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Are Hedge Fund investors sitting on a volcano?

Executive summary

- The Subprime Crisis impacted alternative investments from July 07 to March 08, mainly through "time bomb explosions", i.e a massive draw down on hedge fund managers, with apparently nothing in their track records prior to June 2007 that could have suggested any potential high risk.
- Using a return based risk model, an investor who in June would have only accepted to invest on Hedge Funds exhibiting "normal" risk patterns would have slightly over-performed during the crisis compared to an iso-weighted benchmark. This results from an effective elimination of extreme risk takers, but the benefit of this elimination is widely offset by the fact that it also eliminates successful risk takers, and completely fails in detecting time bombs.
- Using a non-linear factor-based model, such as the one provided by Riskdata, an investor who in June would have rejected any potential "time bomb", detected by comparing past draw downs with predicted ones (using the factor model), would have over performed versus the benchmark by 4%. This is due to a significant reduction of time bombs, while keeping successful risk takers in the portfolio.
- This demonstrates that pure return-based models – even if sophisticated - are insufficient to support sound risk budgeting. They help reduce the level of risk, but do not reduce the "hidden" risk neither do they help select the "good" risk. This can be successfully achieved with an efficient non-linear factor-based model, which is the only approach that can help discriminate between the "lucky" managers and the "talented" ones.

Data used for the study

Materials of the study: 3216 Hedge Funds and Fund of Hedge Funds, reporting their returns to Hedge Funds Research database; as of April 14th 2008, with a track record covering at least the period December 2004 up to January 2008, download and analysed using FOFIX Active. For each manager, we computed:
Ex Ante i.e using performances as known at the end of June 07:
- Statistics of the time series: volatility, max Draw Down, skew, kurtosis etc…
- Expected 99% worst case (worst of the extreme betas), as that could be derived applying the non-linear factor-model of Riskdata on their performances.

Ex Post i.e analyzing their track record from July 2007 up to March 2008:
- Observed Max Draw Down during the period.
- Average Performance over the period.

Our benchmark portfolio is iso-weighted on these 3216 funds. The composition of this benchmark is the following:

Strategy	#Funds
Relative Value Arbitrage	278
Distressed Securities	82
Event-Driven	177
Fund of Funds	1095
Convertible Arbitrage	68
Macro	164
Sector	115
Emerging Markets	134
Managed Futures	190
Short Selling	10
Fixed Income	177
LS Equity	726
Grand Total	3216

A crisis driven by "Time bombs" explosion

- Ex Post, we can classify our benchmark portfolio in 3 groups:

Ex Post Classification	#Funds	%Funds	Average of Perf June to March	Perf Attribution
A	389	12%	8.7%	1.0%
B	2098	65%	1.7%	1.1%
C	729	23%	-9.4%	-2.1%
Grand Total	3216	100%	0.0%	0.0%

- A are the funds for which the crisis period was "business as usual", i.e they did not experience a drawn down higher than twice their volatility prior to the period.
- B are the ones that experienced very high draw downs (more than 2.3x their volatility), but stayed pretty much in line with what they experienced prior to the crisis in term of extreme risk (the June to February draw down was less than the max draw down experienced prior to June). **In other words, an investor had no reason to be surprised by their behaviour during the crisis**.
- C are the ones that experienced very high draw downs not only compared to their volatility (more than 2.3x) but also compared to prior max draw downs (more than 2x past draw down). **In other words, nothing in their track record could have alerted an investor of such a high level of losses**.

This classification demonstrates that this crisis has been driven by the "Time Bombs" explosion: for an investor equally invested across all the funds, they contribute negatively by 2.1%, offsetting the 2% contribution of the good performers.

Unsurprisingly, the highest proportion of "time bombs" are within credit related strategies: fixed income, distressed, even driven. However, one also finds a significant proportion of time bombs among equity related relative value strategies. On the other side, there are no time bombs within short selling, and a small proportion among managed futures.

