

GAIM - Funds of Funds

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The Brave New World of Hedge Fund Indices

Desperately Seeking Pure Style Indices

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Outline

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Motivation

Why Hedge Fund Indices

- HF managers often use risk-free rate as a benchmark
- This absolute return approach is theoretically valid if and only if
 - CAPM is the true factor model
 - Hedge fund beta is zero
- Recent research has shown that CAPM, a linear single-factor model, is ill-suited to benchmark HF returns, for at least two reasons
 - Dynamic trading strategies and use of derivatives by HF managers induce non linear dependency w.r.t. traditional asset classes
 - HFs are exposed to a variety of risk factors, including market risk(s), but also volatility risk(s), credit risk(s), liquidity risk(s), etc.
- Right benchmarking is a fundamental problem in the presence of incentive fees

Motivation

Why Hedge Fund Indices

- This calls for the need of a multi-factor model with non-linear factors
- Such non-linear factors can be
 - Derivatives portfolios: the choice of academia (Mitchell and Pulvino (2000), Fung and Hsieh (2000), Agarwal and Naik (2000), Schneeweis and Spurgin (2000))
 - Hedge fund indices: the choice of the industry
- Hedge fund indices and sub-indices are a natural choice for benchmarking hedge fund returns
- Reliable HF indices are also needed for
 - Indexing strategies and structured products
 - Strategic and tactical asset allocation decisions

Problems with Existing HF Indices

From Specialized Boutiques to Traditional Big Players

Index Provider	Launch Date	Base Date	Web Site
Hennessee Group (<i>Hennessee</i>)	1987*	1987	hedgefnd.com
LJH Global Investments (<i>LJH</i>)	1992	1989	ljh.com
Van Hedge Fund Advisors International, Inc. (<i>Van Hedge</i>)	1994**	1988	vanhedge.com
Hedge Fund Research, Inc. (<i>HFR</i>)	1994	1990	hedgefundresearch.com
CISDM / MAR (<i>CISDM</i>)	1994	1990	marhedge.com
HedgeFundNews.com / Bernheim Index (<i>Bernheim</i>)	1995	1999 (<i>for monthly returns</i>)	hedgefundnews.com/
Evaluation Associates Capital Markets, Inc. (<i>EACM</i>)	1996	1996	eacmalternative.com
Hedgefund.net / Tuna Indices (<i>HF Net</i>)	1998	1976-1995***	hedgefund.net
HFIntelligence / Invest-, Europe-, Asia-Hedge (<i>HFIntelligence</i>)	1998	2000 (<i>2001 for AsiaHedge indices</i>)	hedgefundintelligence.com
CSFB/Tremont Index LLC (<i>CSFB</i>)	October 1999	1994	hedgeindex.com
Investorforce / Altvest (<i>Altvest</i>)	2000	1993	investorforce.com
Zurich Hedge Fund (<i>Zurich</i>)	2001	1998	www1.zindex.com
Standard & Poor's (<i>S&P</i>)	2002	1998	spglobal.com
ABN AMRO / eurekaledge (<i>Eurekaledge</i>)	May 2002	2000	eurekaledge.com
MSCI Hedge Fund Indices (<i>MSCI</i>)	July 2002	2002	msci.com
Blue Chip Hedge Fund Index (<i>Blue X</i>)	October 2002	2002	bluex.org
Feri Alternative Assets GmbH (<i>Feri</i>)	2002	2002	feri-alta.de
MondoHedgeIndex (<i>MondoHedge</i>)	March 2003	2002	mondohedgeindex.com
<i>TalentHedge</i>	2003	Not reported	talenthedge.com

* Publicly since 1992

** Publicly since 1995

*** depends on strategy

Problems with Existing HF Indices

Concern over Independence and Transparency

More than half of existing indices do not make public the composition of their indices and/or have no independent committee

