

Amundi Alternative Investments

Alternative Insights

2007-2011: hedge funds tested by a protean crisis

The financial crisis of summer 2007 seems far from finished. After the American subprime crisis, the result of enormous loans being taken out by not very solvent American households later found in so-called risk-free portfolios, we are now faced with new subprime crises of the sovereign kind. What was initially a financial crisis is now turning into a political and social crisis. How have hedge funds fared in this difficult context? Often held responsible for the jolts associated with a protean crisis, victims of their own success but also of their lack of transparency, we think it is worthwhile to study how this industry has endured the economic crisis. We will decipher this new volatile and uncertain financial environment and the impact on hedge fund performance. By taking a critical look at sources of performance since 2007, we will see that the industry has learned some lessons from the crisis and has certainly changed its standards by successfully adapting to the new financial environment.

Editorial



Scapegoats of the political classes and of public opinion at the very height of the 2008 banking crisis before being cleared by academic research, hedge funds – speculative or cover funds - have begun to update themselves.*

Under legitimate pressure from regulators and investors, the industry is moving towards more regulation, transparency and liquidity.

Nevertheless, while this (r)evolution was necessary, even so it does not make alternative strategies attractive. For, in the end, it is very much the risk/return trade-off that an asset class or management philosophy is likely to offer which makes institutional investors and financial distributors consider whether or not to make an investment.

Analysing hedge fund performance is difficult and one could even question whether it is appropriate to consider alternative management as a homogeneous whole. In fact, the hedge funds industry is characterised by its heterogeneousness and the disparity of performance between strategies. What do an interest rate arbitrage fund and a long/short equity fund actually have in common in terms of the risk/return trade-off?

And yet whereas nobody evaluates the performance of traditional or long only asset management as a whole, instead making a distinction according to the different asset classes, many people tend to judge the performance of alternative management as an indiscriminate whole, sometimes deeming it satisfactory, sometimes disappointing.

The common denominator of all the alternative strategies is their approach: absolute performance, non-benchmark management, using leverage more often than not. On the other hand, the instruments traded, risk budgets and performance targets vary considerably from one strategy to the next. It is, therefore,

important to adopt a more granular approach no longer considering alternative management as a single strategy but rather a number of different alternative managements, meeting different risk/return trade-off targets within the investor's overall portfolio.

In order to gain clarity, we asked Pierre Clauss, an independent teacher-cum-researcher, to carry out an in-depth analysis of hedge fund performance since 2008, and to identify the sources of said performance so that you can form your own opinion about the attractiveness of the asset class.

In order to do this, Pierre Clauss developed proprietary models, the conclusions of which shed an interesting light on the industry's performance during the last few years in the context of troubled markets where all investors are looking for diversification and decorrelation tools.

Finally, the teams at Amundi Alternative Investments would like to take this opportunity in the last issue of 'Alternative Insights' of this year to wish you all the very best for a festive holiday season and look forward to meeting up with you again in 2012, continuing to be at your side and fulfilling your absolute performance needs.

Kind regards,

Charles Lacroix
Head of Commercial Development France, Group & Asia
excluding Japan
Amundi Alternative Investments

* In particular, Noël Amenc, "Les hedge funds ne sont pas responsables de la crise financière" (Hedge funds are not responsible for the financial crisis), in Les Echos, 03/11/2008

A new financial environment

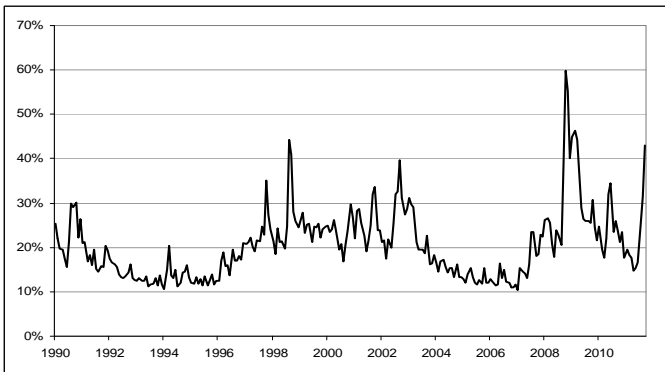
Before entering into detail about hedge fund performance, it is worthwhile taking stock of the profound changes which have occurred since 2007, as regards strictly financial indicators on the markets and the strong uncertainty of the environment.

