

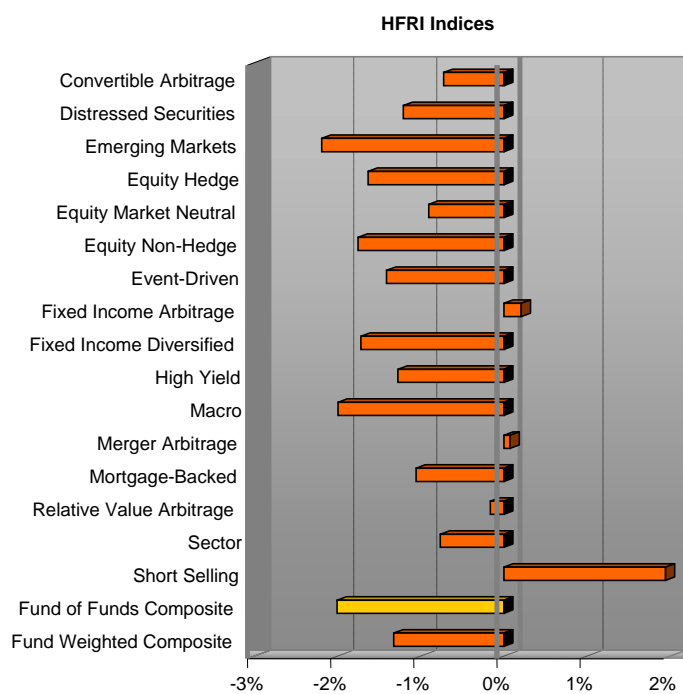
The Systemic Crises in Hedge Funds

What happened in August and how to avert a repeat

Do you need a risk system that only works when you're not at risk?

In August 2007, following the end of the spring sub-prime crisis, funds of hedge funds reported, on average, about 2 sigma losses while several specific strategies – for example, equity market neutral, convertible arbitrage, emerging markets and high yield credit – reported an average loss above one sigma. In August, supposedly uncorrelated investment vehicles suddenly performed in the same, bad direction.

It appears that a number of funds, perhaps because they were following similar trading signals, unwound their positions at the market bottom point in mid-August and could not take advantage of the following rise. While the market was falling, the most leveraged managers sold out and, then, due to a massive domino effect, more of them sold their holdings, creating a liquidity crisis, even in the most liquid assets.



Should we throw away the baby with the bath water and distrust *every* quantitative model because *some* models (if not *a* model), though widely used, failed? The answer is certainly no!

The first flaw is simply the misuse of risk models. It is common sense that, if trading signals are produced by the *same* system that is used for risk assessment, then the model can be fooled by itself. What occurred in August is a typical example: risk models assumed some securities were more liquid than others. When the level of risk rose between mid-July and mid-August owing to market moves, trading systems used by hedge fund managers recommended that the most liquid positions be sold. This rush, in turn, caused illiquidity in many of these assets, otherwise highly liquid.

The second flaw of failing models is their oversimplicity. Typical, traditional models use a fixed set of factors – usually reduced to avoid spurious results – and decompose holdings or investments onto these factors, leaving a residual term, called “*specific risk*” or “*alpha*.” When aggregating risks at the portfolio level, specific risks, which are off-

model risks, are by default assumed independent – i.e. with zero correlation. In a systemic crisis like that which occurred in August, such specific risks were suddenly highly correlated and their investors fell into a *diversification trap*.

At the manager level, correctly estimating specific risk requires models that take into account a sufficient enough number of factors to properly account for the particular risks of one’s typical positions, including spreads and arbitrages. Models with anywhere between 10 and 30 factors are valid for long only portfolios, but miss the point with alternative investments because of the variety of their complex positions.

Stress tests, which often consist of pulling up and down risk factors from the risk model, also fail to properly estimate potential losses under realistic scenarios if the model is too poor or too rigid. For instance, shocking *all* major stock indices as well as stocks up or down as much as 20% is a scenario that sees no risk in a pure, market neutral long-short position, since long and short positions balance each other out. At variance, stressing just the S&P 500 up and down by the same amount, and letting individual stocks and other indices randomly move with respect to these two shocks, produces realistic scenarios with portfolio impacts that resemble true stories. For a faithful risk representation, the stress scenarios may

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involve major spread bets of the position, with stress values that are in line with the true volatility of the said spreads. Remember that a sincere risk report is the best protection against redemptions when bad months occur.

