

# **Portable Beta and Alpha Packaging**

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- Hedge Funds and the Core-Satellite Approach
    - The Core-Satellite Approach
    - Hedge Funds as Diversification versus Substitution Vehicles
  - Hedge Funds in the Core
    - Maximizing Beta Benefits of Hedge Funds
    - From AM to ALM
  - Portable Alpha and Beta Strategies
    - Manager Optimization
    - Completeness Portfolio Approach
  - Conclusions

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# HF's and the Core-Satellite Approach

*Remember this?*

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- Hedge fund returns = Betas (normal returns generated from exposure to rewarded risk factors) + Alphas (abnormal returns due to manager's skill)
- Two types of betas
  - Traditional betas: exposure to return on stock and bonds – arguably lower exposure for HF's compared to MF's
  - Alternative betas: exposure to other equity related factors (small cap vs large cap spread, growth vs value spread, volatility, etc.) and other bond related factors (term spread, credit spread, etc.), as well as other factors (commodity, FX, etc.)
- Two types of alphas
  - Alpha emanating from picking skills
  - Alpha emanating from factor timing bets
- In brief:

*HF Returns = Traditional Equity Factors (TEF) + Traditional Bond Factors (TBF) + Alternative Equity Factors (AEF) + Alternative Bond Factors (TBF) + Other Alternative Factors (OAF) + Alpha*

# HF's and the Core-Satellite Approach

## *Alpha and Beta Benefits of HF's*

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- One (good) reason for investing in hedge funds: Alpha benefits
  - Because hedge fund managers are not subject to the same kinds of constraints that affect long-only investment, they can maximize the potential for alpha for a given level of skills.
  - This legitimates the role of hedge funds as natural candidates for the entering the satellite fraction of an investor's portfolio.
- Another (better) reason for investing in hedge funds: Beta benefits
  - Because hedge funds are exposed to risk factors different from long-only managers (so-called *alternative betas*), they allow for good diversification benefits when mixed with stock and bond portfolios.
  - They also allow for an access to rewarded sources of risks that are not easily accessible otherwise.
  - As such they should rightfully enter the design of the core portfolio, which should take into account the presence of liability problem (from AM to ALM).

# HF's and the Core-Satellite Approach

## *Benefits of Alternative Betas*

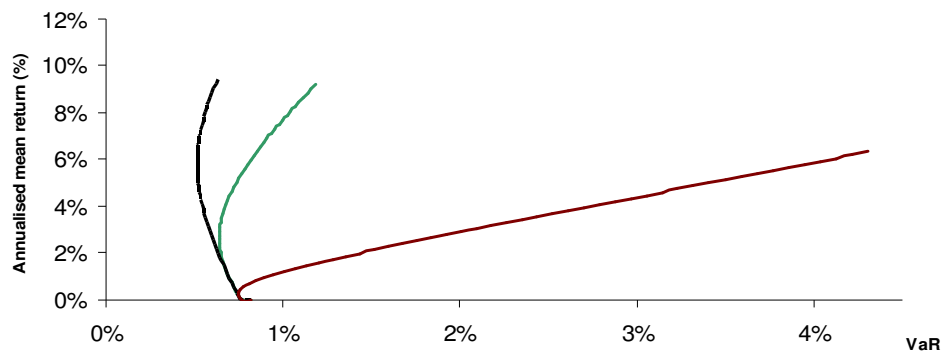
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- Alternative betas are by definition different from traditional betas.
- From a conceptual standpoint, including alternative betas in a portfolio can be useful for at least two different reasons.
  - Because hedge funds are exposed to risk factors different from long-only managers, they allow for good diversification benefits when mixed with stock and bond portfolios.
  - Because hedge funds are exposed to risk factors different from long-only managers, they also allow for a (managed) access to rewarded sources of risks that are not easily accessible otherwise.

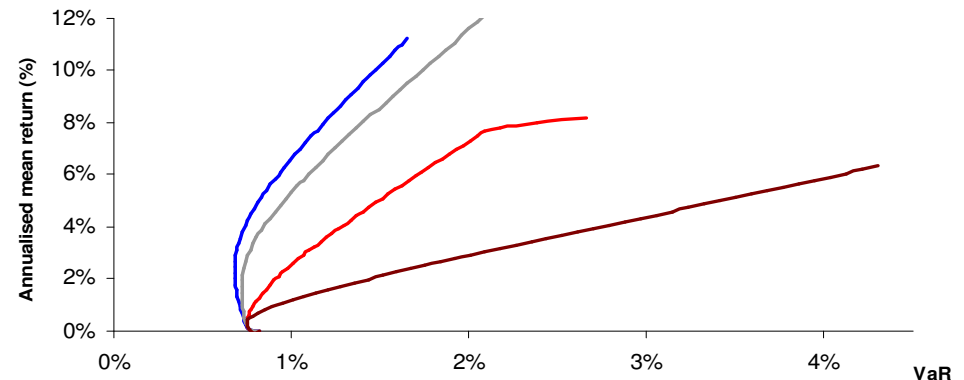
# HF's and the Core-Satellite Approach

## *A Complement or Substitute?*

- As a consequence, there are two kinds of improvements to existing stock and bond portfolio that are due to investment in hedge funds
  - Risk reduction: this is an *optimal diversification* question
  - Return enhancement: this is an *optimal substitution* question



— Convertible Arbitrage  
- - - Equity Market Neutral  
— Without Hedge Funds



— CTA Global  
— Event Driven  
— Long/Short Equity  
— Without Hedge Funds

# HF's and the Core-Satellite Approach

## *Contrasted Benefits of Hedge Fund Strategies*

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- A given hedge fund strategy can be well- or ill-suited for use in a return enhancement or risk reduction purposes depending on
  - What is the existing portfolio it will be added to like
  - Whether it contains more TEF, TBF, AEF or ABF
- For example, long/short equity, which contains lots of TEF, ...
  - ... can be used to enhance the performance of a long-only stock portfolio...
  - ... but does not mix well with stocks for risk reduction purpose...
  - ... while providing a good fit with bonds for risk reduction purposes.