> Extreme risk and waning performance of hedge funds

We are stating the obvious by declaring that financial risk has increased and that performance has fallen sharply. However, we feel it is sensible to briefly mention the context in which this has occurred and to elaborate upon some important consequences for hedge funds.

Let us look at high volatility via the implicit volatility indicator on the S&P 500: the VIX. 2008 and 2009 were years with very high implicit volatility (up to 60%), which then fell in 2010 only to start to rise very sharply yet again during the last few months.

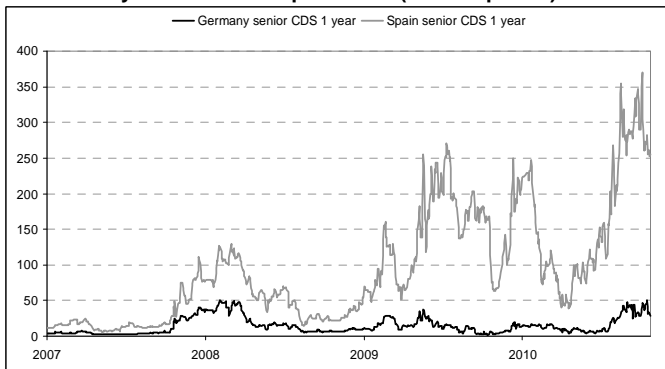
VIX implicit volatility on the S&P 500



Source: Datastream

Sovereign CDS premiums are another indicator of extreme market risks. These insurance contracts which, admittedly, are exchanged over-the-counter, show some of the stress experienced by agents concerning sovereign bonds. Whereas these bonds seemed very safe before the crisis, the premiums (and therefore the implicit likelihood of default) have rocketed, sparing very few States.

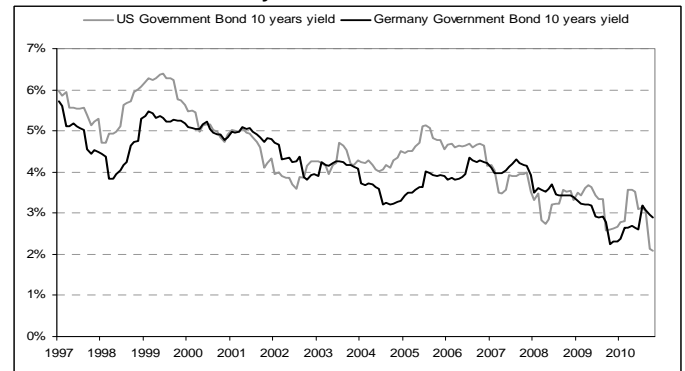
1-year senior CDS premiums (in base points)



Source: Datastream

Given the present context, the flight-to-quality favours American and German bonds which, historically, have a very low return:

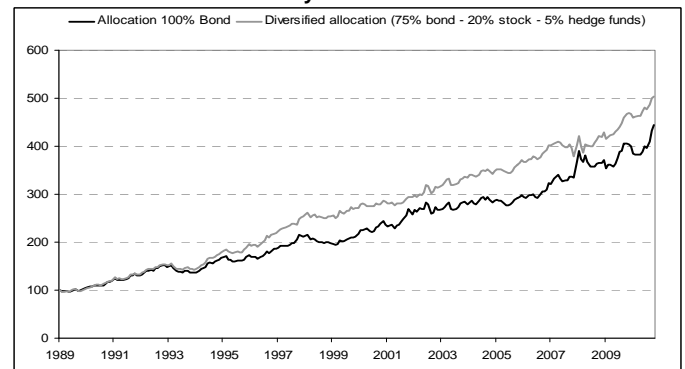
10-year bond returns



Source: Datastream

In times of increased risk, and the return being the compensation for risk in financial theory, hedge funds should be welcomed with open arms. Let us assume that since 1990 institutional investors have invested their funds either wholly in American government bonds or by allocating 75% to US Government bonds, 20% to equities and 5% to hedge funds (it should be recalled that in 1999 CalPERS invested 6% of these funds in alternative investment vehicles including hedge funds).

