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On asset managers, hedge funds and ETFs

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Abstract

The returns generated by the traditional asset management industry do not justify the current fees charged. An "excessive" reward for the risk taken leads to the assumption of disproportionate risks and to a non-efficient allocation of resources. This situation has been become more evident with the appearance of low-cost index-tracking funds, such as exchange-traded funds (ETFs) and robo-advisors, which are favoured in the current low-return, low-volatility and high-correlation investment climate. However, the market cannot be entirely made up of index funds with no discrimination; this would ultimately lead to a massive misallocation of capital.

In this context, the traditional asset management and hedge fund industries need to evolve and adapt to the new environment that requires more transparency, lower fees and new pay structures with more robust set ups.

Keywords:
Hedge fund, ETF, Smart beta, Mutual fund.

JEL classification:
G1, G2.

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Sobre gestoras, **hedge funds y ETFs**

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Resumen

Las rentabilidades generadas en la industria tradicional de gestión de activos no permiten justificar los niveles de comisiones que actualmente se aplican. Una remuneración demasiado elevada por el riesgo asumido incentiva la toma de riesgos excesivos y por consiguiente una asignación de recursos ineficiente. Esta situación se ha hecho más evidente con la aparición de nuevo fondos de bajo coste e indexados, como los ETF y los "robo advisors", favorecidos por el contexto actual de baja rentabilidad y volatilidad, y de alta correlación. No obstante, el mercado no debe caer en la tentación de componerse únicamente de fondos indexados que no proporcionan ningún tipo de discriminación. El resultado sería igualmente una masiva asignación ineficiente de capital.

En este contexto, la industria tradicional de gestión de activos y la de hedge funds necesitan reestructurarse y adaptarse a una nueva realidad que requiere de ellos una mayor transparencia, menores comisiones y mejoras en sus prácticas de gobierno corporativo.

Palabras clave:
Hedge fund, ETF, Smart beta, fondo de inversión.

1. Asset management industry outlook

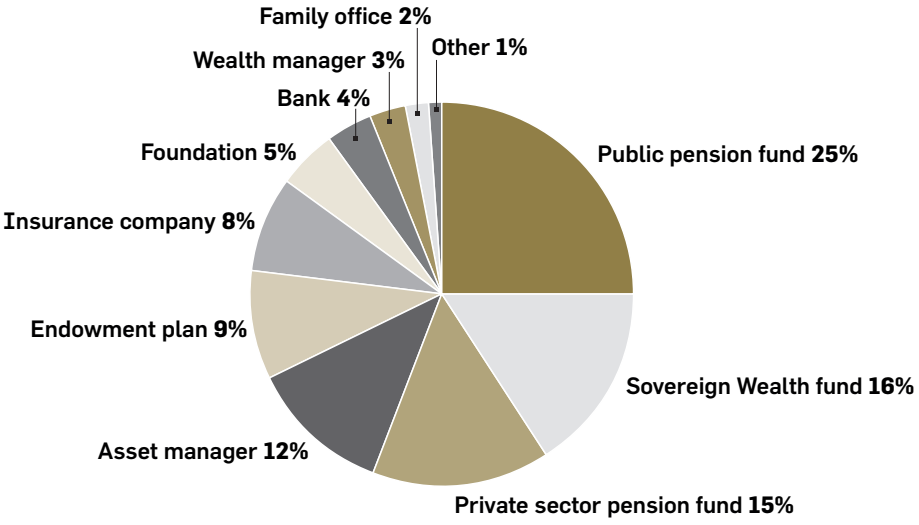
Supported by favourable demographic drivers, many experts expect a positive long-term outlook for the asset management industry, with an average annual growth of around 5% in terms of assets under management (AUM).

In spite of this rosy long-term outlook, asset managers will remain under strong pressure in the short term due to mounting regulatory constraints and decreasing returns. In addition, traditional players, such as active mutual funds, will be challenged by the growing weight of passive strategies. Even the alternative segments, such as hedge funds, will not be immune to this trend. There will be continued pressure on the whole sector to move towards efficiency improvements, more transparency and fee reduction.

There has always been an aura of sophistication around the hedge fund industry despite the fact that it suffers from the same underlying problem as the traditional active asset management industry: consistent underperformance as compared to equity benchmarks during recent years.

The two industries share many problems, challenges and restructuring needs. However, their distinct investor profiles means that they adapt to the new reality at different speeds; the hedge fund industry is mainly funded by professional investors while traditional asset management is favoured by retail clients.

Figure 1. **Capital-weighted breakdown by investor type (hedge funds)**



SOURCE: PREQIN HEDGE FUND INVESTOR PROFILES; PREQIN (2016).