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# Optimal Risk Diversification

## *Design of Diversification Benchmarks*

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- One of the key motivations behind investing in hedge funds is the desire to achieve diversification benefits.
- The presence of alternative betas in hedge fund returns allows for some hope in that direction.
- Academic research has shown, however, that not all hedge fund strategies mix well with all investors' existing portfolios, preferences and constraints.
- It is possible to design hedge fund benchmarks in an attempt to maximize the diversification benefits of these alternative investment strategies.

# Optimal Risk Diversification

## *Step 1: Selection*

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- A first step consists of selecting the right strategies for diversifying either a stock or a bond portfolio.
- Diversification benefits are measured in terms of potential for reduction in volatility, but also increase in skewness (measure of asymmetry) and decrease in kurtosis (measure of extreme risk).
- We have found that the following mix was well suited for the purpose of diversifying a stock versus a bond portfolio.

<b>Equity Diversifier</b>	<b>Bond Diversifier</b>
Convertible Arbitrage	Convertible Arbitrage
CTA Global	Equity Market Neutral
Equity Market Neutral	Event Driven
	Long/Short Equity

# Optimal Risk Diversification

## *Optimal Mixing with Stocks and Bonds*

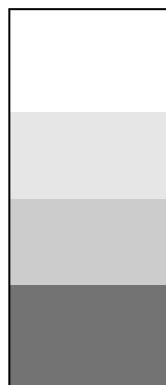
*With MSCI World Stock Index*

	Convertible Arbitrage	CTA Global	Event Driven	Equity Mkt Neutral	Long Short Equity
Covariance Beta	0.06	-0.11	0.27	0.06	0.38
Coskewness Beta	0.06	-0.32	0.43	0.06	0.37
Cokurtosis Beta	0.10	-0.26	0.36	0.07	0.38

*With Lehman Global Treasury Bond Index*

	Convertible Arbitrage	CTA Global	Event Driven	Equity Mkt Neutral	Long Short Equity
Covariance Beta	-0.06	1.51	-0.34	0.05	-0.37
Coskewness Beta	1.23	-1.01	1.39	0.65	0.77
Cokurtosis Beta	-0.12	1.27	-0.36	0.08	-0.08

Co-moments of Hedge Fund Index Return Distribution with Respect to Stock and Bond Returns,  
based on Edhec Hedge Fund Indices with Respect to MSCI Equity and Bond World Indices over the Period 01/1997-12/2005



No diversification potential  
Low diversification potential  
High diversification potential  
Very high diversification potential

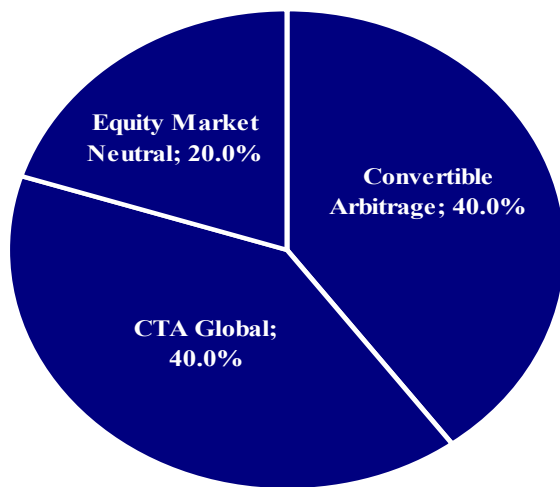
### Interpretations (improvement of portfolio moments)

Decrease in portfolio 2<sup>nd</sup> moment (volatility)  $\Leftrightarrow$  beta covariance  $< 1$   
Increase in portfolio 3<sup>rd</sup> moment  $\Leftrightarrow$  beta coskewness  $< 1$  (if skewness  $< 0$ )  
Decrease in portfolio 4<sup>th</sup> moment  $\Leftrightarrow$  beta cokurtosis  $< 1$