Index Provider	Weighting	Composition Transparency	Index Committee
EACM	EW*	No	No
HFR	EW*	No	No
CSFB	VW**	Yes	Yes
Zurich	EW*	Yes	Yes
Van Hedge	EW*	No	No
Hennessee	EW*	No	Yes
HF Net	EW*	No	No
LJH	EW*	No	No
CISDM	Median	No	No
Altvest	EW*	No	No
MSCI	EW* & VW** for Global Indices	No (only to subscribers)	Yes
S&P	EW*	Yes	Yes
Feri	EW* & MP** for the Composite index	No	No
Blue X	Between 2% and 8% for hedge funds and a maximum of 20% for funds belonging to the same Organization	Yes	Yes
MondoHedge	EW* & MP**	Yes	Yes
Eurekahedge	EW*	Yes (upon request)	No
HFIntelligence	Median	No (only to subscribers)	No
Bernheim	Not reported	No	No
TalentHedge	Not reported	Not reported	Not reported

* EW stands for Equally Weighted

** VW stands for Value Weighted

Problems with Existing HF Indices

Concern over Accuracy and Timeliness

Index Provider	Update Schedule	Flash Returns	Data Verified by the Index Provider
EACM	3 rd week of M+1	No	No
HFR	5 th , 15 th day of M+14 and 1 st day of M+2	Yes	No
CSFB	15 th day of M+1	No	No*
Zurich	4 th week of M+1	No	Yes
Van Hedge	5 th day of M+1 (Global Index), 10 th day of M+1 and last day of M+1 for final results	Yes	No
Hennessee	6 th working day of M+1 and 30 days after month end for final results	Yes	No
HF Net	Every day	Yes	No
LJH	Not reported	No	No
CISDM	2 nd week of M+1 and 2 nd week of M+2	Yes	Yes
Altvest	Every day and last day of M+1 for final results	Yes	No
MSCI	1st estimates during M+1, 2 nd estimates at the end of M+1 and final results at the end of M+2	Yes	No**
S&P	Every day (with up to 2 days delay) and last day of M for final results	Yes	Yes
Feri	Final results are published at the end of M+1	No (only available upon request)	No***
Blue X	Every week and 25 th day of M+1 for final results (with a maximum of 15% of estimated returns)	Yes	No
MondoHedge	Last week of M+1 and 1 st week of M+2 for final results	Yes	No
Eurekahedge	10 th , 15 th day of M+1 for estimates and 20 th , 30 th day of M+1 for final results	Yes	No
HFIntelligence	During the first three weeks of M+1	No	Yes
Bernheim	During M+1	No	No
TalentHedge	Not reported	Not reported	Not reported

* No but there are annual checks against audited data and verification of unusual events.

** Not systematically. There is due diligence when the fund is included, as well as annual due diligence questionnaires. MSCI carries out periodical reviews to reconcile performance data and the fund's classification but not to assess the accuracy of returns themselves.

*** Feri carries out detailed qualitative due diligence on all the potential funds which could become part of the index. They then only perform multi-factor style analysis and clustering to detect any style drift.