Traditional fund managers seem to compete on the basis of past performance, with studies indicating that this is the most influential factor for retail investors in picking a fund. The hedge fund industry, on the other hand, is funded by professional investors looking to construct diversified portfolios across multiple asset classes on the "Efficient Frontier", and seeking to maximize risk-adjusted returns according to modern portfolio theory. To enhance portfolio fund returns, hedge funds do not need to outperform equities; they need to provide returns uncorrelated with equities that will outperform other instruments on a risk-adjusted return basis.

However, this is not a foolproof strategy. Passive fund managers are developing increasingly sophisticated strategies that are presenting fresh challenges to traditional and alternative managers, with the rise of passive funds and robo-advisors becoming one of the biggest threats. It is expected that both traditional and alternative industries will continue to lose market share against these newcomers. According to ETF.com, the AUM in the ETF industry have grown from $300mn in 2005 to more than $3tn in 2015 with more than 6000 ETF available. This is basically the same size estimated for the hedge fund industry, according to BarclayHedge.

In this context, the traditional asset management and hedge fund industries need to evolve and adapt to this new environment that requires better transparency, lower fees and new pay structures with more robust set ups. Particularly relevant in the hedge fund industry is the fee problem, where asymmetric and "excessive" rewards for the risk taken lead to the assumption of disproportionate risks, such as too much leverage. This problem contributes to the non-efficient allocation of resources.

In our opinion, the hedge fund industry makes a crucial contribution to the integration and comprehensiveness of the financial market, however an incomplete understanding of these funds leads to their return characteristics being exaggerated and their inherent level of volatility being underestimated, hence making hedge funds investments appear more attractive than they really are.

Hedge funds provide exposure to different risk factors than those of the traditional assets classes—equity, bonds and cash. Hedge fund return replication is a complex task for passive funds and robo-advisors due to the lack of transparency, their heterogeneous approaches and the complexity inherent in the construction of hedge fund indexes.

However, this does not make the hedge fund industry immune to the new ETF competitors. On the one hand, the hedge fund industry is not fulfilling its expected role, and on the other hand, the new passive funds are providing ever-better proxies of hedge fund strategies. A new generation of funds called "smart beta" is trying to repli-

cate some of the hedge fund strategies, for now mainly equity related, which represents an advancement over the mere passive tracking of an index. This new smart ETFs industry is still in its initial phase but promises to play a prominent role in the near future and to press for more efficient and better structured active management and hedge fund industries.

This article aims to provide a better understanding of hedge fund analysis —an industry unfortunately still not well understood among many investors and researchers—and the contribution of this "asset class" to portfolio optimization.

We show how to identify risk factors and to replicate the return distributions of different hedge fund strategies through simple financial derivatives, an approach that we believe could form the basis for the development of a new phase of "smart beta" funds that could be applied to yet more strategies.

A summary of related studies can be found in Camarero Aguilera (2013). That paper laid the groundwork for a set of studies that we performed aiming to design financial models able to replicate hedge fund index return distributions, studies that concluded with Camarero Aguilera and López Pascual (2013) and Camarero Aguilera (2014).

2. Traditional asset management and hedge fund objectives and challenges

According to Morningstar, its rated funds had not, on average, outperformed their sector benchmarks net of fees since the 2008 market crash. The Financial Conduct Authority (FCA), in its recent "Asset Management Market Study", finds, like others before it, that active managers underperform the index after costs, and it finds little evidence of persistence in outperformance.

It is still remarkable that traditional asset managers, at least when it comes to retail clients, do not compete on price at all. According to the FCA, this is partly due to "investors' ignorance". More than half of retail investors surveyed by the FCA did not know that they paid charges on investment products. However, there is one part of the market where fees have come down: passive or "tracker" funds, which try to match an index. Their fees have fallen by more than half since the turn of the decade due to the growing pressure of ETFs.

One could argue that the more sophisticated investment approach followed by hedge funds and the different objectives of their investor base would provide some shelter

from these pressures. Traditional fund managers seem to compete on the basis of past performance, with studies indicating that this is the most influential factor for retail investors in picking a fund. The hedge fund industry, on the other hand, is funded by professional investors looking to construct diversified portfolios across multiple asset classes on the "Efficient Frontier", and seeking to maximize risk-adjusted returns according to modern portfolio theory.

To enhance portfolio fund returns, hedge funds do not need to outperform equities; they "only" need to provide returns uncorrelated with equities that will outperform other instruments on a risk-adjusted return basis. However, these models have proven to break down during strong market sell-offs.