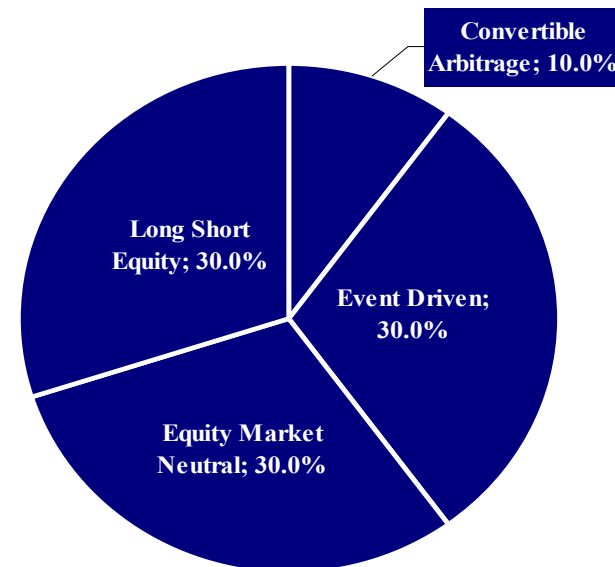
# Optimal Risk Diversification

## *Step 2: Optimization*

- A next step involves finding the best possible allocation with an objective of reducing the risk of a stock or a bond investment
  - The focus is on extreme risk reduction, where risk is measured in terms of VaR.
  - The allocation is dynamically re-balanced every 3 months, based on the assumption of 15% allocated in hedge funds.
  - Stock and bond returns are proxied by the return on MSCI World Stock index and the Lehman Global Treasury Bond index, respectively.



Composition of Edhec Equity Diversifier Benchmark

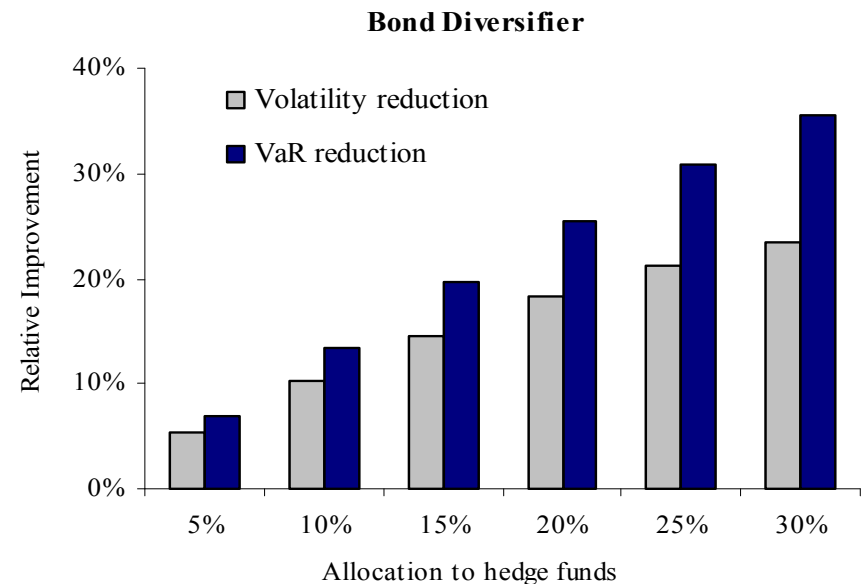
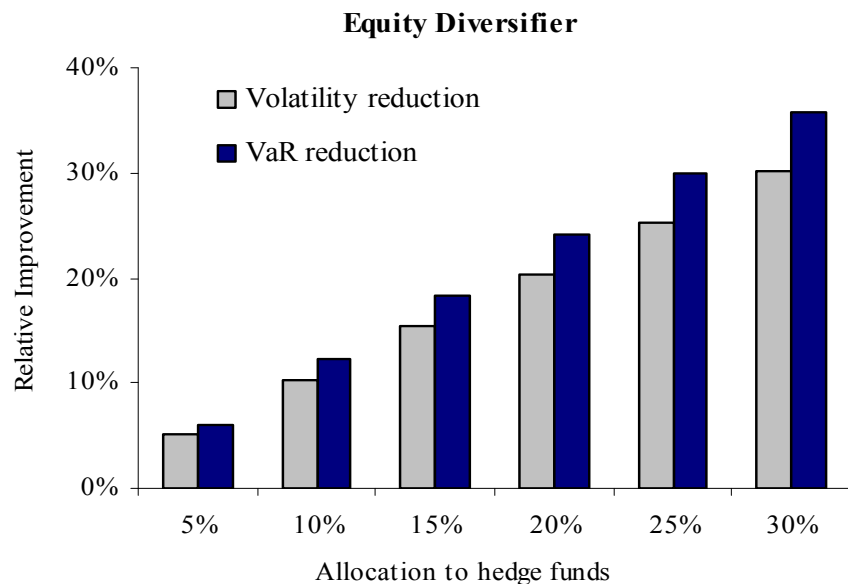


Composition of Edhec Bond Diversifier Benchmark

# Optimal Risk Diversification

## *Risk Reduction Benefits are Sizable*

- The suitably designed diversifiers allows for a significant reduction in risk (both average and extreme risk), even for relatively modest allocations to hedge funds.



The sample period is 04/2002 to 12/2005. For diversifying the bond portfolio, we have used the following Edhec Investable Hedge Fund indices: Equity Market Neutral, Convertible Arbitrage, Event Driven, Long/Short Equity. For diversifying the equity portfolio, we have used the following Edhec Investable hedge fund indices: Equity Market Neutral, Convertible Arbitrage, CTA Global. The MSCI World Equity Index and the Lehman Global Treasury Index have been used as proxies for the returns on stocks and bonds, respectively.

# Optimal Risk Diversification

## *Diversification Benefits*

- As a result of the two-step process involved in the design of the benchmark, diversification benefits are stronger compared to naïve investment in funds of hedge funds.

Improvement in diversification benefits compared to funds of hedge funds (\*)

	Edhec Equity Diversifier	Edhec Bond Diversifier
Decrease in volatility	20%	13%
Decrease in VaR (95%)	31%	9%

Based on monthly returns from April 2002 to December 2005, and a 15% allocation to hedge funds. (\*) Edhec Fund of Hedge Funds Alternative Index has been used in this illustration.