Problems with Existing HF Indices

Concern over Stability

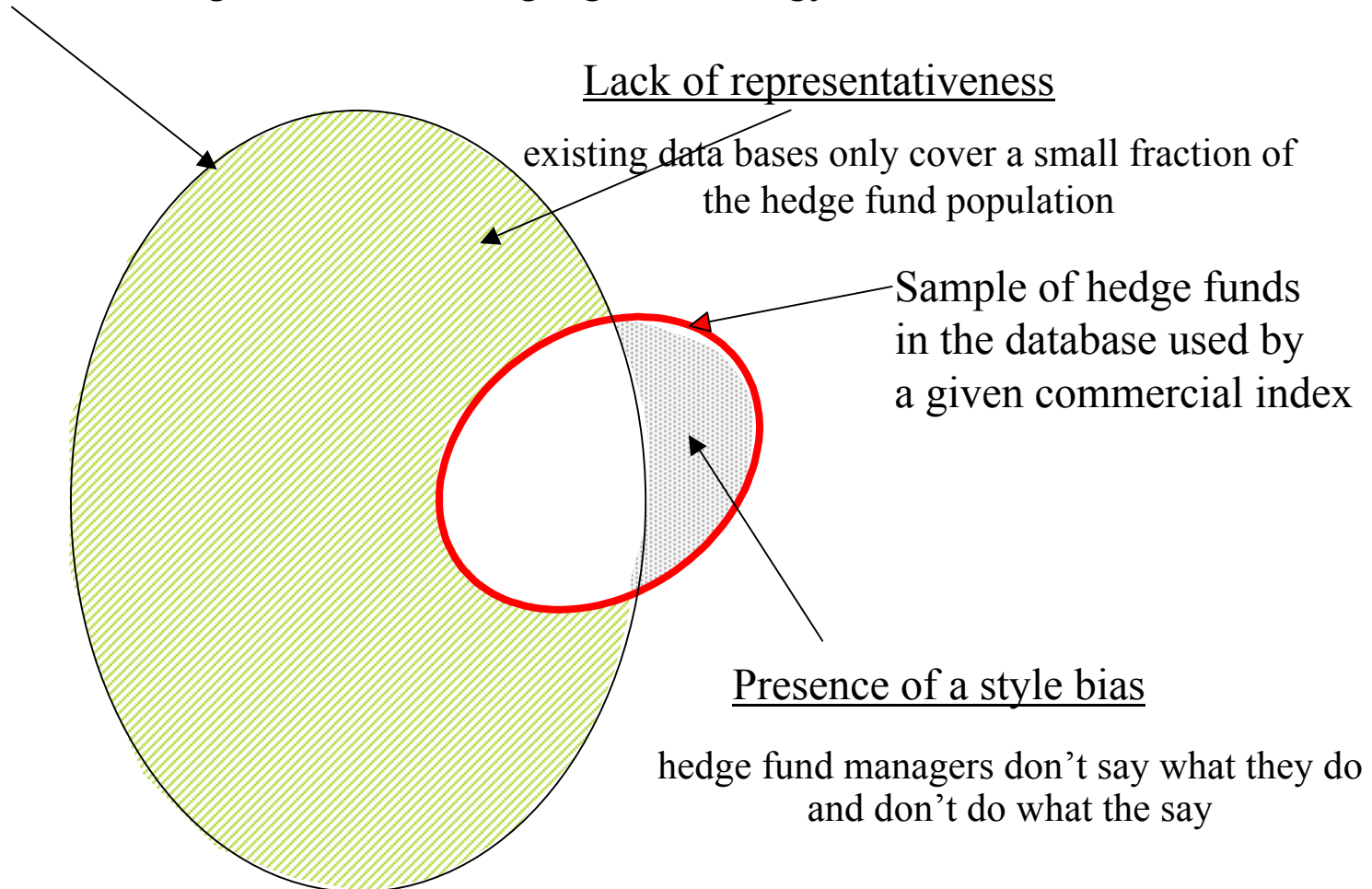
Inclusions of new funds and exclusions of defunct funds can have a dramatic impact on hedge fund index, especially when backfilling is performed

Index Provider	Backfilling	Rebalancing Frequency
EACM	No (Ex post adjustments made on a discretionary basis, however, are not excluded)	Annually
HFR	No (the trailing 4 months are kept as estimates and thus subject to ex post adjustments)	Monthly
CSFB	No	Quarterly
Zurich	No	Quarterly
Van Hedge	No	Monthly
Hennessee	No	Annually
HF Net	Yes (full history)	Continuous
LJH	Not reported	Monthly
CISDM	No	Monthly
Altvest	No	Monthly
MSCI	Yes (full history)	Quarterly for inclusion of funds and Monthly for funds' reclassification
S&P	No	Annually at strategy level and periodically at funds level
Feri	No	Quarterly
Blue X	No	Quarterly
MondoHedge	No	Monthly
EurekaHedge	Yes (full history)	Monthly
HFIntelligence	Not reported	Monthly
Bernheim	Not reported	Not reported
TalentHedge	Not reported	Not reported

