

# Life at Sharpe's end

**By demonstrating the sources of return and economic function of various alternative strategies, Hilary Till explains why standard performance measures may be misleading, and why it may not be a good idea to rely on diversification arguments in selling alternative investments**

If you saw that a well-known Commodity Trading Advisor (CTA) was in a Top 20 CTA table with returns of 44.1% during the year 2000, you would probably think that CTA did a great job for their investors, right? But what if that CTA's Sharpe ratio was also .19? (This is a real example.)

For futures programs, the meaning of rate-of-return numbers can be somewhat ambiguous, given that one does not need to set aside capital in the amount of a pro-

gram's funding level. Instead, an investor can fractionally fund an account using 'notional funding'.

For example, a futures program I am very familiar with requires an investor to set aside about 20% of equity for futures margin and as a loss reserve. (In other words, one needs to fund the CTA with \$20 for every \$100 made into the investment.) This program's year-over-year returns were 16.3%. If the program's returns were stated on the basis of the actual amount of capital needed to participate in the program, the year-over-year returns could be restated as 81.5% ( $= 16.3\% / .20$ ).

With the ability to leverage, a futures manager can arbitrarily restate returns to any number of levels. Therefore, in order to get a clearer picture of the liability assumed when investing in a futures program, many investors use the Sharpe ratio (excess return of the investment over the risk-free rate divided by its standard deviation) to evaluate a manager.

Given that a hedge fund manager typically aims for a Sharpe ratio of greater than 1.0, the CTA manager with a Sharpe ratio of .19 would do poorly under this criterion. And in fact, this manager's largest draw-down was fairly hefty, in the 30% arena.

But the Sharpe ratio has its own set of difficulties as a performance measure. In September 1996, after 31 months of operation, Long Term Capital Management (LTCM) reportedly had a Sharpe ratio of 4.35 (after fees). With the benefit of hindsight, we can say that LTCM's realised Sharpe ratio after two and a half years of operation did not give a meaningful indication of how to evaluate its investments.

In this article, I will touch upon the quantitative and modeling shortfalls of the Sharpe ratio and other related



### With the benefit of hindsight, we can say LTCM's Sharpe ratio after two and a half years of operation did not give a meaningful indication of how to evaluate its investments

Capital Asset Pricing Model (CAPM) measures used to evaluate alternative investments. These shortfalls can best be appreciated once one understands the common nature of how most alternative investment strategies earn their returns. And surprisingly, once one understands the source of a program's returns, even an investment with a Sharpe ratio of .19 could win a place in an investor's portfolio based on certain return-to-risk considerations.

A number of assumptions have to be made when accepting the use of various CAPM metrics. Under CAPM:

- (1) Investors choose portfolios according to a mean-variance framework; and
- (2) There is only one source of risk for which investors are rewarded, and that is market risk.

The Sharpe ratio results from accepting the first assumption. The use of the statistic, alpha, results from accepting the second assumption. Alpha is the excess return above and beyond taking on market risk. Under the theory, a manager can only earn a positive alpha if s/he has an ability to identify mispriced securities or to time the market.

The first assumption – that investors choose portfolios according to a mean-variance framework – produces difficulties when an investment strategy has highly asymmetric outcomes, as with option strategies. By using variance (or standard deviation) around the mean as the risk measure, one is assuming that investors are indifferent to direction of risk. In this case, investors are said to not have 'skewness' preference. But investors most certainly do have a preference for upside risk and an aversion to downside risk!

An investor can seem to 'outperform' under CAPM by accepting negatively skewed returns in exchange for improving the mean or variance of the investment. As a matter of fact, Hayne Leland of UC-Berkeley has shown that a strategy of selling fairly valued options can produce a positive alpha. Now of course it shouldn't, given that a positive alpha should only result from a manager having superior market information.

It should then be no surprise that a managed futures article from a year ago noted that option sellers scored high Sharpe ratios. The average Sharpe ratio for options traders in the Barclay CTA database was measured at 1.42 while the average Sharpe ratio for all CTAs in this database was .56.

To be fair, professional investment consultants do attempt to correct for the Sharpe ratio's lack of emphasis on downside risk, sometimes by using the Sortino ratio. This measure is defined as the incremental return over a minimum acceptable return (MAR) divided by the downside deviation below the MAR. In the downside deviation calculation, if an outcome has a value greater than the MAR, it gets a value of zero in this risk calculation. Only outcomes with values of less than the MAR are included in this risk measure.