# Optimal Risk Diversification

## *HFs in ALM*

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- An investor's core portfolio should take into account the presence of liability constraints.
- There are two possible approaches to the inclusion of hedge funds in an ALM context.
  - Hedge funds as *an addition to traditional asset classes*: introduce hedge funds as an additional asset class along stocks and bonds in surplus optimization.
  - Hedge funds as *a complement to traditional asset classes*: use hedge fund to improve the risk-return profile of equity and/or bond portfolios.

# Optimal Risk Diversification

## *Challenges in HF Modeling*

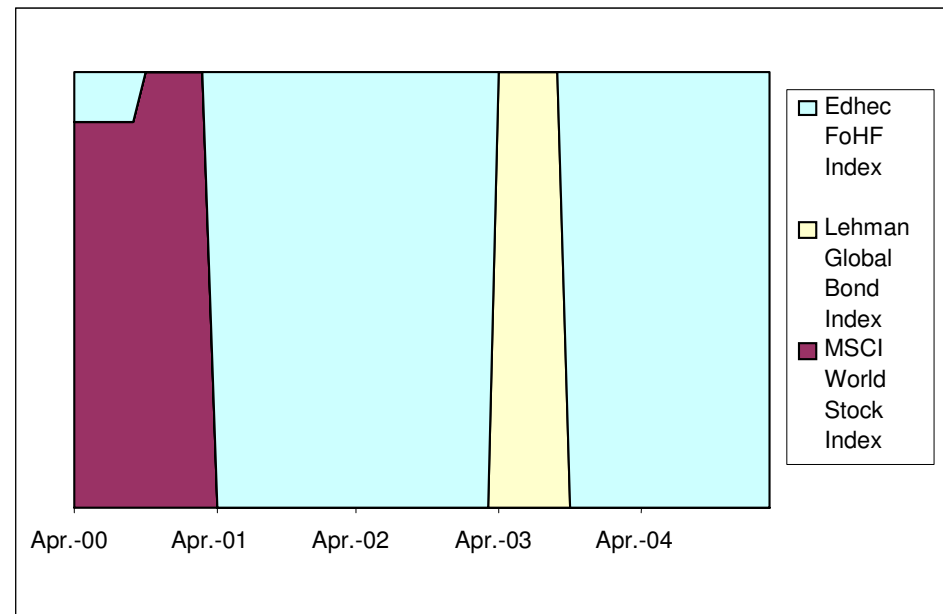
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- Treating hedge funds as *additional asset class* poses a series of conceptual and technical challenges.
- Conceptual challenges: hedge funds are not a homogeneous asset class, but rather a diverse set of strategies.
- Technical challenges
  - While there are consensual models for the dynamics of stock and bond returns (multi-factor models with mean-reverting drifts and stochastic volatility components), there are not yet any truly satisfying models for representing the dynamics of hedge fund returns.
  - All hope is not lost (see for example Fung and Hsieh (2002) or Agarwal et Naik (2004)) but there is still a long way to go.
  - We do not have long-term parameter estimates for hedge fund returns and the results will be strongly sample-dependent.

# Optimal Risk Diversification

## *Lack of Robustness of Naïve Approaches*

- The exhibit below shows the result of the maximisation of the information ratio based on a rolling-window on the out-of-sample period ranging from 04/2000 to 03/2005.



*The Edhec Fund of Hedge Funds Index is used as a proxy for hedge fund returns. The Lehman Brothers Bond Index is used as a proxy for bond returns. The MSCI World Index is used as a proxy for stock returns.*