Problems with Existing HF Indices

Pure Hedge Fund Indices are not Observable

Population of hedge funds following a given strategy



Problems with Existing HF Indices

Concern over Representativeness

Hedge fund indices and their database

Index Provider	Data Base	N° of Funds in Data Base	N° of Funds in Indices	Composite Index	FoF Index
Van Hedge	Proprietary Data Base	+5400	1300	Yes	Yes
Feri	Proprietary Data Base + other commercially available Data Bases (Van Hedge, TASS, HF Net)	+5000	41	Yes	No
Hennessee	Proprietary Data Base	+3500	+690	Yes	No
S&P	Proprietary Data Base + other commercially available Data Bases	3500	40	Yes	No
CSFB	TASS Data Base + Tremont Data Base	3300	431	Yes	No (planned)
Altvest	Proprietary Data Base	+2600	All the funds	Yes	Yes
HF Net	Proprietary Data Base	+2300	All the funds	Yes	Yes
HFR	Proprietary Data Base	+2300	+1400	Yes	Yes
CISDM	Proprietary Data Base	2300	+1600	No	Yes
MSCI	Proprietary Data Base	1800	+1500	Yes	Not reported
HFIntelligence	Proprietary Data Base	+1700	All the funds	No	Yes
Bernheim	U.S. Offshore Funds Directory	+900	18	Yes	No
Zurich	Zurich Capital Market Data Base + other commercially available Data Bases	900	60	No	No
LJH	Proprietary Data Base	+800	All the funds	Yes	No
MondoHedge	Proprietary Data Base	720	48	No	Yes
Blue X	Proprietary Data Base	350 - 400	30-40	Yes	No
EurekaHedge	Proprietary Data Base	310	90	No	No
EACM	Proprietary Data Base	100	100	Yes	No
TalentHedge	Proprietary Data Base	n.a.	n.a.	Yes	No

Problems with Existing HF Indices

Concern over Purity

Classification methodologies

Index Provider	N° of Indices	Classification Methodology
EACM	18	Classified by EACM
HFR	37	Manager self proclaimed style
CSFB	14	Classified by the manager and then checked by the Index Committee
Zurich	5	Classified by Zurich
Van Hedge	16	Classified by Van Hedge
Hennessee	24	Classified by the manager and then checked by the Index Committee
HF Net	37	Manager self proclaimed style
LJH	16	Classified by LJH
CISDM	19	Manager self proclaimed style
Altvest	14	Manager self proclaimed style
MSCI	over 160	Classified by the manager and then checked by the Index Committee
S&P	10	Classified by S&P
Feri	16	Classified by Feri
Blue X	1	Classified by BlueX
MondoHedge	7	Classified by the manager and then checked by the Index Committee
EurekaHedge	3	Not reported
HFIntelligence	9 InvestHedge + 12 EuroHedge + 7 AsiaHedge	Not reported
Bernheim	1	Not reported
TalentHedge	3	Classified by TalentHedge

Hedge Fund Indices are not Created Equal

Heterogeneity in HF Indices – Max Monthly Difference

Sub-Universe	Max Difference (with dates and indices)
Convertible Arbitrage	4.75% (Oct 98; CSFB (-4.67) / Hennessee (0.08))
Emerging Markets	19.45% (Aug 98; (MAR -26.65) / Altvest (-7.2))
Equity Market Neutral	5.00% (Dec 99; Hennessee (0.2) / Van Hedge (5.2))
Event Driven	5.06% (Aug 98; CSFB (-11.77) / Altvest (-6.71))
Fixed Income Arbitrage	10.98% (Oct 98; HF Net (-10.78) / Van Hedge (0.2))
Global Macro	17.80% (May 00: Van Hedge (-5.80) / HF Net (12))
Long/Short	22.04% (Feb 00: EACM (-1.56) / Zürich (20.48))
Merger Arbitrage	1.85% (Sep 98: Altvest (-0.11) / HFR (1.74))
Relative Value	10.47% (Sep 98: EACM (-6.07) / Van Hedge (4.40))
Short Selling	21.20% (Feb 00: Van Hedge (-24.3) / EACM (-3.09))
Distressed Securities	7.38% (Aug 98: HF Net (-12.08) / Van Hedge (-4.70))
Fund of Funds	8.01% (Dec 99: MAR-Zürich (2.41) / Altvest (10.42))