At the investor level, the question becomes more difficult because of the necessity to aggregate risks in the *portfolio* of funds. One first needs to get sufficient information in managers’ risk reports so that their diversification can be assessed not only in normal market conditions, but also when an extreme event occurs. Let us examine the case of an investor who

receives from his long-short equity managers figures of sector exposures as well as some stress scenarios related to shocks on major indices, such as the S&P 500, NASDAQ, or even spreads between small caps and large caps or growth and value indices. He also receives from his fixed income managers key rate durations, PVOI on credit spreads (say BAA) and break-downs of the portfolio by ratings and industries. At the aggregated level, equity stress tests are blind on the fixed income part and, conversely, yield curve and credit spread shifts do not impact equity positions. In

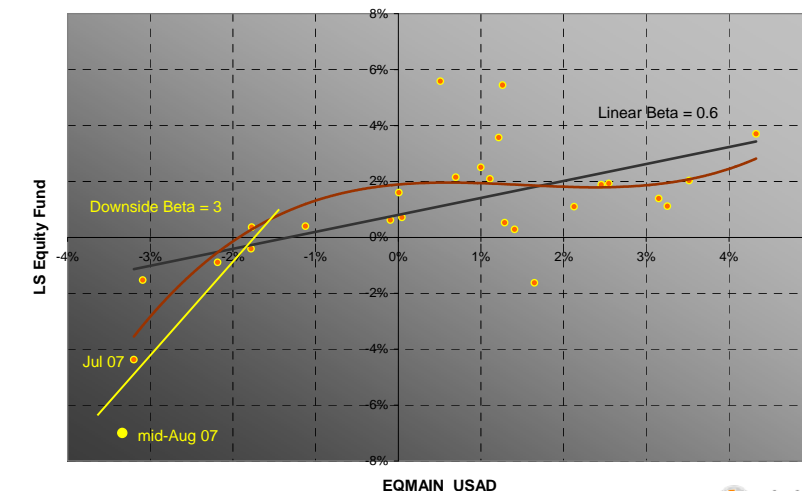
reality, like this summer’s crisis, some sectors start dropping and, then, by a domino effect, credit spreads jump and, finally, the S&P 500 drops in its turn. As we can see, major events in fixed income and equity markets tend to occur at the same time. This is why equity managers should produce *realistic* stress tests also on fixed income factors, which take into account cross-asset class correlations and, likewise, fixed income managers should estimate the impact on their portfolios of equity stress scenarios. In two words, risk models that are specific to one particular asset class are suitable to estimate the pure risk level of managers in this class, but don’t allow aggregation with managers trading other asset classes because they don’t provide enough information to truly estimate diversification across managers.

Large performance drops in the portfolios of hedge funds are more often due to a *joint* down move – even not so important – of individual funds, than to the blow-up of one particular fund, such as Amaranth. Remember, in August, funds of funds lost on average about 2.5%, whereas a fund of fund that was 2% invested in Amaranth (a typical exposure), would have lost only $2\% \times 60\% = 1.2\%$, half of the above. Anticipating the sudden – and seemingly unexpected – combined drop of a large number of funds is a task that cannot just rely on risk reports produced by managers themselves, whatever their accuracy and sincerity. Investors should have their own oversight on the portfolio.