As illustrated in Camarero Aguilera (2014), there are many reasons behind this fact. The main one is that two of the inputs in portfolio construction are dynamic and non-linear. When markets sell off, correlations tend to increase. When combined with a spike in volatility, this creates much more tail risk than originally perceived.

Many portfolio optimization models use hedge fund index returns as input for their calculations. However, there are some important issues to consider when working with hedge fund indexes, such as *survivorship bias.* In addition, most hedge fund strategies, except *short bias*, show common characteristics such as negative skewness, positive excess kurtosis and serial correlation.

Therefore, it is not surprising that we are seeing a growing number of public pension funds pulling out of hedge funds or reducing their hedge fund exposure[1]. They cite "complexity" as a major factor for their decision to stop investing in these funds, as well as high associated costs. "With hedge funds, you're certain of the high costs, but uncertain of the return," stated Jan Willem van Oostveen, PFZW's Manager of Financial and Investment Policy, adding that "For a long time, hedge funds were a useful tool...but lately they have not made a sufficient contribution." He further noted the "high remuneration in the hedge funds sector and often limited concern for society and the environment".

Nonetheless, the overall level of AUM in the industry, which hovers just below $3tn, has not fallen dramatically over the last years.

[1] CalPERS was the first high-profile public pension to pull out of hedge funds in late 2014 (https://www.calpers.ca.gov). Its decision was followed by other big public retirement plans such as PFZW (Pensioenfonds Zorg en Welzijn), Europe's second biggest pension fund, which announced on 9 January 2015 that it was to stop all further investments in hedge funds.

3. Hedge fund indexes

Before investing in hedge funds it should be understood that hedge funds are not a homogenous asset class. Databases providers develop a series of benchmark indexes designed to reflect hedge fund industry performance. Their objective is to identify and to group hedge funds that really compete using similar investment strategies. However, there is no consensus as to the number of investment strategies used by hedge funds. In addition, the number of strategies is continually increasing in parallel with the development of new products.

The process of building a hedge fund index is complex due to the nature of the information involved. A hedge fund could seek opportunistic exposure or drift from its published investment style without notice. Therefore, it is important to filter any new data from a quantitative and qualitative point of view.

There are important problems to consider when working with hedge fund indexes, such as *survivorship bias*. Many hedge funds that were included in the indexes at some point in the past might not now comply with the index requirements or might be defunct. For example, Hedge Fund Research (HFR), a database provider, minimizes this problem by trying to include a fund's performance up until the final liquidation of the fund.

It is important to highlight the work done in the index analysis field by some researchers. Amin and Kat (2003) found that concentrating only on surviving funds leads to overestimating the mean return on individual hedge funds by approximately 2% and introduces significant biases in estimates of the standard deviation, skewness and kurtosis.

In addition, Brooks and Kat (2002) argued that the serial correlation of hedge fund returns seems inconsistent with the notion of efficient markets. They suggest that one possible explanation could be the fact that many hedge funds invest in illiquid or complex assets.

It is not always easy to find up-to-date valuations of these assets; therefore, the last reported transaction price or model valuations are sometimes used. López and Cuellar (2007) used similar arguments to explain the serial correlation in hedge fund returns, affirming that real valuations show the same problem due to the illiquid securities being appraised. These explanations are also corroborated by many researchers, who claim that hedge funds, to a certain extent, manage the reported returns in order to "smooth" their return distributions.

These findings add an extra layer of complication to the analysis of hedge funds and to the quality of the data used by researchers and investors in such analysis.

4. Using hedge funds in asset portfolio construction

As stated above, most strategies except *short bias* show common characteristics such as negative skewness, positive excess kurtosis and serial correlation. The main consequence of these characteristics is that the left tail of the return distribution is longer than the right; therefore, large losses are bigger than those suggested by the standard deviation. Furthermore, the serial correlation of the returns does not show that the model underestimates the true variance and reduces the effective number of degrees of freedom in a time series. In the case of hedge fund analysis, this means underestimating the true risk of our investment and overallocating to hedge funds when we undertake a mean variance portfolio analysis.

Therefore, in order to corroborate the validity of the Capital Assets Pricing Model (CAPM) approach for hedge funds, it is important to study the statistical characteristics of their return distributions.

The Central Limit Theorem (CLT) affirms that the distribution of the average of a sufficiently large number of independent variables approaches normality if certain conditions are fulfilled:

- The mean and standard deviations or the processes generating the returns should be stationary over time.
- The processes generating the returns should be independent of each other rather than a function of general systematic factors.

Camarero Aguilera (2014) showed that hedge funds display serial correlation in their returns, which challenges the hypothesis of independent identically distributed (i.i.d.) random variables.