Different portfolio allocations with reinvested dividends and monthly reallocation



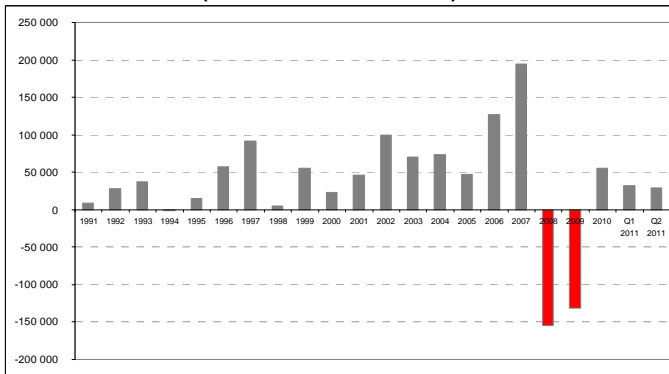
Source: Datastream and author's calculations

This latest allocation, which is diversified and more aggressive, would have earned more money for institutional investors even during the present crisis.

This is without taking into account the strong mistrust shown by investors with regard to this extreme risk, which is understandable given the financial environment. This again backs up the contra-cyclical character of the behaviour of economic agents. It was in 2006-2007 that agents should have "pulled out", as risk was at its lowest level (cf. previous VIX graph), and performance very strong, consequently becoming very suspicious.

Flows of assets into hedge funds are certainly positive in spite of the pervading slump, but they are far from reaching the levels recorded in 2006 and 2007.

Inward/outward flows on hedge funds (in millions of US dollars)

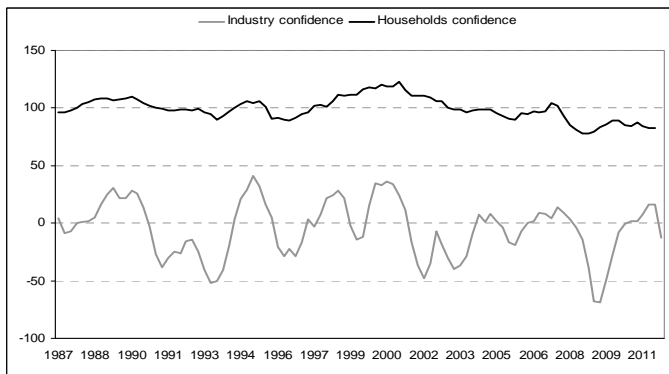


Source: Hedge Funds Research

> Mistrust shown by investors

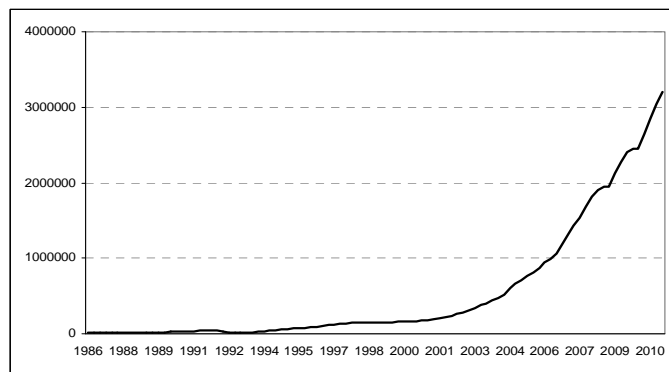
It becomes logically more difficult in this period, therefore, to raise capital on risky assets (cf. below, confidence indices, in decline), whereas at the same time, the liquidity of rich States (for example, China – cf. infra), and savings (case of France, below) are on the increase.

Confidence indices in France



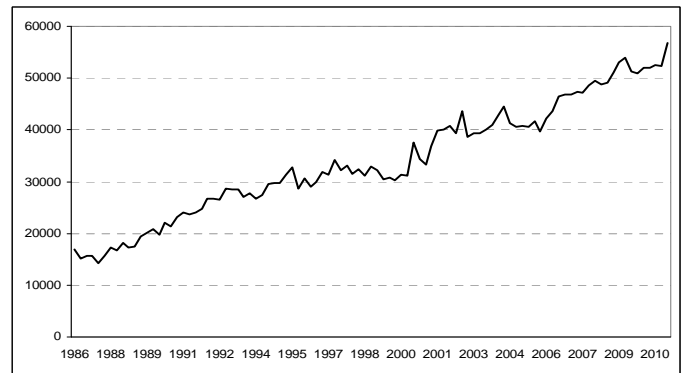
Source: Datastream

International reserves of China (in millions of \$)



