongst these various sectors in search of enhanced value. E-mini S&P Select Sector Stock Index futures provide the basis for an "overlay" strategy which may be deployed effectively to rotate assets from

[6] 130/30 strategies probably evolved from a popular technique known as "pairs trading." This requires one to identify pairs of corporations, typically engaged in the same or similar industry sectors. *E.g.,* one may pair 2 high-tech computer companies, 2 energy companies, 2 auto companies, etc. One further identifies the stronger and weaker of the 2 companies in each pair, based upon fundamental or technical analysis, buying the stronger and selling the weaker company in each pair. By executing this strategy across multiple pairs of stocks, one may hope to generate attractive returns.

[7] There is nothing particularly magical about the 130/30 proportion. Sometimes the strategy is pursued on a 140/40 ratio, sometimes on a 120/20 ratio, or with the use of other proportions.

one market sector to the next without disturbing the composition of the underlying cash or spot equity portfolio. This entails a relatively simple strategy of shifting away from low beta into high beta sectors in anticipation of a bull market in equities. Or, shifting away from high beta and into low-beta sectors in anticipation of a bear market.

While all of S&P Select Sector indexes are positively correlated to the "mother" S&P 500 Index, the betas (β) and coefficients of determination (R^2) derived from a statistical regression of sector index returns vs. those of the S&P 500 vary widely.

Select Sector Performance vs. S&P 500
(Based on Weekly Data from 4/29/11 – 4/26/13)

Index	Symbol	Beta (β)	R^2
Consumer Disc	IXY	1.039	0.911
Consumer Staples	IXR	0.526	0.664
Energy	IXE	1.354	0.857
Financial	IXM	1.298	0.895
Health Care	IXV	0.734	0.810
Industrial	IXI	1.156	0.943
Materials	IXB	1.258	0.834
Technology	IXT	1.002	0.878
Utilities	IXU	0.442	0.424

Source: Bloomberg

E.g., the utility index exhibits a conservative beta of 0.442 and a weak correlation of 0.424. The energy and financial indexes have very aggressive betas of 1.354 and 1.298, respectively. The industrial sector is most heavily correlated with the S&P 500 with an R^2=0.943.

By early 2013, the economy seems to be showing signs of recovery and the stock market has rallied to new all-time highs. Thus, the financial sector of the market has rallied back from the lows to which it sank in the wake of the subprime crisis which broke out in 2007-08. If an asset manager expected this trend to continue, he might consider rotating the composition of the portfolio from industrials into financials.

This may be accomplished simply by liquidating industrial stocks in favor of buying financial stocks. Or, one might utilize Select Sector futures similarly to restructure the portfolio. Specifically, one may transact a spread by selling E-mini Industrial Select Sector futures and buying E-mini Financial Select Sector futures. In fact, this strategy is analogous to the spreading strategy discussed above with the distinction that this spread may be executed in the context of a risk management or investment strategy rather than as a purely speculative pursuit.

In order to place an inter-market spread, it is necessary to derive the so-called "spread ratio" as discussed above. Let us further borrow the details of our spreading example as well.

E.g., on July 16, 2012, the September 2012 Financial/Industrial spread ratio was calculated at 1.062, suggesting that one might balance 20 Financial index futures with 21 Industrial index futures, or a similar ratio.

Assume that manager of the $100,010,954 portfolio wanted to "overweight" financials by 5% and similarly "underweight" industrials by 5%. This would imply the purchase of 137 Financial Sector futures [= (5% x $100,010,954) ÷ $36,537.50]) coupled with the sale of 145 Industrial Sector futures (=1.062 x 137).

Buy 137 Financial Sector futures & Sell 145 Industrial Sector futures ➔ **Effectively over-weights financials by 5% & under-weights industrials by 5%**

Thus, our asset manager may quickly and effectively rotate investment from one economic sector to another while leaving core holdings undisturbed. Similarly, one may use stock index futures to rotate investment from one national stock market to another.

E.g., one might sell CME E-mini S&P 500 futures and buy CME E-mini S&P CNX Nifty futures effectively to rotate investment away from U.S. and into Indian equity markets.

Conditional Rebalancing

Traditional pension fund management strategies require investors to allocate funds amongst different asset classes such as stocks, bonds and "alternate" investments (*e.g.*, real estate, commodities). A typical mix may be approximately 60% in stocks; 30% in bonds and 10% in alternative investments. The mix may be determined based on investor return objectives, risk tolerance, investment horizon and other factors.