In addition, the CLT approach provided is based on the hypothesis of a portfolio built from N_k equally weighted assets. However, the objective of any optimization process is to maximize return and minimize risk. This leads, as Amenc and Martellini (2002) stated, to the largest proportion of capital being allocated to the asset class for which the estimation error in the expected returns is the greatest.

It is also important to point out certain characteristics of the CLT. It allows us to estimate the probability of the return being in the interval of size $\sim\sigma/\sqrt{n}$ around the mean value. However, it should not be used to estimate the probability of a large loss $R_n < -L$ in the limit of large n, since as n gets larger, the variance gets smaller. Therefore, this approach skips over all the information embedded in the tails of the distribution, which, as we have shown in the case of hedge funds, is very significant.

The last point to make here regards the treatment of systematic and unsystematic risk. As Markowitz (2012) shows:

$$\sigma_p^2 = \sum_{i=1}^{n} x_i^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{\substack{j=1 \\ i \neq j}}^{n} x_i x_j \sigma_{ij} =$$

$$= \sum_{i=1}^{n} x_i^2 \sigma_i^2 + \sum_{i=1}^{n} \sum_{\substack{j=1 \\ i \neq j}}^{n} x_i x_j \sigma_i \sigma_j \rho_{ij}$$

where:

σ_p^2 is the portfolio variance,
$x_i x_j$ are the asset weights,
ρ_{ij} is the correlation between the returns of two assets.

The systematic risk is the undiversifiable part of the portfolio risk due to the correlation between the different assets.

Therefore, an important limitation is that the final portfolio return distribution will depend on the correlation assumptions. Many models treat the correlation as a constant or a linear function, however, a more robust approach is to treat correlation as a stochastic variable.

Assuming that the β of a security is time-invariant, it is easy to assess the changes in correlation as the market volatility changes.

$$\rho_{i,m} = \frac{cov(r_i, r_m)}{\sigma_i \sigma_m} = \frac{cov(r_i, r_m)}{\sigma_m^2} \frac{\sigma_m}{\sigma_i} = \beta \frac{\sigma_m}{\sigma_i}$$

where:

$\rho_{i,m}$ = is the correlation between the returns of asset i and the market.

We have thus shown that:

- The correlation depends on a non-linear relation.
- Higher market volatility increases the correlation between our variables, challenging the robustness of the model.

Our findings explain why, in market downturns when market volatility increases, asset returns became more correlated. At the same time, we can conclude that the validity of the CAPM or any other linear portfolio building model becomes compromised when we see changes in the correlation levels.

As we have shown, this is particularly true in the case of the hedge funds, where the i.i.d. of the returns is challenged from the outset due to the serial correlation of their returns.

5. Identifying risk factor exposures and replicating hedge fund performance

As we previously pointed out, there is no consensus as to the number of investment strategies used by hedge funds. In addition, the number of strategies is continually increasing in parallel with the development of new products.

HFR has created the following index classification:

Table 1. **Hedge fund strategy classification**

Hedge fund strategy classification			
Equity hedge	**Event driven**	**Macro**	**Relative value**
Equity market neutral	Activist	Active trading	Fixed income-Asset backed
Fundamental growth	Credit arbitrage	Commodity: agriculture	Fixed income-Convertible arbitrage
Fundamental value	Distressed/Restructuring	Commodity: energy	Fixed income-corporate
Quantitative directional	Merger arbitrage	Commodity: metals	Fixed income-sovereign
Sector: energy/basic materials	Private issue/ regulation D	Commodity: multi	Volatility
Sector: technology/healthcare	Special situations	Currency: discretionary	Yield alternatives: energy infrastructure
Short bias	Multi-strategy	Currency: systematic	Yield alternatives: real state
Multi-strategy		Discretionary thematic	Multi-strategy
		Systematic diversified multi-strategy	

SOURCE: WWW.HEDGEFUNDRESEARCH.COM

The historical return analysis provides an important source of information for evaluating and understanding hedge fund investment styles. These time series can help us to identify each strategy's exposure to risk factors. If we can replicate the return distribution, we would be able to replicate the hedge fund exposure.

There have been a number of different attempts to replicate the non-normality and non-linearity of hedge fund returns through conditional multifactor models. One of the latest publications in this field, Camarero and López Pascual (2013), focused on the purchase and sale of plain vanilla options to assimilate and explain the returns of different hedge fund strategies.

This approach allows us to classify strategies and provide an intuitive explanation of the risk factor behaviour. In addition, this paper opens the door to the study of hedge fund risk through options-based models (such as the Quadratic Value at Risk measures).