Source: Datastream

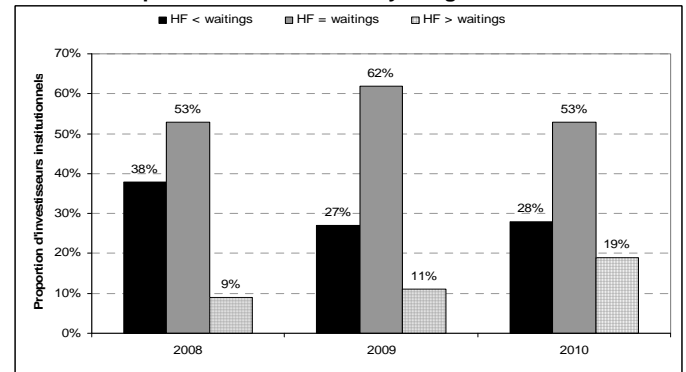
Household savings in France



Source: Datastream

Lastly, the results of a Preqin survey carried out in 2011 on a panel of institutional investors are very interesting. In 2010, the proportion of investors who expected hedge funds to perform less well increased (19% of the investors surveyed, compared with 9% and 11% in 2008 and 2009 respectively).

Institutional investors: their expectations with regard to the performance achieved by hedge funds



Source: Preqin Hedge Fund Investor Review (2011)

Admittedly, the percentage of investors who expected hedge funds to achieve greater returns still remains high at 28%, which is logical in the present financial environment. Over the last 2 years, have hedge funds shown that they can again perform well? This is what we will attempt to show in the rest of this issue.

New performance standards for the hedge funds industry

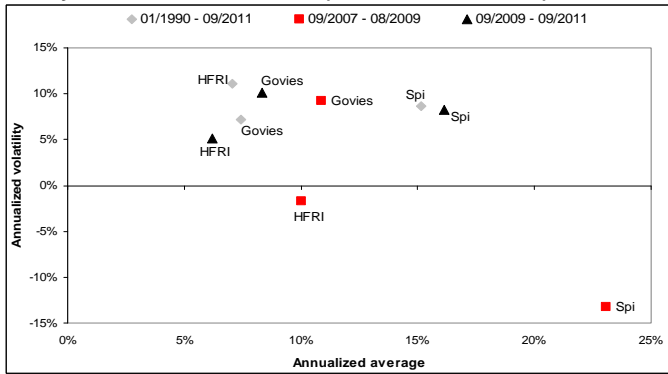
The new financial environment has had a considerable impact on the performance standards of hedge funds. However, there are notable differences between the start of the crisis in 2007 (liquidity crisis, overly complex financial products), and its consequences, which affected States in 2009 (crisis of confidence, political crisis).

> Lower returns...

A first reading of the new standards quite simply involves comparing the volatility and average return of hedge funds with equities (in this

case S&P 500) and bonds (in this case 10-year US Govies).

Chart showing the average/volatility of the S&P 500, 10-year US Govies and HFRI (reinvested dividends) indices



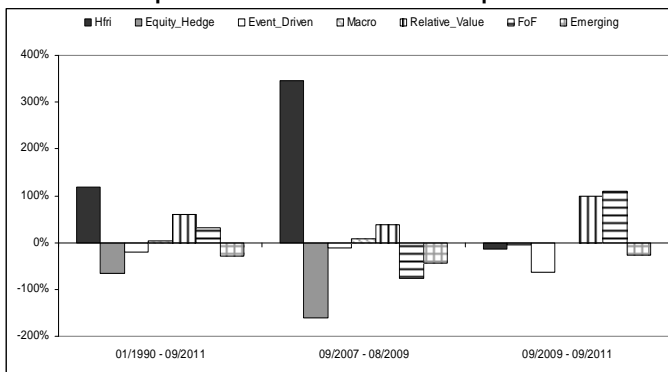
Source: Datastream and author's calculations

As far as the HFRI index (Hedge Fund Research Index: the overall index for hedge funds studied by HFR) is concerned, we observe volatility which, relatively speaking, has been controlled, unlike the traditional asset classes. Furthermore, this index proves to be more profitable than equities for the whole period and the subprime period (09/2007 – 08/2009); today, however, the S&P 500, although twice as risky, gives a slightly better return. As for 10-year US Govies, their stability explains why they are so attractive in these turbulent times.

> ... but more attractive diversification at present

It is very interesting to compare the efficient frontier lines originally defined by Markowitz (cf. Clauss, 2011), between hedge fund strategies and GMV (Global Minimum Variance – cf. boxed text opposite) portfolios, and between hedge fund strategies before and after 2007.