Fund	Proportion of exploded time bombs (C category) within the strategy	Average Performance of C Funds	Loss Attribution in the benchmark
Fixed Income	45%	-14.2%	16%
Distressed Securities	40%	-12.3%	6%
Event-Driven	36%	-9.2%	8%
Relative Value Arbitrage	33%	-7.0%	9%
LS Equity	22%	-14.5%	33%
Fund of Funds	21%	-5.1%	17%
Convertible Arbitrage	16%	-12.5%	2%
Macro	14%	-7.5%	3%
Sector	12%	-18.1%	4%
Emerging Markets	12%	-3.3%	1%
Managed Futures	4%	-4.0%	0%
Short Selling	0%		0%
Grand Total	23%	-9.4%	100%

The critical question for any investor is to know if it is possible to detect such time bombs prior their explosion. In other words, are they simply hiding their risks (like for sub prime) – and in that case this 23% of exploded time bombs are a signal that investors may sit on a volcano – or is the information simply somewhere here, and in that case could an investor using this information correctly stay away from these time bombs?

Return based analysis doesn't help to stay away from Time Bombs

Let us imagine that you are an investor in June 2007, with 1 b$ to invest in alternative investments. A maximum diversification approach, iso-allocating on all the managers, leads to lose 1M$ over the period. Was it possible at that time, using pure quantitative techniques to analyse the returns distribution of the funds, to stay away from the future losers, and detect the future winners – resulting in making money?

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In order to do this, the natural approach is to stay away from the funds that have an abnormal return distribution as observed in June 2007, i.e any fund that has a high extreme risk compared to its "business as usual" risk (using of course the actual distribution or sophisticated distribution modeling, rather than a simple normal model).

An investor using this approach would have some reason to be happy using such a return based approach: investing equally on all funds flagged "yes" (i.e with *ex ante* a good distribution), he would have then benefited from a small positive performance (4 millions $) over the period, instead of flat performance if equally invested on all funds:

	Weight on return based selection	Average Performance on return based selection	Attribution of relative Perf to Benchmark
A	36%	8.7%	2.1%
B	24%	-0.9%	-1.3%
C	40%	-6.2%	-0.3%
Total	100%	0.4%	0.4%

This apparently promising result is obtained by increasing the proportion of "A" Manager, but it is unfortunately offset by the fact that it eliminates most of the extreme risk takers – including the good ones (elimination of the B category), while doubling the proportion of time bombs (increase average loss in C category).

While non linear factor analysis helps to reduce significantly the proportion of time bombs, IT ALSO BOOSTS returns in a spectacular way