# Optimal Risk Diversification

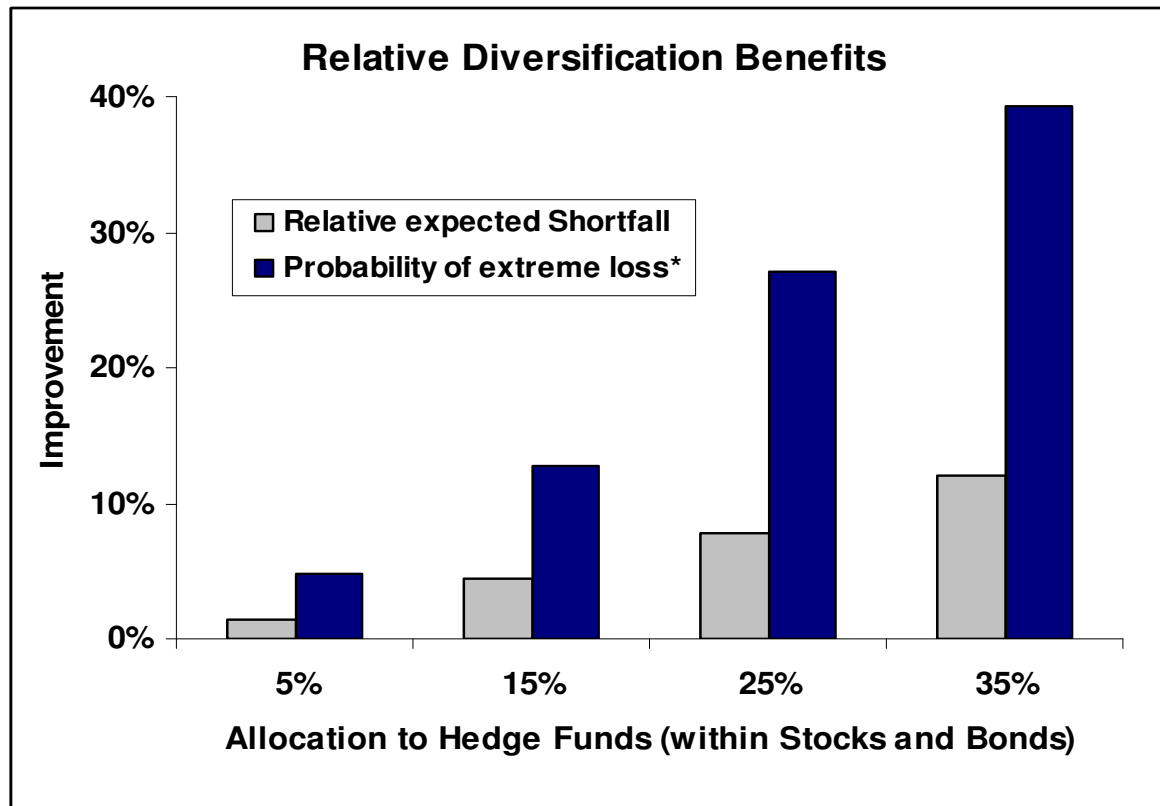
## *A Pragmatic Approach*

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- A more pragmatic approach consists of treating hedge funds as *a complement to traditional asset classes*.
- In other words one may use hedge funds to improve the risk-return profile of equity and/or bond portfolios.
- The improvement in risk parameters they allow for is likely to generate significant benefits in an ALM context.
- We have conducted a formal study of the benefits in hedge funds from an ALM perspective.

# Optimal Risk Diversification

## *ALM Benefits*



Adding HFs to stocks and bonds allows for significant benefits in an ALM context

### *Effective allocation to HFs*

	Stocks	Bonds	TIPS	Hedge Funds
0%	15.71%	29.11%	55.19%	0.00%
5%	16.09%	23.66%	58.17%	2.09%
15%	15.51%	24.82%	52.55%	7.12%
25%	20.88%	13.79%	53.78%	11.56%
35%	21.38%	9.42%	52.62%	16.58%

\*Probability that the deficit exceeds 25% of the liabilities

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# Portable Alpha & Beta Strategies

## *Biases in Hedge Fund Style Allocation*

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- Reconciling fund picking decisions with a top-down allocation approach is not straightforward.
- In particular, it may be the case that resulting style allocation biases in a portfolio of hedge funds are not consistent with the investor's or the manager's views on hedge fund style returns.
- Such bets are often implicit and unintended.
- Two competing approaches can be used to manage the presence of biases in hedge fund style allocation.
  - Manager optimization approach
  - Completeness portfolio approach

# Portable Alpha & Beta Strategies

## *Optimal Manager Portfolio with Target Style Exposure*

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- Formally, run a unconstrained regression of n managers with return vector r on K factors (style) with return vector R

$$r_t = a + BR_t + \varepsilon_t; B = \Sigma_{rR} \Sigma_{RR}^{-1}; a = \mu_r - B\mu_R$$

- Optimization program with target style exposure e

$$\underset{w}{\text{Min}} \text{Var}(r_p) = w' \Sigma_{rr} w$$

$$\text{s.t. } E(R_p) = w' \mu_r = m; w' 1_n = 1; Bw = e$$

$$\text{or } A' w = \theta \text{ with } A = (a, 1_n, B'); \theta' = (m, 1, e)$$

- Solution

- Multi-factor efficient portfolio (Fama (1996))

- See also Cochrane (1999)

$$w^* = \Sigma_{\varepsilon\varepsilon}^{-1} A \left( A' \Sigma_{\varepsilon\varepsilon}^{-1} A \right)^{-1} \theta$$

# Portable Alpha & Beta Strategies

## *Completeness Portfolio Approach*

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- Optimizing over manager allocation may not necessarily be a good solution in practice, even when feasible in theory, since it is usually costly to dynamically adjust the allocations to HF managers
- An alternative solution is to use a completeness portfolio approach
  - As opposed to trying to optimize the composition of the manager's portfolio, select one convenient allocation (say, equally-weighted)
  - Then, invest in a completeness portfolio with biases intended to neutralize those of the portfolio with respect to the target

$$R_{Target}(t) = \sum_{k=1}^K w_{Target,k} R_k(t)$$

$$R_{Satellite}(t) = \sum_{k=1}^K w_{Satellite,k} R_k(t) + \alpha_{Satellite}(t)$$