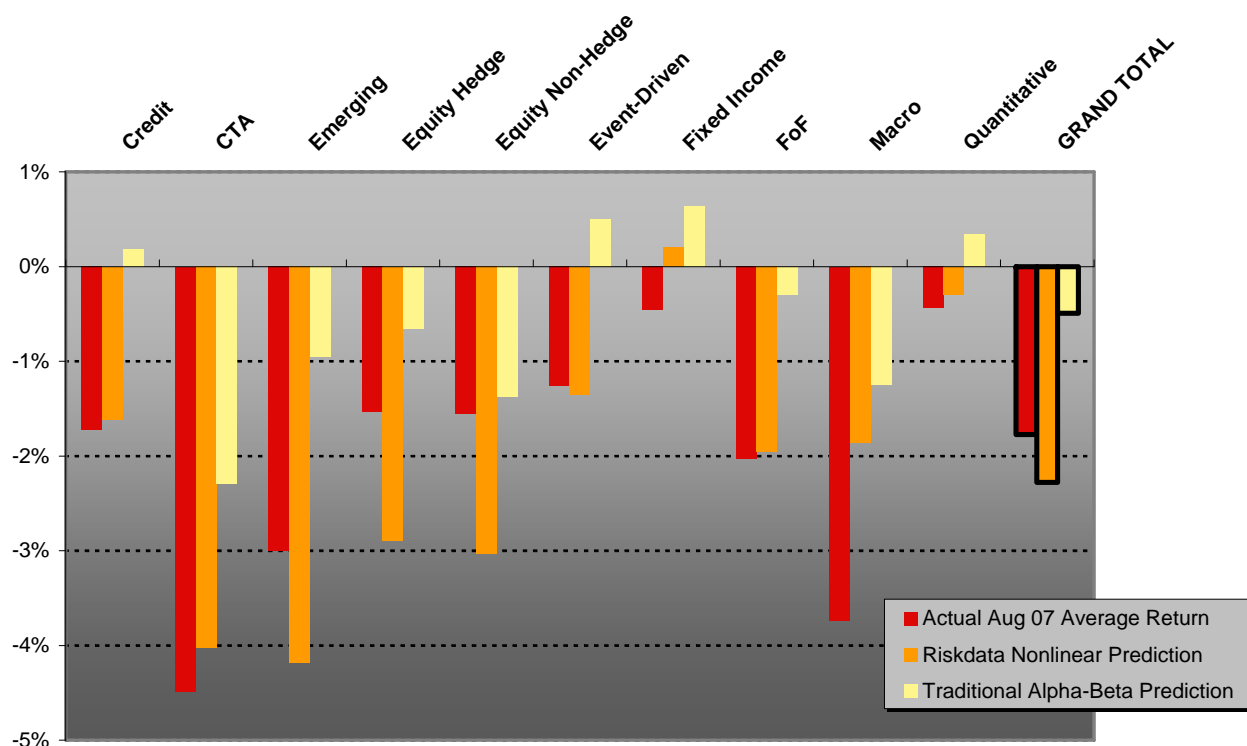
Traditional models usually neglect *correlation breaks*. At best, they would consider them as an unpredictable event and stress correlations independently of other factors. It is well known, however, that correlation breaks occur in quite a systematic manner – whether they are between funds and underlying market factors, or among funds themselves. In market turmoil, when liquidity dries up, correlations reach unusually high levels, for the following reason. Many managers have identified some specific market inefficiencies, which differ from one another, and that they can safely arbitrage as long as markets behave “normally.” But, when the storm is coming, their assumptions are no longer valid and arbitrages become traps from which they cannot escape without applying damaging stop-losses. This paradigm produces typical *option-like* behaviors, such as *short-put* risk profiles, where “alpha” is only generated when markets are quiet. Upon a strong downturn, the beta dramatically increases – like a put entering the money – and the fund displays significant losses. The picture above shows a real example of a quantitative long-short equity fund, purely invested in liquid, US stocks. The graph is the scatter plot of the fund returns vs. Riskdata’s FOFiX[®] US main equity factor.

The picture below shows the difference in risk anticipation when using traditional “alpha-beta” models with frozen correlations versus nonlinear models, which incorporate hedge funds’ option-like behavior. Risk anticipations were computed for every fund in a database of more than 7,000 as of the end of July using both a traditional 10 factor model and the Riskdata nonlinear model. Then, the average obtained with each model according to each fund strategy is compared to

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the actual average return of the funds in August. It is apparent from these results that the traditional model fails to predict the crisis whereas the nonlinear approach anticipates it.



In average, Riskdata predicted August result within 28% accuracy, whereas the alpha-beta methodology missed more than 70% of losses.

The conclusions of this study can be summarized with a few recommendations for the proper quantitative risk models:

At the manager's level:

- Monitor risk with a model that is independent from the quantitative model used for trading and use a sufficient number of factors to properly model alpha risk.
- Risk reporting should be taken seriously. For the manager, this is the best protection against redemptions on bad months, since investors won't take the downturn as a nasty surprise.

At the investor's level:

- Require from your managers risk reports that can be aggregated for your portfolio.
- Have your own oversight on hedge funds risk and do not solely rely on managers' reports. Use a solution that models correlation breaks and aggregates the analysis across all managers.
- Use risk models that can anticipate the impact of regime changes due to liquidity issues and dynamic trading strategies. Think of correlations in extreme conditions. These extreme correlations may strongly differ from those in normal conditions

About Riskdata

Riskdata is the leading provider of expert risk management solutions developed specifically for the global alternative investment community. Riskdata's comprehensive solutions enable investment managers to proactively manage and control credit and market risk while mitigating systemic and model risk through an independent, efficient and objective approach.

About the writer

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Raphael Douady is one of the founders of Riskdata, the market-leading provider of risk management tools for investors, asset managers, hedge funds and funds of funds. With more than ten years of experience in the banking industry (risk management, option models, trading strategies) and twenty years of research in pure and applied mathematics, Dr. Douady is renowned for his highly sophisticated quantitative solutions and statistical analysis. He created and organized the New York University Seminar of Mathematical Finance.