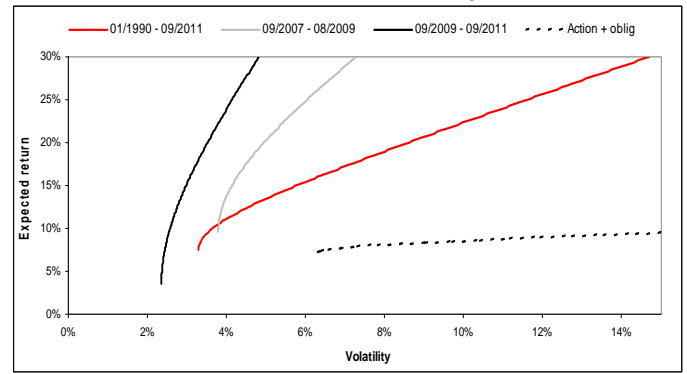
GMV portfolio allocations at different periods



Source: Datastream and author's calculations

Firstly, we observe that the efficient frontier lines constructed on the basis of hedge fund strategies are more lucrative than those determined using equities (S&P 500 and CAC 40) and bonds (US 10-year bonds). Furthermore, the efficient frontier lines for the 2 interest sub-periods generally make it possible to obtain a greater expectation of returns for the same level of volatility. Lastly, the efficient frontier line for the most recent period is even more attractive since it allows even lower volatility levels than the 2 others to be obtained (close to 2% annualized).

Efficient frontier lines at different periods



Source: Datastream and author's calculations

In terms of diversification and reduced volatility, the period 2009-2011, therefore, proves to be very attractive. This is confirmed by the portfolios with the lowest volatility (GMV portfolios, cf. supra). In fact, unlike the period 2007-2009, diversification is well distributed between strategies while having less concentrated weightings than the period 2007-2009.

These facts illustrate that hedge fund strategies have been in better health for 2 years in terms of both risk control and their *diversifying* characteristics.

Global Minimum Variance (“GMV”)

The GMV portfolio (GMV) is a portfolio which is simple to use and which may prove to be very attractive in terms of the risk/return trade-off.

Principle

In all efficient portfolios made up solely of risky assets, we can determine the portfolio with the lowest variance. We call it the Global Minimum Variance (GMV) portfolio.

Let us recall that an efficient frontier line of the Markowitz type comes from minimizing the variance or volatility of the portfolio in order to provide a target return. In concrete terms, this makes it possible to determine a minimum risk portfolio according to the return sought by the client. This describes all the *efficient* portfolios forming a parabola in the chart showing the average-variance. The GMV is the vertex of the parabola.

Mathematical determination of value

The weights of the GMV portfolio written down as ω_g are determined by using the following formula:

$$\omega_g = \frac{1}{e' \Sigma^{-1} e} \Sigma^{-1} e$$

with Σ the variance-covariance matrix of the returns on the n risky assets of the investment universe, e a vector of size n made up solely of the figure 1.

We can also express the average return μ_g and the standard deviation σ_g of the GMV portfolio as follows:

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$$\mu_g = \frac{\mu' \Sigma^{-1} e}{e' \Sigma^{-1} e}$$

$$\sigma_g = \sqrt{\frac{1}{e' \Sigma^{-1} e}}$$

Note that the GMV portfolio will turn out to be very attractive because in its construction (weight ω_g), the expected return estimate, which often proves to be very unstable, is not required.

Estimate

In order to estimate the weights ω_g of the GMV portfolio, it is necessary to determine a judicious value for Σ^{-1} . An interesting quality of an estimator is that it is, on average, equal to the unknown value sought: the estimator is then said to be *unbiased*.

In the case of Σ^{-1} , if we use the following estimator of the variance-covariance matrix:

$$\hat{\Sigma} = \frac{1}{T-n-2} \sum_{t=1}^T (r_t - \hat{\mu})(r_t - \hat{\mu})'$$

and we assume that the sample return results (r_1, \dots, r_T) come from independent and identically distributed random vectors of law $N(\mu, \Sigma)$, then $\hat{\Sigma}^{-1}$ is an unbiased estimator of Σ^{-1} .

It should be pointed out that $\hat{\mu} = \frac{1}{T} \sum_{t=1}^T r_t$ and that n and T

respectively represent the number of risky assets making up the portfolio and the number of observations (in days, for example) at our disposal.

Staying power and leverage

Let us now enter into greater detail about the sources of hedge fund performance, with a particular interest in comparing the periods of summer 2007-summer 2009, and summer 2009-summer 2011.