After establishing the allocation, investors often retain the services of active fund managers to manage portions of portfolio, *e.g.,* stocks, bonds, etc. Thus, investors may seek to retain managers in hopes of generating excess return (or "alpha") beyond the beta return in any specific asset classes, as measured by benchmark indexes, *e.g.,* S&P 500 in equity markets; or, Barclays Capital U.S. Aggregate Index in the bond markets.

But the portfolio's mix will necessarily fluctuate as a function of market movements. *E.g.,* if equities advance (decline) sharply, the portfolio may become over (under) weighted with stock; and, under (over) weighted with bonds. As such, the portfolio manager may be compelled to rebalance the portfolio by reallocating funds from one asset class to another.

Sometimes asset managers use options on E-mini S&P 500 futures to provide for a "conditional rebalancing" of the portfolio. Specifically, one might sell call options and put options in the form of an option strangle, *i.e.,* sell out-of-the-money calls and sell out-of-the-money puts.

If stocks rally beyond the strike price of the call options, they may be exercised, resulting in short futures positions. Those short futures contracts will serve effectively to offset expansion of the equity portion of the portfolio if the market continues to advance; or, as a hedge if the market should reverse downward.

Sell out-of-the-money calls & puts (sell a strangle) ➔ **Rebalances position, creating long futures positions in bear market & short futures in bull market**

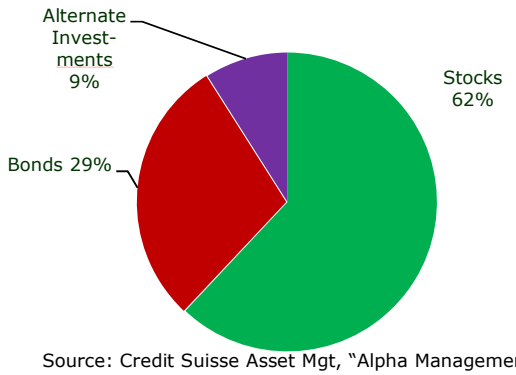
If stocks decline beyond the put option strike price, they may likewise be exercised, resulting in a long futures position. That long futures position serves as a proxy for the further purchase of equities.

Portable Alpha

"Portable alpha" investment strategies have become quite popular over the past decade. This technique distinguishes total portfolio returns by reference to an alpha and a beta component. The beta component of those returns is tied to a general market benchmark, *e.g.,* the S&P 500. Additional returns are generated by devoting a portion of one's assets to another more ambitious trading strategy intended to generate a superior return over the base or benchmark "beta" return.

Why has the market embraced portable alpha programs? Consider the traditional or typical asset allocation approach practiced by many pension fund managers. This process generally involves allocation of a specified proportion of one's assets to various asset classes, often facilitated by the employment of external asset managers. *E.g.,* it is quite common to allocate roughly 60% of one's assets to stocks, 30% to bonds and the residual 10% to alternate investments possibly including real estate, commodities and other items.

Typical Exposure of S&P 500 Defined Benefit Pension Fund



Source: Credit Suisse Asset Mgt, "Alpha Management Revolution or Evolution, A Portable Alpha Primer,"

While this approach is typical, it may nonetheless fail to generate returns in excess of benchmark returns. In particular, few asset managers are able consistently to outperform the market after considering management fees. If they did, their services would be in much demand and high management fees may detract from performance.

Portable alpha strategies are designed specifically in the hopes of achieving (alpha) returns in excess of the applicable benchmark (or beta) returns. Thus, there are two components of a portable alpha strategy: alpha and beta.

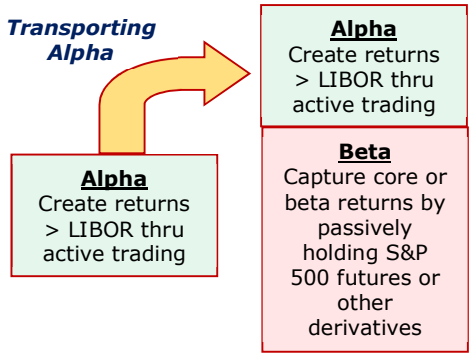
Beta is typically created with a passive buy-and-hold strategy using derivatives such as futures or over-the-counter swaps. Stock index futures have proven to be particularly useful vehicles for achieving those

beta returns in the context of a portable alpha program. Futures are traded on leverage, freeing a sizable portion of one's assets for application to an alpha generating strategy. Per our recurring theme, futures must offer efficient beta to serve their purpose, a point discussed in more detail below.

