The Asymmetry of Beta
or why Beta can be different in bull and bear markets

by IMCZ Member John Henry Smith

From time immemorial we have sought to reduce future uncertainty, often with dubious means such as astrology, crystal balls, tarot cards, and even tea leaves. In contrast to this 'hocus-pocus', the world of modern finance prefers statistical concepts and models as a means of rationally predicting future capital market prices! Here such abstract quantifications of reality attempt to measure the inherent risks, the most volatile of all being those of the stock markets.

The recent turmoil in these markets triggered after October 9, 2007 by the U.S. 'credit crunch' broke the back of the 5 year bull market and triggered serious discussion as to the soundness of risk and econometric models, since none had signalled the gathering threats of recession and the rapid slip into the bear market. This inability of risk metrics to protect shareholder equity under situations of abrupt discontinuity begs the simple question of whether historic data can fore-warn markets to enable appropriate adjustments in portfolios.

What is Beta?

Beta (β) is a measure of volatility, or systematic risk, of a security or portfolio in comparison to the market as a whole (most people us the S&P 500 index to represent the market).
Beta is also a measure of the covariance of a stock with the market. It is calculated using regression analysis.
- A beta of 1 indicates that the security's price will move with the market.
- A beta greater than 1 indicates that the security's price will be more volatile than the market.
- A beta less than 1 means that it will be less volatile than the market.
You can think of beta as the tendency of a security's returns to respond to swings in the market. For example, if a stock's beta is 1.2 it's theoretically 20% more volatile than the market.

Modern portfolio theory has taught us that diversification can lower specific-stock related risks by up to two-thirds, leaving the remaining one-third as undiversifiable market risk, thus largely immunizing a portfolio against the broad swings of the economic cycle. However, the recent economic crisis has clearly shown that a high percentage of asset prices did not behave as expected when primary trends reversed direction, thus exposing some asset classes to huge losses. A major pitfall of financial risk models is their inescapable reliance on historical data that may be collated over a period of up to 5 years; a period that today covers the 'once was' bull market! This discontinuity has caused the dominant sentiment of greed to be replaced by the prevailing one of fear. Consequently, price actions, being subjected to different concerns, increased in volatility and immediately impacted core measurements such as price averages and standard deviation values. The end effect is that the data that conventional wisdom uses in risk management systems, such as standard beta calculations, is no longer that meaningful because it does not wholly incorporate the new values of the paradigm shift; thus seriously undermining the certainty of any risk/reward trade-offs and leading to overreactions.

Evidence of this incapacity to take proper account of discontinuity can be seen from this histogram that shows some very significant variances between prices expected by standard beta values and actual market prices from July 19, 2007 to December 31, 2008 inclusive.

Standard Beta - Actual vs Expected
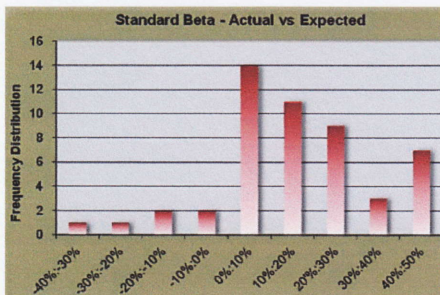
For the purposes of measurement, the SP 500 was used, which has fallen 42% over the period. In the sample of 50 stocks:

- Only 16 stocks or 32% range between -6.3% and +9.9% of their expected beta prices.
- 30 stocks or 60% outperformed their expected beta prices with a dispersion of +10.3% to +48.9%.
- 4 stocks or 8% underperformed their expected beta prices with a dispersion of -10.4% to -36.7%.

Remarkable is that the combined variances of over and under-performing stocks means that 34 stocks or 68% produced prices that had no relation to the forecasted beta values with performance weighted better than expected, as shown in sub-para. 2. The following table shows the significance of these results as they relate to the stocks at both ends of the histogram:

Stock/Index	Symbol	Price Jul 19 2007	Price Dec 31 2008	Actual % Price Change	Standard Beta Value	Expected % Price Change
SP 500		1553.08	903.25	-41.8%		
Woodward Governor Co	WGOV	32.41	23.02	-29.0%	1.86	-77.8%
Gilead Sciences Inc	GILD	40.42	51.14	+26.5%	0.53	-22.2%
Atheros Comms Inc	ATHR	33.87	14.31	-57.8%	2.50	-104.6%
CME Group Inc	CME	572.00	208.11	-63.6%	1.17	-49.0%
Encore Wire Corp	WIRE	30.67	18.86	-38.2%	0.37	-15.5%
Chemed Corp	CHE	67.77	39.77	-41.3%	0.11	-4.6%

Any changes in beta values depend not only on prevailing market trends, but also on how a stock weathers the specific factors impacting it. The first three stocks given in the table clearly have stronger business models than beta predicts and have generated greater accumulation in the face of the current market decline, whereas the last three suffered severe distribution, again for company-specific reasons. Either way, standard beta was not able to reflect these aggressive price changes, because they only form part of its total range of calculations.

In his article in the Financial Times dated March 17, 2008 entitled, *"We will never have a perfect model of risk"* Alan Greenspan, ex-chairman of the U.S. Federal Reserve Board and author of "The Age of Turbulence: Adventures in a New World" wrote:

"If we could adequately model each phase of the cycle separately and divine the signals that tell us when the shift in regimes is about to occur, risk management systems would be improved significantly. One difficult problem is that much of the dubious financial-market behaviour that chronically emerges during the expansion phase is the result not of ignorance of badly under-priced risk, but of the concern that unless firms participate in a current euphoria, they will irretrievably lose market share."

Mr. Greenspan's phrase 'divine the signals....' is disturbing if only because it is uncomfortably close to the dubious means mentioned at the beginning of this article. However, I'm sure he meant that more realistic models are needed to understand and manage new hybrids of risk that fast-moving capital markets often beget. In this context, clearly for me, the standard beta model is dead on its feet, along with those models that use its values, such as the Capital Asset Pricing Model (CAPM), at least for the stock market!

To deliver reliable and actionable value-at-risk metrics for the evolving market paradigm, out-of-date models either need to be suitably modified or abandoned altogether. For example, financial risk systems need take into account much shorter time frames in the same way that companies issue ever shorter financial forecasts. Furthermore, they must have the capability to model the manifold stock specific risks in order to identify and contain the worst effects of discontinuity and illiquidity. In the current credit crisis, the shares of cash-rich, debt-free corporations fell in unison with the debt-wracked ones, wiping out many of the benefits of portfolio diversification. Is it just wishful thinking that one day we will reach these goals?

Perhaps, for it could be that on reflection the wise owl Mr. Greenspan knows that the market will never have the perfect risk model, since in the final analysis the financial world is just too complex and fast-moving to make realistic mathematical abstractions of it; unless, of course, it has the help of some kind of alchemy!