The Sortino ratio also has its own set of problems, as pointed out by Frank Sortino himself (of the Pension Research Institute). The main problem is that it is usually calculated based on discrete data over a limited time-frame. Investment statistics calculated over limited time intervals are very unstable, making this ratio (and any other ratio based on discrete data) not very useful in making predictions for the future.

As James Grant has written in *Grant's Interest Rate Observer* Wall Street will take any new money-making strategy and drive it (and its returns) into the ground like a tomato stake. This tendency for a strategy's popularity to result in its distribution of returns changing dramatically is especially strong with alternative investment strategies, since their hallmark is the use of leverage. David Shaw of DE Shaw noted recently that the conditions of the fall of 1998, which led to the failure of LTCM and Shaw's own relative-value bond fund, had never happened before and therefore could not have been modeled (if one were solely relying on historical data to build one's models).

Sortino, in common with other authors, has recommended that one should derive a downside risk measure from estimations of the shape of uncertainty for an investment program, including its skewness in returns. He also has recommended re-scaling a specific investment manager's risk measure based on the risk of its investment style, for which longer term data would be available.

I would agree with the direction of Sortino's refinements, but they are very difficult to implement in practice. Basically, one would have to have a very strong theoretical understanding of an investment to successfully model its 'shape of uncertainty'.

The second assumption – that investors are rewarded only for assuming market risk – can produce performance metrics that create an illusion of superior manager skill (as in the option sellers example). Under

CAPM, an asset will earn a return greater than T-bills only if it tends to move up and down with the market. Any return unrelated to the market would be due to superior judgment or inside information. This excess return is known as alpha, as touched upon above.

The latest stream of thought by financial economists is that there are multiple sources of risk besides the market risk factor, which can produce high average returns. If an investor passively bears any of these risks, that investor will earn a return which is not conditioned upon superior information. Frequently, there may be large losses from bearing one of these risk factors, resulting in a short-option-like return distribution, but the returns over time are sufficient to make the activity profitable. These returns are called 'risk premia'.

In such instances it would be misleading to calculate the excess returns over the market return of such an activity and then call the results of this calculation 'alpha', which implies that the returns are due to manager skill in either market timing or in identifying mispriced securities.

Using the Sharpe ratio to evaluate risk-premia strategies will create the same type of problems as with measuring the risk-adjusted performance of short-option sellers. In investment activities where one earns a risk premium, an investor is implicitly short options and is therefore exposed to asymmetric payoffs. And as noted before, the CAPM measures are inappropriate for investments with highly skewed outcomes.

In the following section, I will give several examples of alternative investment strategies where it appears that the investor earns a risk premium. (John Cochrane of the University of Chicago originally collected some of these examples.)

### Relative-value bond funds

One could argue that a relative-value bond fund earns its returns by taking on the illiquid assets that international banks desire to lay off when in need of reducing risk. The fund hedges this risk by shorting liquid assets. A relative-value bond fund thereby provides a reinsurance function for financial institutions, but it also exposes the fund to liquidity crises. As a result, an examination of empirical data shows that relative-value bond funds have short-option-like returns. An investor in such funds assumes the risk of systemic financial distress and provides other investors with the flexibility of being able to readily liquidate their investments. A relative-value bond fund is in essence providing real options to other investors.

### Equity risk arbitrage

In this strategy, a merger candidate is bought by a hedge fund at a discount to where its intended buyer

Once one understands the source of returns, even an investment with a Sharpe ratio of .19 could win a place in a portfolio based on certain return-to-risk considerations

has announced it will pay for the company. An investor assumes the risk that a merger deal will fail. This strategy tends to earn consistent returns but sustains very large losses in the event that a deal is not consummated.

Historical analysis of merger arbitrage deals shows that this strategy's return is correlated to the overall market during severe market downturns, giving a return profile similar to short index put options.

A recent *Financial Times* article noted that professors Mark Mitchell of Harvard University and Todd Pulvino of Northwestern University have created an investable risk arbitrage index. This passive index, which will be run by AQR Capital Management, has matched the returns and risks of active risk arbitrage managers over a ten-year timeframe.