The proposed approach is simple; it starts by analysing the changes in the risk profile of the different investment strategies in response to the upward and to the downward movements of the equity market. We illustrate a few examples[2] of arbitrage strategies based on the monthly performance of the HFRI Indexes from June 2007 to March 2011, as developed originally in Camarero Aguilera and López Pascual (2013):

Arbitrage strategies

The aim of these strategies is to exploit relative mispricing in certain securities, looking for negative correlation in the returns of the selected securities.

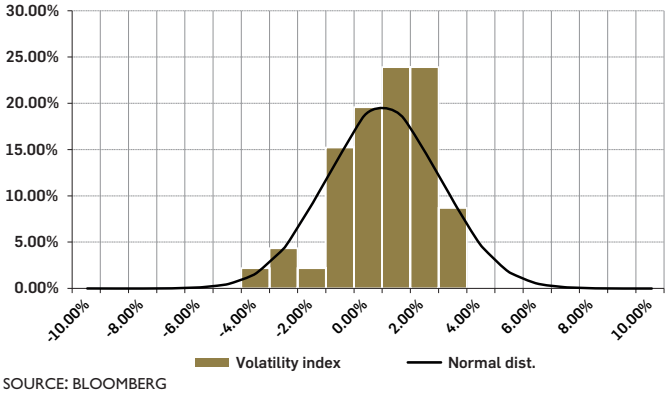
Arbitrage hedge fund strategies achieve consistently small positive returns, with low volatility; however, in times of stress they suffer larger losses than would be predicted based on the historical volatility of their returns.

The replication of these strategies resembles the selling of options, so *arbitrageurs* seem to be net sellers of volatility. As mentioned above, in times of market stress such funds may suffer large losses, precisely when the correlation in the markets tends to increase. Therefore, these funds are not only consistently short volatility (*vega* and *gamma*), they are also short correlation, which explains why they would suffer larger losses in times of stress than would be predicted based on the historical volatility of their returns.

Volatility strategy

These funds trade volatility as an asset class through both listed and unlisted instruments. The instruments used are mainly derivatives or other types of assets with embedded derivatives. The price of these instruments depends on the volatility level; therefore, hedging other risk factors, it is possible to isolate the exposure to the volatility.

Figure 2. **The distribution of volatility index returns**



SOURCE: BLOOMBERG

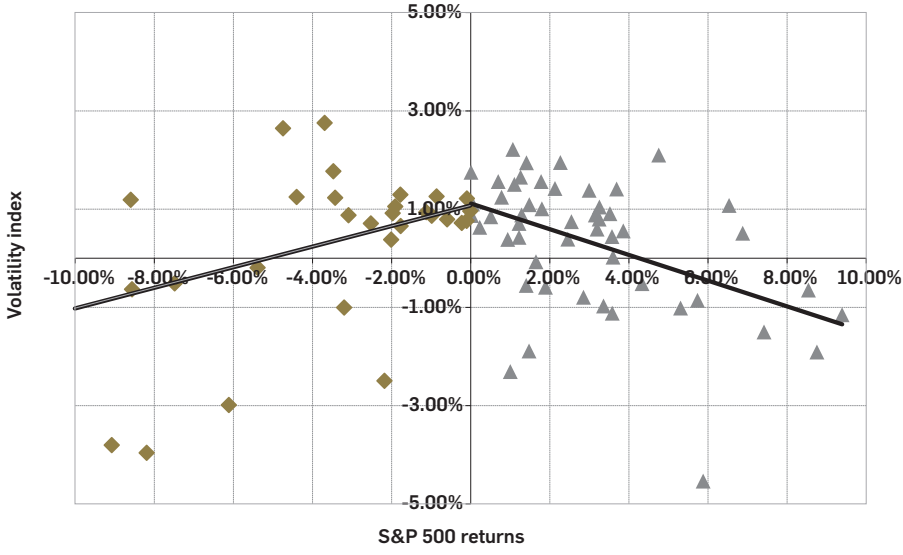
[2] For readers interested in a more in-depth analysis and calibration parameters, please refer to Camarero Aguilera and López Pascual (2013).

Table 2. **The statistics of the volatility index return distribution**

Volatility	
Mean	0.040%
Median	0.652%
Std. dev.	1.704%
Skew	-0.8604
Kurtosis	0.494
Min.	-4.53%
Max.	2.76%
N. of positive	56.52%
N. of negative	43.48%

We observe that the returns from this strategy assimilates the sale of a series of straddles on equity market returns, with the strikes set around 0%, as illustrated in Figure 3. This means that hedge funds managers generate the biggest returns when the equity market barely moves. When large equity market movements occur to either side, their returns are reduced.