$$R_{Completeness}(t) = \sum_{k=1}^K (w_{Target,k} - w_{Satellite,k}) R_k(t)$$

# Portable Alpha & Beta Strategies

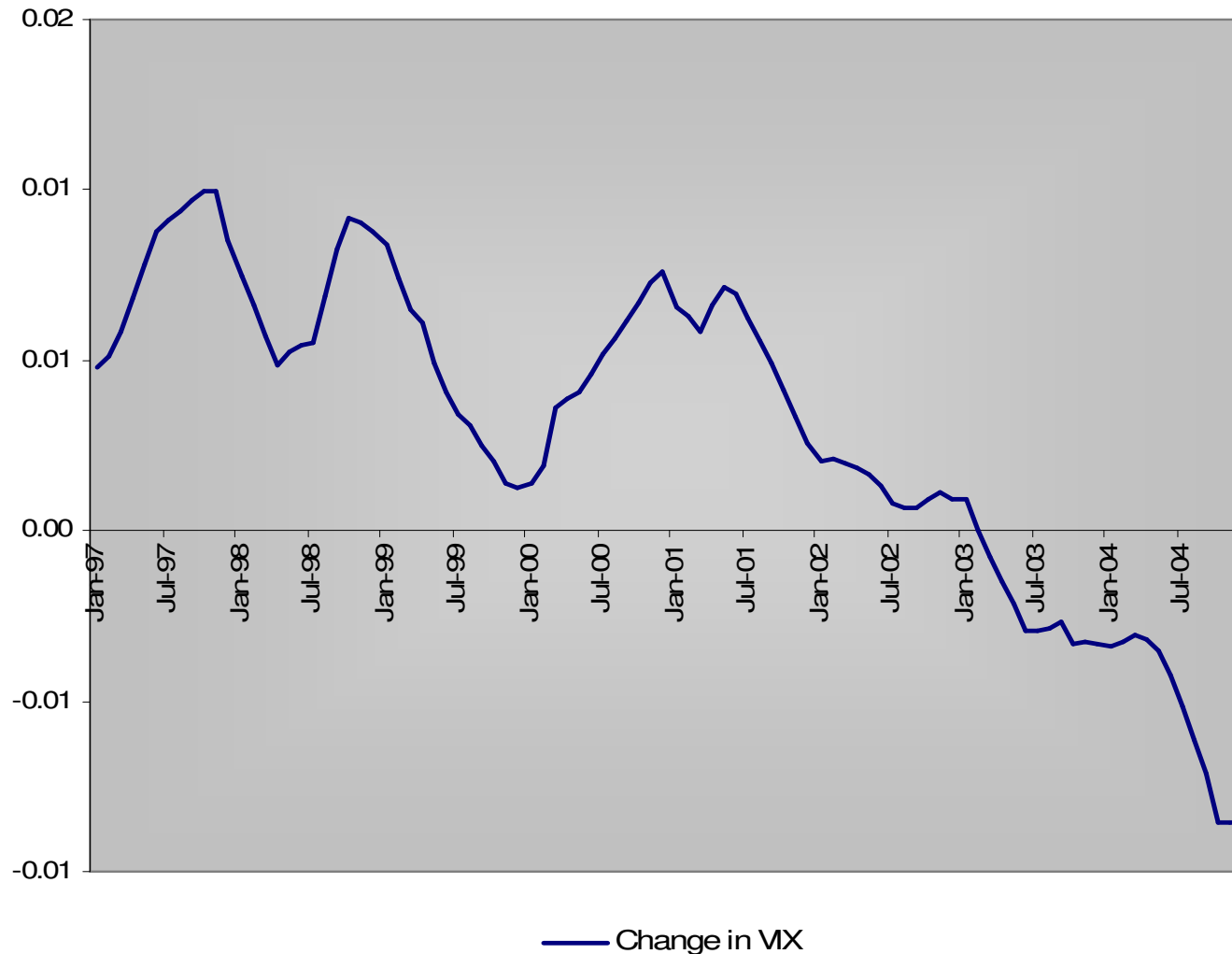
## *Implementation Issues*

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- In theory, the completeness portfolio approach requires the use of investable indices.
- Short positions in hedge fund indices are not easy to implement
  - They involve some shorting of the alphas in addition to shorting the betas
  - They are costly if available
- An alternative consists of using short/long position in investable factors that can be used as proxies for traditional and alternative betas.
- The challenge there is that hedge fund betas are actively managed and time-varying.
- This raises the question of passive replication of hedge fund (normal) returns.