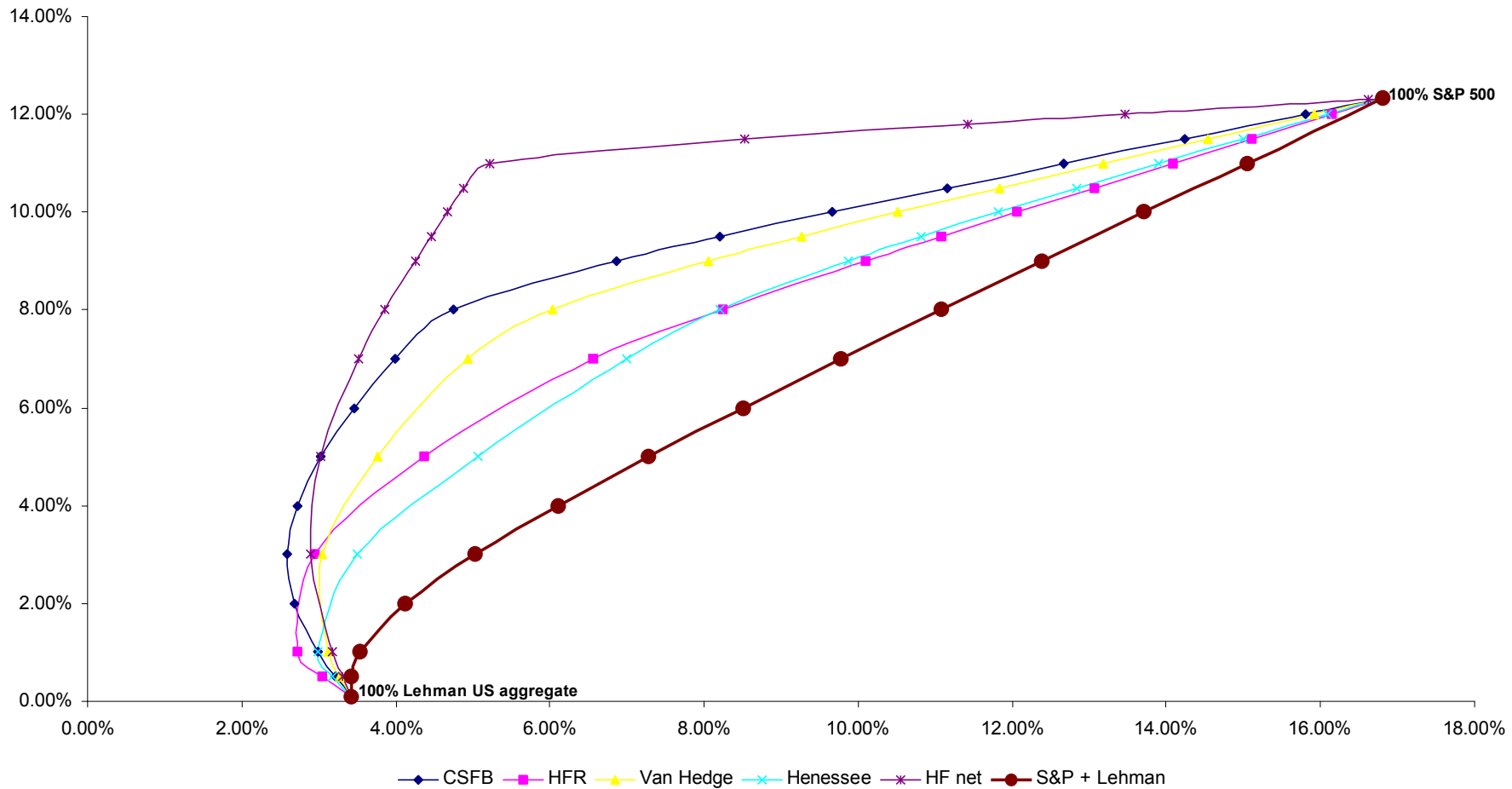
Hedge Fund Indices are not Created Equal

Heterogeneity in Hedge Fund Indices – Correlation

Sub-Universe	Average Correlation	Lowest Correlation
Convertible Arbitrage	0.8183	0.6350
Emerging Markets	0.9284	0.8301
Equity Market Neutral	0.4276	0.1258
Event Driven	0.9232	0.8458
Fixed Income Arbitrage	0.5407	0.2254
Global Macro	0.5598	0.2698
Long/Short	0.4575	-0.1901
Merger Arbitrage	0.9193	0.8797
Relative Value	0.6752	0.3042
Short Selling	0.8811	0.7796
Distressed Securities	0.8645	0.7218
Fund of Funds	0.8757	0.7985