Given that it appears that one can earn the returns from this strategy in a passive manner and given that one is also assuming the risk of severe market downturns with this strategy, it appears that one is earning a risk premium by entering into this type of investment.

### Equity option market-making

Equity option market-makers are risk transfer agents for institutions that want to alter their risk profiles by buying option protection for their portfolios. Given the institutional demand for out-of-the-money options, implied volatilities for these options are typically higher than nearer at-the-money options. Using this valuation mismatch, market-makers are able to create hedged portfolios of options where they are short the relatively overvalued options against other options which are not in as much demand. The consistently successful market makers appear to earn a return for providing 'catastrophe insurance' to institutions.

### Value vs growth equity strategy

One market anomaly identified by Barr Rosenberg and others in the 1980s was that one could earn returns beyond that predicted by CAPM by investing in stocks that have high book-value-to-price ratios. This strategy has historically had twice the Sharpe ratio of the overall

### A consequence of understanding strategies as being inherently short event risk is to reassess their role as diversifiers for conventional stock-and-bond portfolios

market. An interesting argument by Eugene Fama and Kenneth French of the University of Chicago a decade later was that an investor pursuing this strategy is actually providing recession insurance to other investors.

The idea is that investors have larger economic worries than just the performance of their investment portfolios. The main source of income is from their jobs. In the event of a recession, individuals whose jobs are at risk would not want their portfolios to be particularly at risk to the business cycle. This means avoiding stocks of companies that could be threatened with bankruptcy. One indication of a weak company is one in which its price-to-book ratio is low.

An investor who systematically buys stocks based on 'value' considerations such as a low price-to-book ratio and sells stocks based on 'growth' considerations would be taking on the business cycle risk that most other investors desire to avoid.

So, rather than saying that this strategy provides a positive alpha, one might include a recession-risk factor in a model of asset-class returns and note that the strategy's returns result from exposure to this risk factor.

#### High-yield currency investing

In this strategy, one invests in currencies with relatively high interest rates and funds this purchase in a currency with relatively low interest rates. On average this kind of strategy has proven profitable; the forward rate of currencies is not predictive of where future currency spot rates will be. One could argue, particularly in cases where a currency pair has an extreme interest-rate differential, that one is taking on devaluation risk with this strategy. This devaluation risk increases with global financial panics. This strategy definitely has a short-option-type payoff profile.

Other trades, such as embedded fear premium in commodities futures prices, Weather fear premia in futures markets also embed options risk.

#### Implications

We note then that a number of diverse alternative investment strategies appear to earn their returns due to assuming risk positions in a risk-averse financial world, rather than from inefficiencies in the marketplace.

A risk-premia strategy's 'excess' returns are in effect due to being short options. This is the opposite indicator of manager skill: one way to measure manager skill at market timing is if the manager's strategy produces a return profile similar to being long free put options.

One problem for the risk and performance measurement of risk-premia-type strategies is that while one may be earning a return due to the assumption of a catastrophic risk, an empirical measure may not show this if the Big Event has not occurred yet. Therefore, we are left trying to understand why an investment has been allowed to earn returns consistently. If we believe this is due to the assumption of event risk, we will need to handicap any performance measurement that shows a mind-boggling, empirical return-to-risk metric.

A major consequence of our understanding of a number of alternative investment strategies as being inherently short event risk is to reassess their role as diversifiers for conventional stock-and-bond portfolios. The nature of correlation changes dramatically during eventful times. In the fall of 1998, for example, the correlation of market-neutral hedge funds to broad markets approached 1.0. Therefore, one should probably not rely on diversification arguments in advocating hedge-fund investments. Instead, one should probably note whether an investor is particularly well paid for assuming a fund's risks and also decide whether an investor is in a unique position to assume risks that others wish to lay off (or not take on).

We can now return to the original example of the CTA with a Sharpe ratio of .19. In this example, the CTA's investment process benefits from large structural shifts, since the firm is a systematic trend-follower. During the fall of 1998, this CTA stood out with its double-digit returns. Once we define risk as exposure to infrequent, extreme financial distress, we can see that a CTA with a Sharpe ratio of .19 could be preferable to a hedge fund with a Sharpe ratio of 4.35 based on an event-risk-adjusted return metric.



In the October issue Hilary will offer some solutions to the problems she has indicated above. Hilary Till is a principal of Premia Capital Management.