Buy-and-hold futures → **Replicate core or beta portfolio performance with cash management flexibility**

Alpha returns, in excess of prevailing short-term rates as often represented by LIBOR, are generated by applying some portion of one's capital to an active trading strategy. Common alpha generating strategies include tactical asset allocation or "overlay" programs that attempt to shift capital from less to more attractive investments; programs that attempt to generate attractive absolute returns such as hedge funds, commodity funds, real estate investment vehicles; and, traditional active management strategies within a particular asset class or sector of an asset class. Much of the growth in the hedge fund industry in recent years may be attributed to the pursuit of alpha.

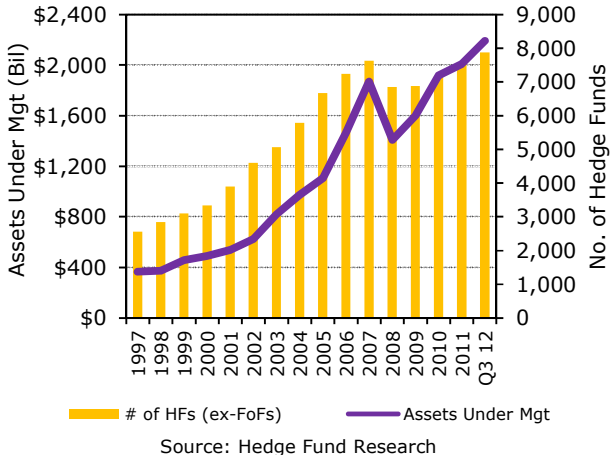
Portable Alpha Strategy



Of course, more active alpha generating strategies tend to require more trading skill. While they may generate attractive returns, they may also entail higher management fees. And still, it is difficult to find an investment strategy that consistently delivers attractive alpha and that is truly distinct from the benchmark class that forms the core beta returns.

As such, the major and most obvious risk associated with portable alpha strategies is the possibility that the alpha strategy fails to outperform LIBOR.

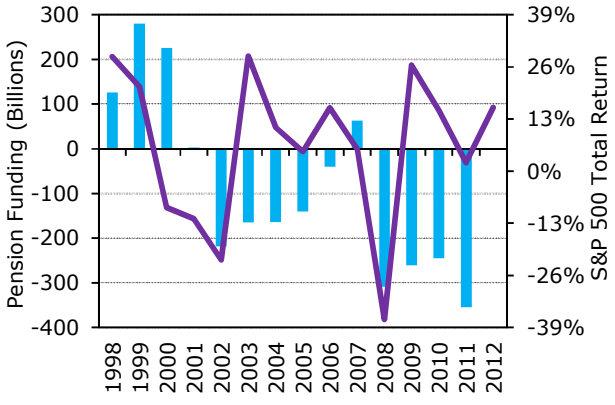
Size of Hedge Fund Industry



Source: Hedge Fund Research

Still, it is safe to conclude that the "search for alpha" will continue unabated in the future. This is apparent when one considers the significant pension funding gap, or the difference between pension fund assets and the present value of their future obligations. As of the conclusion of 2011, the gap faced by the corporate pension funds of the firms that comprise the S&P 500 stood at some $355 billion.

Pension Funding Gap vs. S&P 500



Source: Standard & Poor's

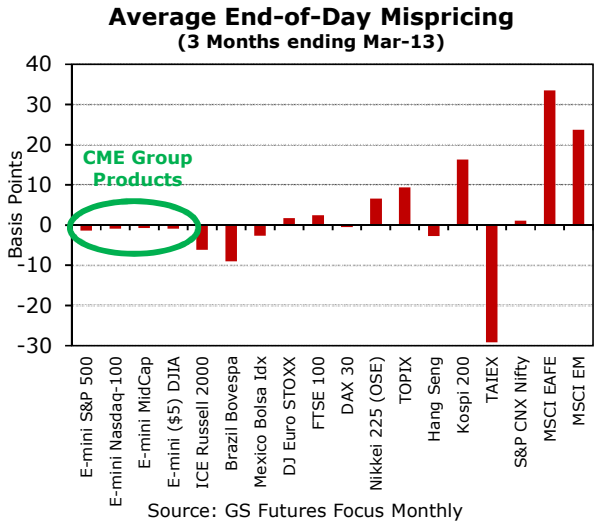
Delivering Efficient Beta

A recurring theme in this discussion is that stock index futures must deliver efficient beta, *i.e.,* low tracking error and low transaction costs, in order effectively to serve the purposes as outlined above.