Our investor can also choose to use a "non-linear factor-model", as the one proposed by Riskdata, to try to detect time bombs. It relies on the following hypothesis: a significant part of the time bombs are simply lucky managers. They are exposed to factors which happen to have low volatility during the period of analysis. A good example is illustrated by the chart below: this is a hedge fund exposed to the credit spread. In black, its track record prior to June: high returns, low volatility, low extreme risk – a typical good candidate for a return based selection. In red, its performances after June 2007. In grey, the spread between government and investment grade bonds: it simply happens that the period 2003 – June 2007 was exceptional in the life of this spread, compare to before and after… This manager is simply lucky!
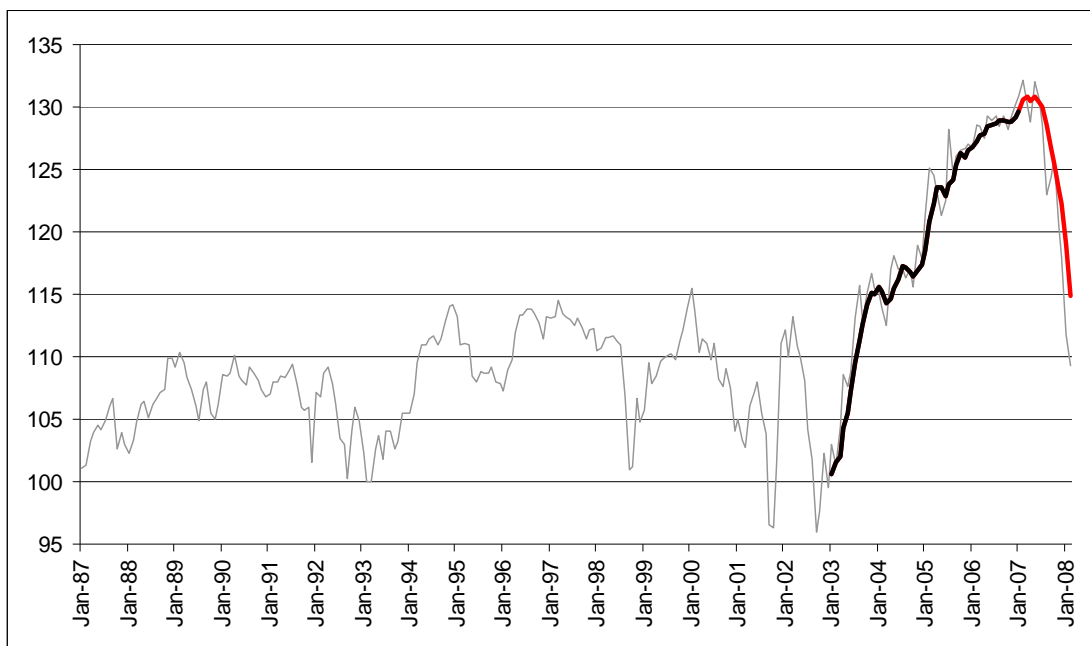
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This example gives us a way to detect such time bombs: they are the ones whose predicted risk, based on the long term risk of their underlying factors, is significantly higher than the observed max draw down. We use this simple criterion – eliminate any funds for which *predicted* extreme risk (using all factor history) is more than twice the observed past max draw down or 2.3 time the volatility. Results are simply spectacular:

	Weight on non linear factor based selection	Average Performance on factor based selection	Attribution of relative Perf to Benchmark
A	21%	10.5%	1.1%
B	58%	6.1%	2.5%
C	21%	-8.0%	0.5%
Total	100%	4.0%	4.0%

Our investor, choosing this approach, would have made a profit of 40 millions $ over the period, 10 x what can be achieved using the return based approach

The main reason is that this approach successfully helps to reduce the proportion of time bombs (C category), while increasing the number of "A" funds, *without eliminating good risk takers* (B category).

Are the factors selected relevant? The crystal ball test

The ultimate test to ensure that the factors selected and used in the previous model is to look at the performance of an investor who has a crystal ball on the markets: he perfectly anticipates markets behavior between July and March, and therefore selects only the hedge funds for which no losses are predicted by the factor models over the period. In that case, we get a spectacular confirmation of the relevance of the factor selected: an investor who has a crystal ball on the markets, and using the factor model to reject the predicted loser would over perform by 5.4% the benchmark.

	Weight on crystal based selection	Average Performance on return based selection	Attribution of relative Perf to Benchmark
A	31%	11.5%	2.5%
B	50%	5.5%	1.6%
C	19%	-4.5%	1.3%
Total	100%	5.4%	5.4%

Conclusion

Hedge fund investors are not sitting on a volcano, if and only if they are use tools which make risk transparent. Risk transparency simply means avoiding nasty surprises.

Simply analyzing returns, even in the most sophisticated way, does not help make risk more transparent. A risk system brings true value is by revealing and quantifying the so-called "hidden risks" or "time bombs".

In previous studies, Riskdata has highlighted non linearity (ie changes in correlation) and return smoothing as two sources of hidden risks which can be uncovered with appropriate methods. This study demonstrated that the time bomb effect is also a critical source of hidden risk, particularly in a period of low volatility as the one experienced between 2003 and 2007. Time bombs appear in any bubble because people tend to focus on short-term trends while losing memory of what may happen when the markets come back to earth. Factor analysis is the only way to re-introduce long-term memory.

Finally, this study confirms that a good risk system is not a cost, but should be viewed as a investment with a potentially very high ROI. For an investment expressed in hundreds of thousands dollars in June 2007, our investor would have earned back $40 million nine months later: therefore, who did better in the market?