Figure 3. **Volatility index returns vs. S&P 500 returns**



SOURCE: BLOOMBERG

One of the first conclusions that we reach is that these hedge funds consistently achieve their returns by selling volatility to the market. This finding contradicts the claims made by many volatility hedge fund managers that they maintain a net long volatility position or have the skills to change from being short volatility to long volatil-

ity when the market moves. It is worth noting that the tail risk in this strategy seems to be quite limited.

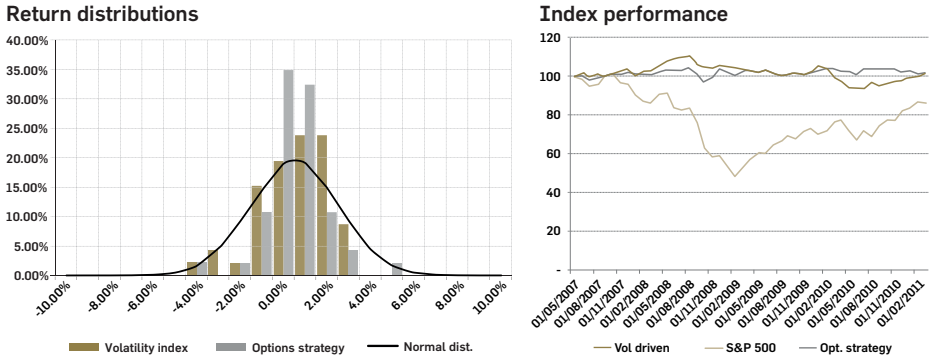
Accordingly, we expect a return distribution for this strategy with a high concentration of small positive returns, low variance and no fat tail.

Table 3. Comparison between volatility and options strategies distributions

	Volatility index	Options strategy
Mean	0.040%	0.051%
Median	0.652%	0.103%
Stand. desv.	1.704%	1.312%
Skew	-0.860	-0.205
Kurtosis	0.494	3.290
Min.	-4.53%	-4.42%
Max.	2.76%	4.04%
N. of positive	56.52%	50.00%
N. of negative	43.48%	50.00%

In Figure 4, we can see how the synthetic option strategy proposed achieves a very similar return distribution and absolute performance once the returns are adjusted for the standard 2/20 fee (a fee of 2% on AUM and 20% on performance with a high-water mark).

Figure 4. Return distributions and performances (in base 100) of volatility index vs. options portfolio



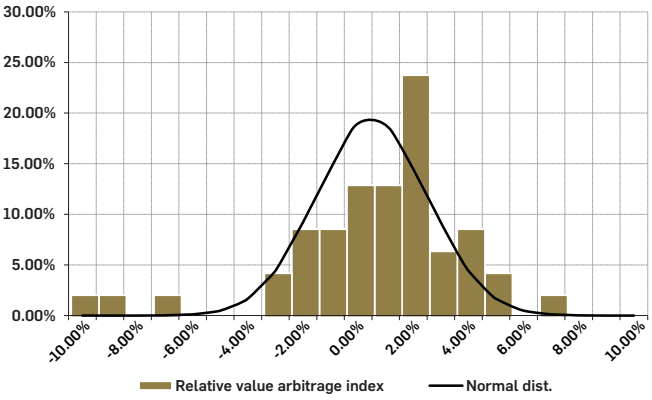
* Note that the S&P 500 returns are not adjusted with the 2/20 commissions.

SOURCE: BLOOMBERG

Relative value strategy

This type of fund looks for discrepancies in the market price of certain securities. These opportunities can be identified through the use of fundamental, macro models or quantitative analysis. There are no restrictions in terms of the securities used.

Figure 5. **The distribution of relative value arbitrage returns**

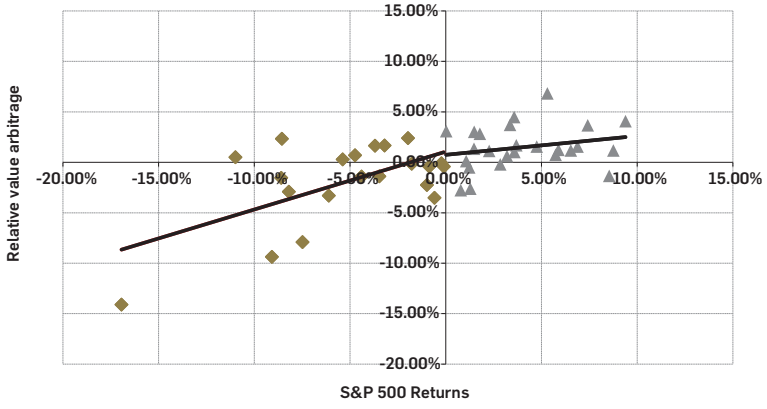


SOURCE: BLOOMBERG

Table 4. **The statistics of the relative value arbitrage returns**

Volatility	
Mean	-0.043%
Median	0.650%
Std. dev.	3.592%
Skew	-1.7597
Kurtosis	5.135
Min.	-14.11%
Max.	6.81%
N. of positive	58.70%
N. of negative	41.30%