Low tracking error means that the futures contract accurately and consistently reflects its "fair value." This is reflected in the end-of-day (EOD) mispricings or deviations between the futures settlement price and fair value as reflected in the spot index value adjusted by financing costs and anticipated dividends.

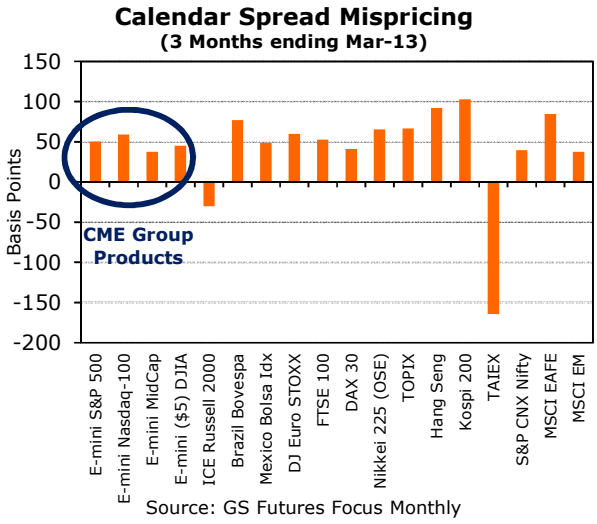
Note that CME Group utilizes an end-of-month fair value (FV) settlement procedure. This means that on the final day of each calendar month, the futures settlement prices for many CME Group domestic stock index futures are established by reference to its fair value.

The Exchange surveys broker-dealers for the applicable interest rate and anticipated present value of dividend flows and calculates the fair value of the futures contract. Thus, these CME Group stock index futures are forced to reflect fair value at the conclusion of each calendar month or accounting period. This practice has likely contributed significantly to the growth of the portable alpha fund business since 1998 when the practice was established.



A further means of measuring tracking error is by reference to the "roll" or the difference between prices prevailing between the current and deferred futures contract month. Portable alpha managers typically use stock index futures on a passive buy-and-hold basis. Thus, they establish a long position and maintain it consistently in proportion to their AUM. But they will roll the position forward, *i.e.,* sell the nearby, maturing contract in favor of buying a deferred contract, on a quarterly basis.

Independent research on the subject of end-of-day mispricing and mispricing inherent in the quarterly roll suggests that CME Group products are quite competitive relative to stock index futures offered elsewhere.



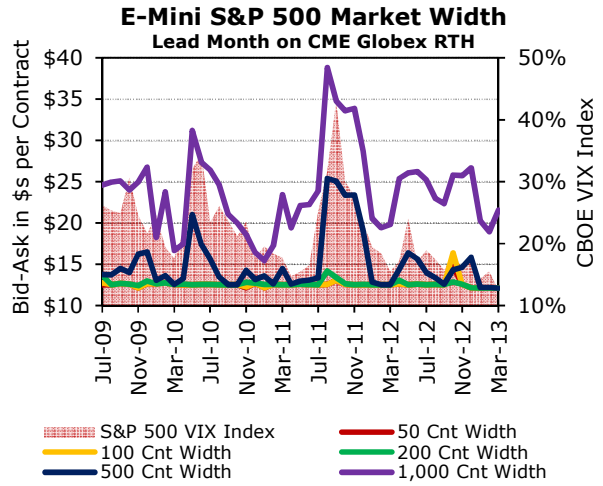
Transaction costs attendant to trading stock index futures may be comprised of various components including brokerage commissions and exchange fees. But the most significant of transaction costs is trading friction, aka execution skids or slippage, *i.e.,* the risk that the market is insufficiently liquid to execute commercial-scale transactions at fair prices.

Liquidity may be measured in many ways but two of the most common and practical methods are to monitor the width of the bid-ask spread; and, the depth of market.