In this special issue, we will elaborate upon two innovative models in financial research: a factor-based model incorporating different systemic risk proxies and a measure of leverage impact on the performance of hedge funds, which is peculiar to them.

> Staying power

The numerous factor-based models studied in investment literature (cf. issue 7 of *Alternative Insights*) are very interesting but have not, for the most part, taken into account the new financial environment and particularly the impact of the crisis which we have experienced since 2007, as they were determined before the crisis.

It has been our wish, in this issue, to offer an innovative model, incorporating traditional asset classes and other more alternative classes. In order to do this, we have defined variables capturing systemic risk, which has now become something that cannot be ignored in the creation of investment performance. The ultimate objective is to find out whether the alpha remaining after all the risk factors in respect of returns have been taken into account has staying power over time.

The model has two types of risk factors: traditional and alternative. The risk factors determined by indices are expressed as reinvested dividends (Total Return).

Traditional risk factors	Equities	S&P 500
		NASDAQ
		MSCI BRIC
		MSCI US Growth
	Rates	10-year US Govies
		US 1-month interbank interest rate
Foreign exchange	Euro – US Dollar	
Alternative risk factors	Raw materials	S&P Commodities
	Derivatives	VIX
	Systemic risk	3-year ITRAXX Europe (CDS)
		US Corporate Spread AAA/BAA
		US money supply trend (M2)

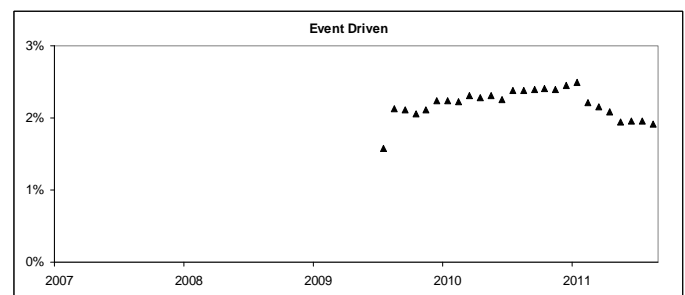
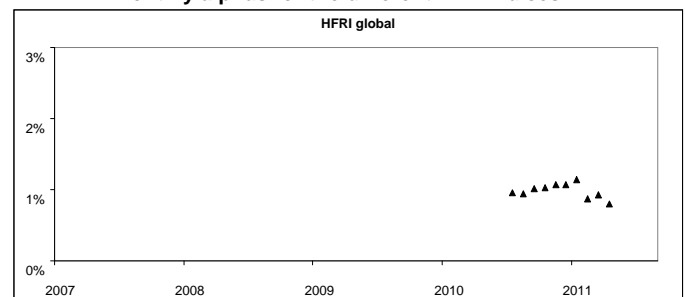
The model's innovation essentially lies in the incorporation of financial variables describing systemic risk within 3 segments of the economy:

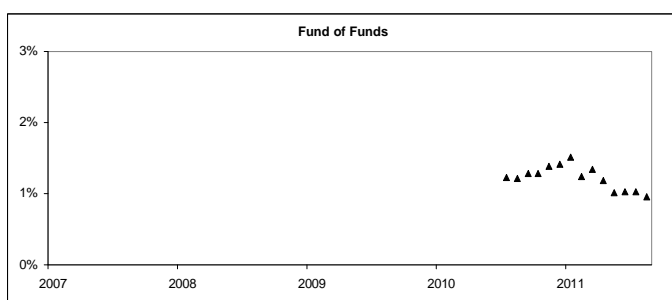
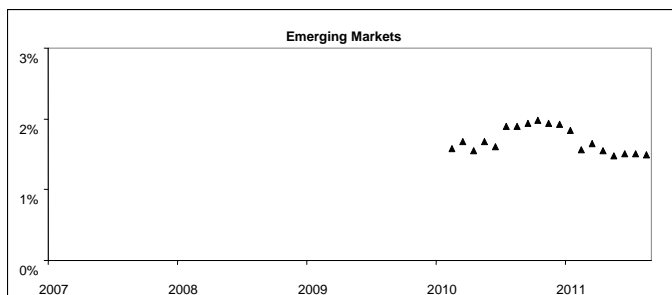
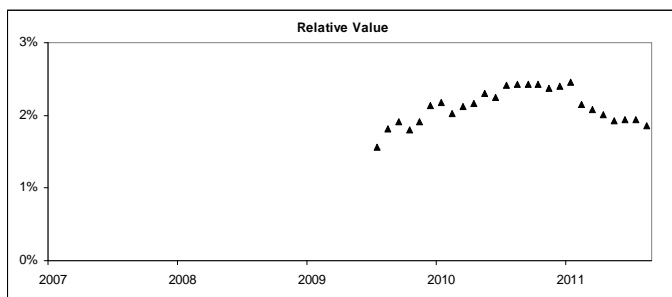
1. Purely financial with European CDS premiums;
2. Industrial with corporate spreads of US companies, with a Moody's rating of AAA and BAA respectively;
3. Sovereign with the relative trend in liquidity within a State, determined in this instance by the monetary aggregate (M2) of the United States (notes, coins, short-term deposits and term deposits under 2 years).