Figure 6. **Relative value arbitrage index returns vs. S&P 500 returns**



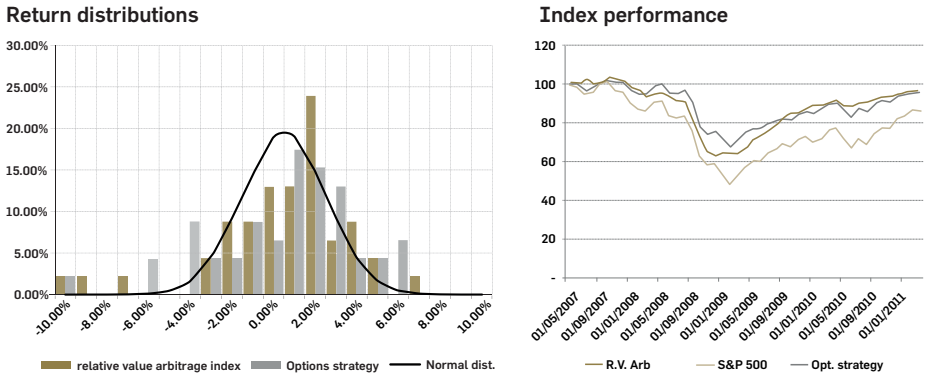
SOURCE: BLOOMBERG

The relative value arbitrage returns are similar to the sale of put options on the equity market, as illustrated in Figure 6. Our results are coherent with the findings of Mitchell and Pulvino (2001), who found that risk arbitrage returns are positively

correlated with equity market returns in downturns but uncorrelated in flat or appreciating equity markets. The return distribution for this strategy shows the highest median of the analysed strategies, low variance and a fat tail to large negative returns from the equity market.

Once more, in Figure 7 we can see how the synthetic option strategy proposed achieves a very similar return distribution and absolute performance once the returns are adjusted for the standard 2/20 fee (a fee of 2% on AUM and 20% on performance with a high-water mark). This calls into question the justification for charging such large fees, which is a serious conclusion to draw because, in our view, an asymmetric and "excessive" fee in relation to the risk assumed can lead to the assumption of disproportionate risks and contribute to the non-efficient allocation of resources.

Figure 7. **Return distributions and performances (in base 100) of relative value arbitrage index vs. options portfolio**



* Note that the S&P 500 returns are not adjusted with the 2/20 commissions.

SOURCE: BLOOMBERG

Formal validation of the analysis

In order to check the validity of our models, we have to bear in mind that the original hedge fund strategy returns show serial correlation. As we indicated above, one reason behind the serial correlation of hedge fund returns could be managers' attempts to smooth returns and therefore to reduce their reported risk level. This argument is underlined by the fact that serial correlation is reduced when we increase the return period length. Not surprisingly, this increase in the return period length also increases the explanatory power and the statistical significance of our model returns when we perform a regression analysis. For the sake of consistency with the redemption window assumed in our analysis, we choose 3-month returns.

Table 5 shows the difference in the reported R^2 between the hedge fund and the option strategy returns regressions for 1-month versus 3-month returns.

Table 5. R^2 between hedge fund and option strategies for different periods of returns

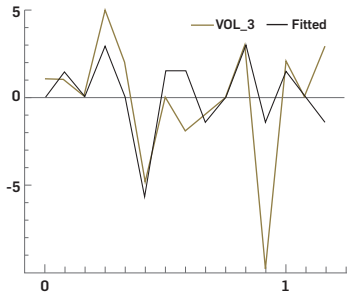
R^2	Volatility	Relative value arbitrage	Equity market neutral	Short bias
1-month returns	0.05	0.43	0.01	0.86
3-month returns	0.35	0.82	0.55	0.88

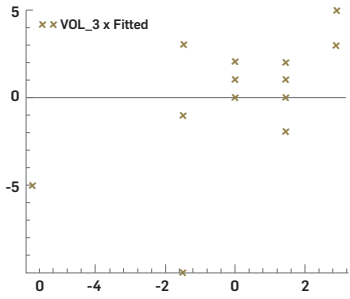
Figure 8 illustrates the regression analysis of the 3-month hedge fund returns on options strategies returns, the R^2 results and the statistical significance of the variables.