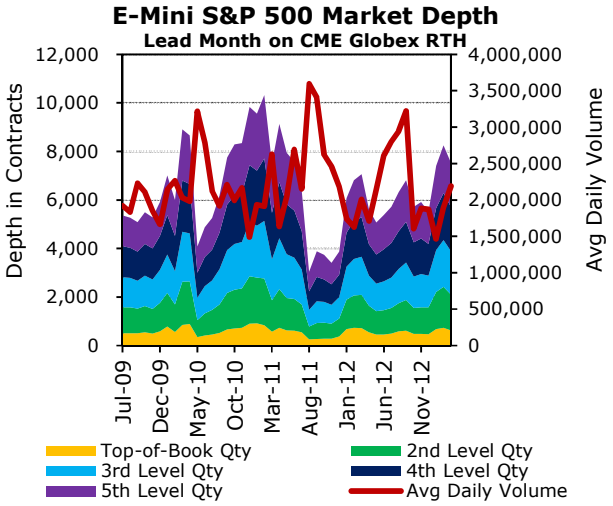
The width of the bid-ask spread simply refers to the average difference between the bid and the asking or offering price throughout any particular period. These figures may be based upon order sizes of stated quantities, *e.g.,* a 50-lot, a 100-lot order, etc. Liquidity is correlated closely with volatility.

The VIX or S&P 500 volatility index is a popular measure of volatility. The width of the bid-ask spread widened in late 2008 and early 2009 at the height of the so-called subprime mortgage crisis when the VIX advanced to 60%. Since then, market width has declined to levels barely over the

one minimum price fluctuation ($12.50) in E-mini S&P 500 futures for a 500-lot order.



Market depth is a reference to the number of resting orders in the central limit order book (CLOB). The CME Globex® electronic trading platform routinely disseminates information regarding market depth at the best bid-ask spread (the "top-of-book"), at the 2nd, 3rd, 4th and 5th best bid and asking prices as well. Liquidity as measured by market depth has increased significantly since the recent financial crisis.



Concluding Note

CME Group is committed to finding effective and practical risk-management solutions for equity asset managers in a dynamic economic environment. While the recent financial crisis has sent shivers through the investment community, it is noteworthy that CME Group's exchange traded futures and options on futures performed flawlessly throughout these trying times. Our products offer deep liquidity, unmatched financial integrity and innovative solutions to risk management issues.

Exhibit 1: Specifications of Popular Stock Index Futures Contracts

	E-mini S&P 500	E-mini Nasdaq 100	E-mini MidCap 400	E-mini ($5) DJIA
Contact multiplier	$50 × S&P 500 Index	$20 × Nasdaq 100 Index	$100 × S&P MidCap 400	$5 × Dow Jones Industrial Average
Minimum price fluctuation (tick)	0.25 index points ($12.50)	0.50 index points ($10.00)	0.10 index points ($10.00)	1.00 index points ($5.00)
Price limits	Limits at 7%, 13%, 20% moves			
Contract months	First five months in March quarterly cycle			First four months in March quarterly cycle
Trading hours	Mon–Thu: 5:00 PM (previous day) to 4:15 PM with trading halt between 3:15 PM and 3:30 PM			
Trading ends at	8:30 AM on third Friday of month			
Cash settlement	Vs. Special Opening Quotation (SOQ)			
Position limits or accountability	100,000 E-mini S&P contracts	50,000 E-mini NASDAQ contracts	25,000 E-mini MidCap contracts	100,000 E-mini DJIA contracts
Symbol	ES	NQ	EMD	YM

Exhibit 2: Quoting E-mini S&P 500 Futures
(As of 4/23/13)

Month	Open	High	Low	Settlement	Change	Volume	Open Interest
Jun-13	1,557.25	1,527.00	1,548.75	1,573.60	+17.70	2,108,113	2,984,052
Sep-13	1,550.25	1,570.50	1,543.00	1,567.60	+17.80	14,452	41,661
Dec-13	1,549.25	1,563.50	1,536.50A	1,561.10	+17.80	60	2,438
Mar-14	1,532.50	1,555.00B	1,530.25A	1,554.90	+17.80	10	27
Jun-14		1,544.25B	1,529.25A	1,547.90	+17.80		1
TOTAL						**2,122,635**	**3,028,179**

Exhibit 3: Pricing Popular Stock Index Futures
(As of 4/23/13)

	Contract Multiplier	Jun-13 Contract	Contract Value	Tick (Index Points)	$ Value of Tick
Standard S&P 500	$250 x	1,573.60	$393,400	0.10	$25.00
E-mini S&P 500	$50 x	1,573.60	$78,680	0.25	$12.50
E-mini Nasdaq 100	$20 x	2,823.00	$56,460	0.50	$10.00
E-mini S&P MidCap 400	$100 x	1,133.80	$113,380	0.10	$10.00
E-mini ($5) DJIA	$5 x	14,644	$73,220	1.00	$5.00