# Portable Alpha & Beta Strategies

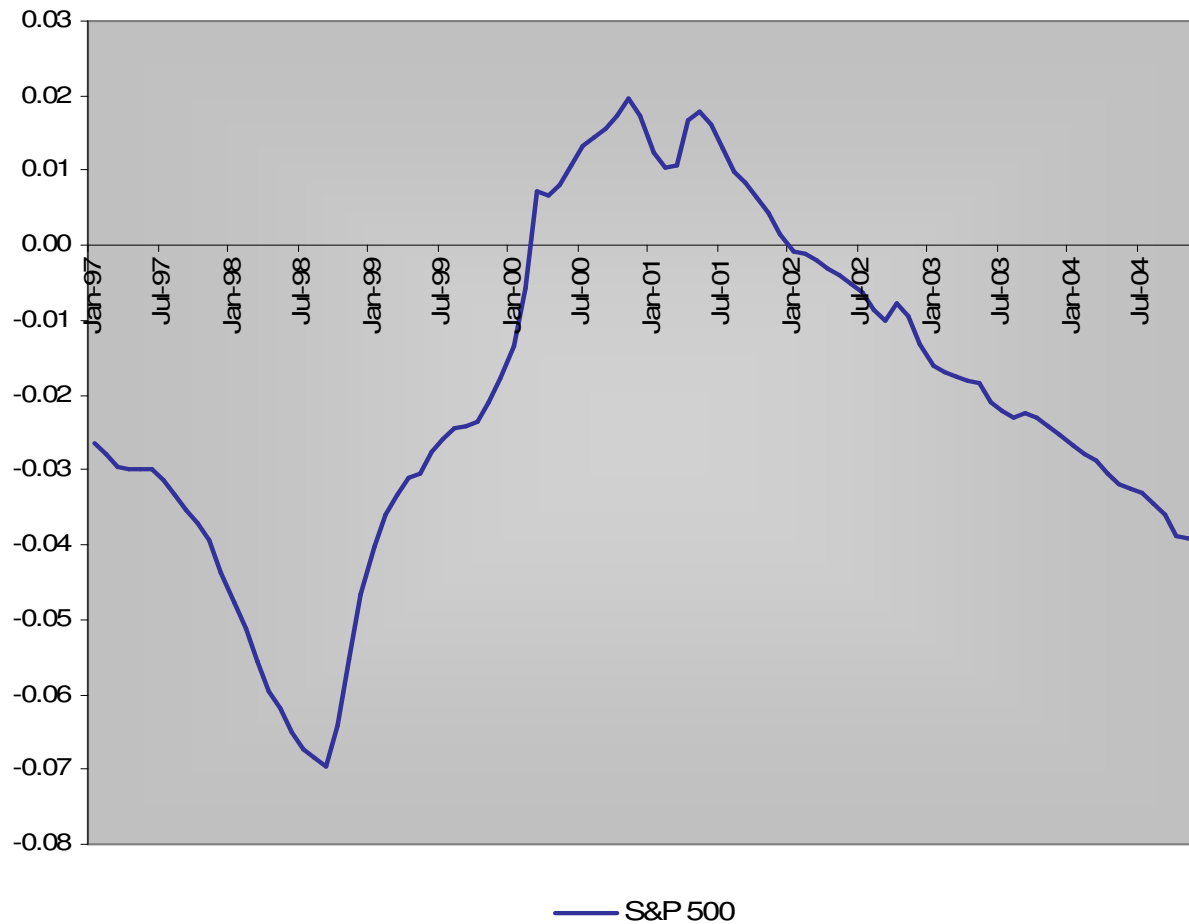
## *Example of Time-Varying Risk Exposure: Conv. Arb.*



Exposure to volatility risk (i.e., changes in implied volatility), estimated via a Kalman smoother approach

# Portable Alpha & Beta Strategies

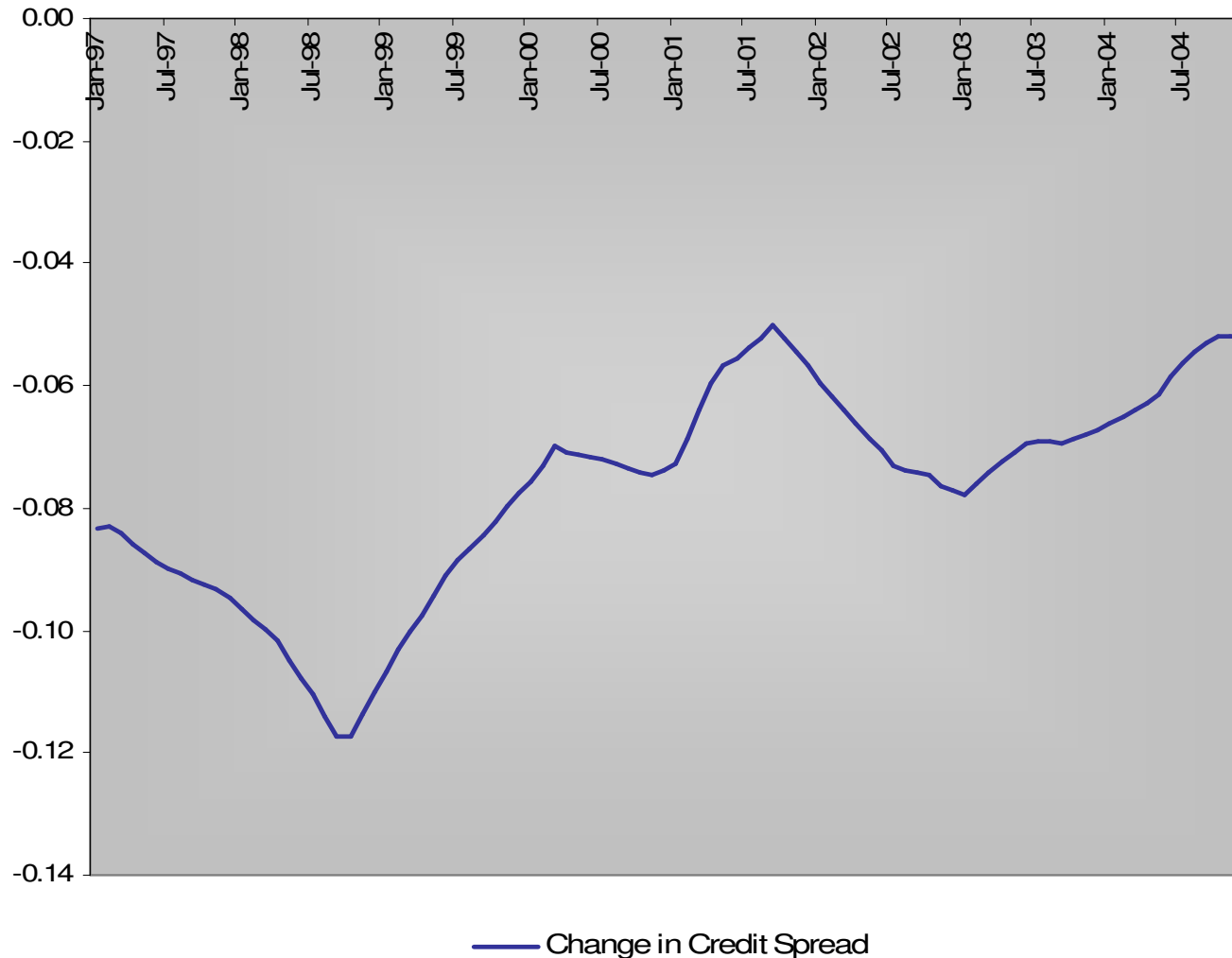
## *Example of Time-Varying Risk Exposure: Conv. Arb.*