The period covered by our study is from 31 March 2005 to 30 September 2011. The data is monthly data. In order to carry out our linear regressions, a minimum data sample is required: therefore, we are not able to determine an alpha as from 31 March 2005, but we use the first 2 years (24 months) to introduce our estimators.

We are then able to observe the alphas from the graphs below. It should be explained that the alphas on the graphs are the only significant ones at the 5% threshold (cf. Clauss, 2011).

Monthly alphas for the different HFR indices





Source: Datastream and author's calculations

Interestingly, we observe the return of alphas in 2010 and 2011 for most strategies, after a lean period between 2007 and 2009 for all strategies, some of which again managed to find the road back to outperforming the market a bit before mid-2009 (*Event Driven* and *Relative Value*).

With this model, the *Equity Hedge* and *Macro* strategies do not show any significant alphas. This does not mean that these strategies did not create any investment performance over the period 2007-2011, but that this performance is only due to risk factors in the returns.

Therefore, after a dearth lasting for 2 to 3 years hedge funds have again found sources of outperformance by adapting to the new financial environment.

When the risk factor weightings are looked at in detail, we can see (for the global HFRI index) several very interesting lessons:

- Since January 2010, a negative weighting in US equities;
- Disappearance of the positive weighting in short-term rates and in commodities since summer 2009;
- Positive weighting in favour of Value Equities since summer 2010;
- Diminishing systemic risk exposure which then disappears in 2011.

These reallocations have made it possible for hedge funds to again find the source of outperformance, while greatly reducing the risk taken (cf. previous section). However, another fundamental change has taken place: lower investment performance due to leverage.

> Leverage

Leverage, considered a source of systemic risk by some, is first and foremost a source of performance for hedge fund investors. However, the value of the leverage taken by a hedge fund is generally passed on by the fund without necessarily obtaining all its ins and outs. We are, therefore, going to develop a method to measure it quantitatively based solely on returns and so objectively.

The idea of this measure is to use the previous model, to determine the alpha over 2 sub-periods (summer 2007 - summer 2009, then summer 2009 - summer 2011), and to compare it with the alpha for the same model but without any leverage possibilities. This is reflected by the following constraints:

1. Risk factor exposure which is always positive: ban on selling risk factors.
2. Total exposure equal to 100%: no loan (borrowing) possibilities.

With these constraints, the 2 main sources of hedge fund leverage are eliminated: short selling and investment leverage.

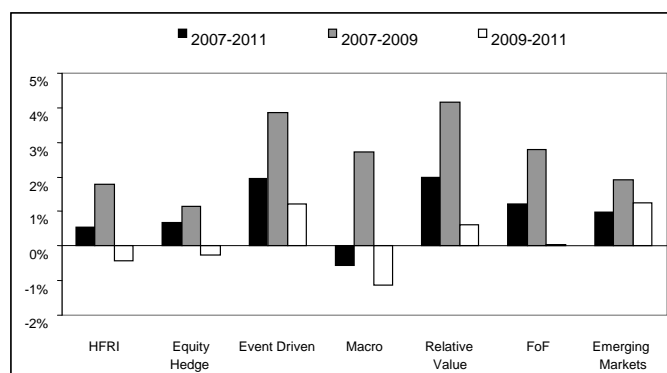
In this instance we have taken inspiration from the style regression developed by Sharpe in 1992 for determining the benchmarks and implicit allocations of mutual funds (cf. boxed text on the next page). By determining the difference between these 2 alphas, which we write down as $\alpha_{\text{levier}} = \alpha_{\text{sans contrainte}} - \alpha_{\text{contraint}}$, we will be able to obtain the source of outperformance or underperformance due to leverage.