Figure 8. Regression of hedge fund on options strategies for quarterly returns, fitted model and error distribution

VOLATILITY

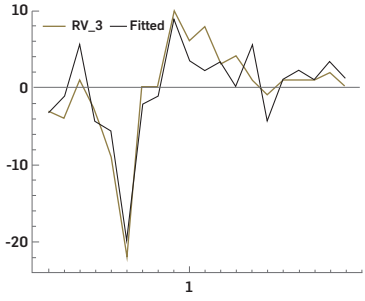
	Coefficient	Std. error	*t*-value	*t*-prob	Part. R^2
OPC_3	1.45161	0.5207	2.79	0.015	0.3570
sigma	2.89923	RSS	117.677419		
log-likelihood	-36.7333	DW	1.79		
no. of observations	15	no. of parameters	1		
mean(VOL_3)	-0.0666667	var(VOL_3)	12.1956		

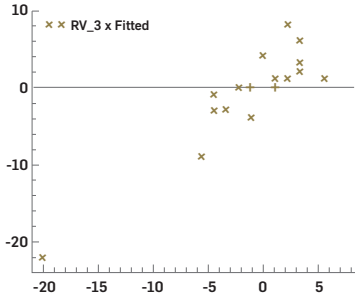




RELATIVE VALUE

	Coefficient	Std. error	*t*-value	*t*-prob	Part. R^2
Opc_3	1.11861	0.1193	9.37	0.000	0.8222
sigma	2.7937	RSS	148.290146		
log-likelihood	-48.4132	DW	2.15		
no. of observations	20	no. of parameters	1		
mean(RV_3)	-0.2	var(RV_3)	41.66		





6. Conclusions

The asset management industry is going through a profound restructuring process driven by the growing prominence of passive strategies and ETFs in a low return world. The industry plays a vital role in helping institutions and individuals meet their future financial needs, and in a low interest rate, low return world, this is more important than ever. Finding solutions to an ever-increasing demand for income remains a critical challenge for the industry.

In this context, the traditional asset management and hedge fund industries need to evolve and to adapt to the new environment that requires more transparency, new lower fees and new pay fee structures with more robust set ups.

Particularly relevant is the fee problem. The returns generated by the traditional asset management industry, and especially hedge funds, do not justify the current fees charged.

This issue has become very obvious with the appearance of new, cheaper funds such as ETFs and robo-advisors. On the one hand, it is true that an asymmetric and "excessive" reward for the risk taken leads to the assumption of disproportionate risks and to a non-efficient allocation of resources; on the other hand, the current low return/low volatility/high correlation investment climate favours low-cost index-tracking funds over active managers.

We have shown in this document how this trend is beginning to affect niche sectors such as the alternative space occupied by hedge funds. There are important limitations and considerations to bear in mind when investing in hedge funds. Two of the inputs in portfolio construction are dynamic and non-linear. When markets sell off, correlations tend to increase. When combined with a spike in volatility, this creates much more tail risk than originally perceived.

In addition, we have provided an approach using financial options that enables us to identify the relevant risk factors which explain hedge fund strategies' returns and risks. This technique allows us to replicate return distributions and account for the non-linearity and non-normality of these returns, outperforming most of the hedge fund absolute returns strategies if we assume lower commissions. Therefore, we can see no justification for the large fees still being charged across large parts of the hedge fund industry. At the same time, we consider that this type of approach could form the basis for the development of a new phase of "smart beta" funds that could be applied to yet more strategies, for which we see an enormous growth opportunity.

Our finding corroborates the consensus that traditional asset managers and hedge funds will be challenged by the growing weight of passive funds, and this trend will eventually affect even the most sophisticated strategies. Nonetheless, there is still a place for active management. The market cannot be entirely made up of index funds with no discrimination; this would ultimately lead to a massive misallocation of capital. For now, however, restructuring is called for and there will be continued pressure on the whole sector to move towards efficiency improvements, more transparency and fee reduction.

Efficiency, fee reduction and improvement in pay structures will translate into bigger returns for investors and a better alignment between investment managers and investors, contributing to a more efficient allocation of resources and promoting funds that offer real value to investors, whether through outperformance, diversification or any other means.

Transparency is an important factor in reliability, corporate governance and risk management, and facilitates the work of asset allocators/investors, overcoming important mathematical complexity generated in some of the most sophisticated strategies. Managers need to realize that drawdowns matter less if they can be explained and they are holding true to their stated strategy, as an ETF does.

"It is not often that a man can make opportunities for himself. But he can put himself in such shape that when or if the opportunities come he is ready". (Theodore Roosevelt)

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