Exposure to market risk (i.e., S&P 500 returns), estimated via a Kalman smoother approach

# Portable Alpha & Beta Strategies

## *Example of Time-Varying Risk Exposure: Conv. Arb.*



Exposure to credit risk (i.e., changes in the level of credit spreads), estimated via a Kalman smoother approach

# Portable Alpha & Beta Strategies

## *From the Delivering to the Packaging of Alpha*

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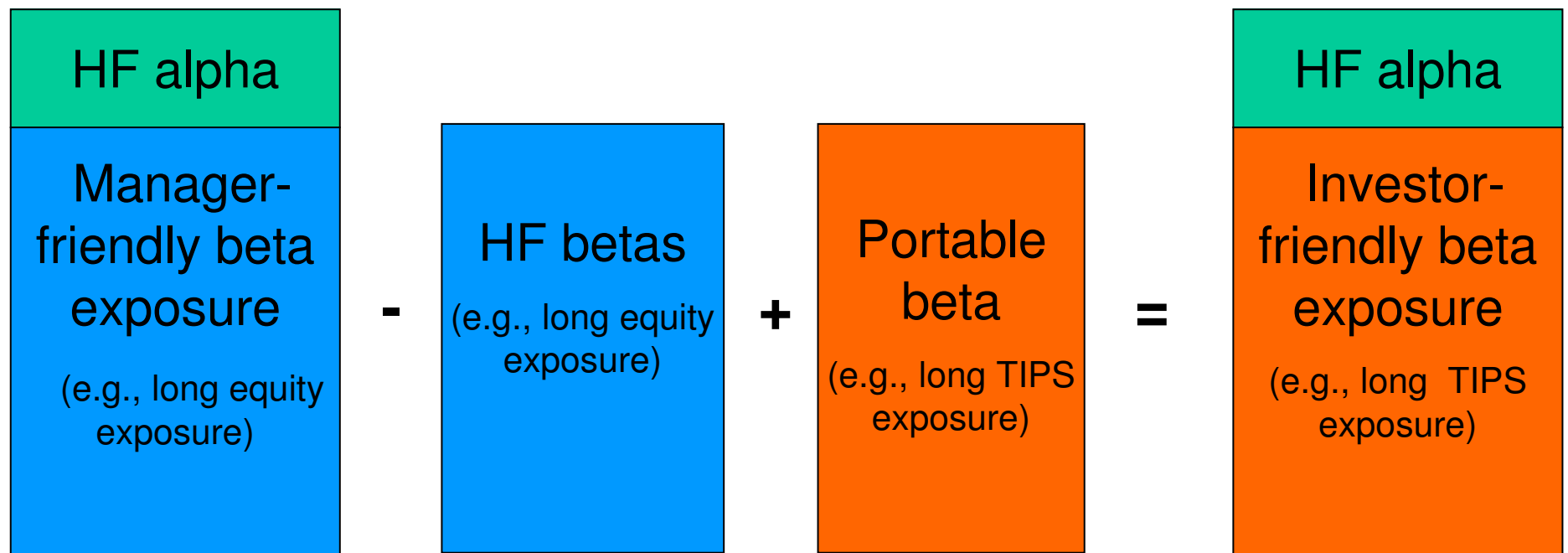
- As outlined by the completeness portfolio approach, it is neither desirable nor necessary to tie together the generation of alpha and beta sources.
- The focus is increasingly shifting from pure delivery to the packaging of alpha.
- As in any maturing industry, this is a shift from production to marketing.
  - Not only should hedge funds bring alpha; the alpha must also fit investors' need
  - Investors like hedge funds for their alpha; they also need hedge fund betas to fit their needs
- The key equation is:

$$\text{Hedge Fund Beta \& Alpha} + \text{Derivatives} = \text{Investor Friendly Beta Exposure} + \text{Portable Alpha}$$

# Portable Alpha & Beta Strategies

## *The Mechanics of Alpha and Beta Transport*

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# Conclusions

## *The Times are Changing*

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- Most current hedge fund offerings to institutional investors are based on the promotion of hedge funds with a focus on the producer standpoint
  - On the one hand, hedge fund managers certainly do not want to face tracking error constraints
  - On the other hand, investors need to control their overall allocation
- Investors do not only care about how alpha is generated
  - They also need to know how alpha can be ported to their portfolio
  - More meaningful hedge fund solutions can be designed, based on the recognition that the marketing and packaging of alpha is as important as the delivery of alpha
- The times are changing
  - Recognising that tracking error management can be separated from the alpha generating process allows for better performance and risk management