Two types of outcome are then possible:

1. $\alpha_{\text{levier}} > 0$, so leverage is beneficial and makes it possible to create investment performance for hedge funds;
2. $\alpha_{\text{levier}} < 0$, so leverage is a source of risk and with no leverage, hedge funds may perform better. In other words, the performance of unleveraged hedge funds can be replicated, creating more alpha: it can then be considered that hedge funds will be tempted to use leverage less.

The graph below shows that leverage-based performance fell drastically between 2007-2009 and 2009-2011. A change of paradigm occurred most probably because of less use of leverage. Hedge funds have tightened their belts.

Monthly α_{levier} for the different HFR indices



Source: Datastream and author's calculations

Hedge funds have, therefore, changed tack in order to recover alpha by making more limited use of leverage, which was over-used before 2009. It should be explained that this reduction in leverage is also due to the decrease in available liquidity compared to 2008, when the central banks had flooded the interbank market; furthermore, increased capital requirements have led to a reduction in prime brokerage activity; lastly, the ban on short selling has had the knock-on effect of reducing this leverage.

However, in spite of this, hedge funds have managed to find the road back to alpha.

Sharpe's style regression

Style regression is a very worthwhile technique for determining the allocation of a portfolio using only its returns, and without knowing the management policy which has been implemented.

Principle

The article written by Sharpe in 1992 in the *Journal of Portfolio Management* is fundamental when analysing the style of mutual funds and performance attribution in regard to them.

In that article he defines a factor-based model made up of different asset classes. He uses 20 in all, ranging from short-term rates to share indices, according to different capitalisations, various geographic regions, and by using bond indices.

He therefore covers the universe of traditional asset classes quite comprehensively.

He finally defines dynamic and implicit portfolio exposure by imposing the following constraints: total exposure equal to 1 and each exposure being positive.

Determination of value

The factor-based model is defined as follows:

$$r_t = \sum_{i=1}^k \beta_i F_{i,t} + \varepsilon_t$$

with r_t the return on the portfolio determined on date t , β_i the exposure to k factors $F_{i,t}$ and ε_t the residual of the model. We are adding exposure α to Sharpe's original model via a factor of 1 only.

We can also write this model as a matrix by considering the vector R as the total returns over the period under review:

$$R = F\beta + \varepsilon$$

The Ordinary Least Squares (OLS) estimator comes from minimizing the sum of residuals in the squares:

$$\hat{\beta} = \arg \min \sum_{t=1}^T \varepsilon_t^2$$

Which, from a matrix point of view, is equivalent to:

$$\hat{\beta} = \arg \min \varepsilon' \varepsilon = \arg \min (R - F\beta)' (R - F\beta)$$

This estimator has as its standard solution (and so without constraints):

$$\hat{\beta} = (F'F)^{-1} F'R$$

However, when there is a wish for constraints to be added as in Sharpe's article (1992), we do not have any explicit solution. An optimisation programme must, therefore, be decided which turns out to be a quadratic programme (cf. Roncalli, 2010).

In fact, the function to be minimized can also be written as:

$$(R - F\beta)' (R - F\beta) = R'R + \beta' F'F\beta - 2\beta' F'R \\ \propto \frac{1}{2} \beta' F'F\beta - \beta' F'R$$

So now we do have a standard quadratic optimisation programme for determining $\hat{\beta}$ by adding the constraints $\beta_i > 0 \forall i$

$$\text{and } \sum_{i=1}^k \beta_i = 1.$$

A strong ability to adapt

With no preconceived ideas at the outset, and without being the champion of the hedge funds industry, we must acknowledge the astonishing ability demonstrated by hedge funds to adapt to the new financial environment through attractive diversification between strategies, judicious reallocation and less use of leverage, amongst other things.

The study is based only on the indices of the main hedge fund strategies defined by HFR and not the hedge funds directly. This in no way detracts from the truthfulness of the results, which make it possible to define a standard model which I hope will prove useful to anyone wishing to invest in hedge funds.

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Further reading..

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Roncalli, T. (2010). *La Gestion d'Actifs Quantitative*. Economica.

Sharpe, W. (1992). *Asset Allocation: Management Style and Performance Measurement*. Journal of Portfolio Management, 18(2), 7-19.

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NEXT EDITION: "How can customer liabilities and hedge fund assets be reconciled?"