Hedge Fund Indices are not Created Equal

Implications for Asset Allocation – Fixed-Income Arb



Efficient frontiers based on monthly data for the period extending from January 1996 to October 2001

Indexing the Indices

Portfolio of Indices

Given that existing hedge fund indices offer very contrasted views of HF returns, an investor seeking a reference index is left with the following three options :

- Option 1 : Build a new index (requires a significant amount of time, resources and know-how)
- Option 2 : Select one of the available indices (*a priori* requires little time, resources and know-how)

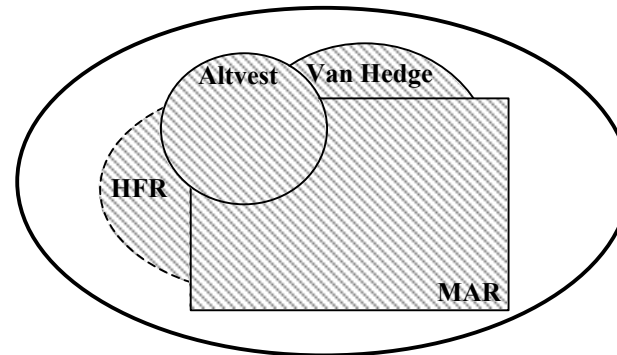
Options 1 & 2 are based upon the assumption that there exists such a thing as a “best index”. Any consensus on the subject is however very hard to achieved, as evidenced by the number of competing indices and methods. Therefore options 1 and 2 both lead to accept a fair amount of subjectivity.

- Option 3 : Build an index (e.g., a portfolio) of indices
 - ⇒ Enhances representativity
 - ⇒ Reduce biases

Indexing the Indices

Enhancing Representativeness

Theorem 1 : An index of indices is always more representative than any competing index it is based upon



$$I_P = \left(\bigcap_{i=1, \dots, n} I_i \right) \cup \left(\overline{\bigcap_{i=1, \dots, n} I_i} \right) = \bigcup_{i=1, \dots, n} I_i$$

Let $\text{Card}(I_j)$ be the number of funds in the data base used by index I_j

$$\text{Card}(I_P) = \text{Card} \left(\bigcap_{i=1, \dots, n} I_i \right) + \text{Card} \left(\overline{\bigcap_{i=1, \dots, n} I_i} \right) = \text{Card} \left(\bigcup_{i=1, \dots, n} I_i \right) \geq \max_{i=1, \dots, n} (\text{card}(I_i))$$

Indexing the Indices

Reducing the Bias

Theorem 2 : An index of indices is always less biased than the average of the set of indices it is extracted from

$$s_{e_p}^2 \leq \sum_{i=1}^n w_i s_{e_i}^2$$

Indeed, if we assume that biases in competing indices are independent:

$$s_{e_p}^2 = w' \cdot \sum_e \cdot w = \sum_{i=1}^n w_i^2 s_{e_i}^2$$

where w is the vector containing portfolio weights, i.e. $w = (w_1, \dots, w_n)$. We then have :

$$\sum_{i=1}^n w_i^2 s_{e_i}^2 \leq \sum_{i=1}^n w_i s_{e_i}^2$$

EDHEC Alternative Indices

Construction Methodology

A Principal Component Analysis of a time-series allows one to explain the behavior of observed variables using a smaller set of unobserved implied variables. From a mathematical standpoint, it involves transforming a set of correlated variables into a set of orthogonal variables, or implicit factors, which reproduces the original information present in the correlation structure. Each implicit factor is defined as a linear combination of original variables.

The first principal component can be regarded as the “best one dimensional summary” of a set of competing indices, as it accounts for the largest fraction of the information they contain

$$\max_w \frac{I_1}{\sum_{i=1}^N I_i} \quad \text{where } \lambda_i \text{ is the eigenvalue associated with the } i\text{th principal component}$$

Furthermore, a simple normalization can be performed to obtain an index which can be regarded as a portfolio of competing indices.

EDHEC Alternative Indices

Management Principles

The composition of different Edhec Alternative Indexes is calculated every three months based on a PCA on the historical performance data (three years) of the selected competing indices

An analysis of the risk/return measures for Edhec indices is published the 3rd working day of the month M+1 on the website *www.edhec-risk.com*, with flashes available on the 26th of the month

Example: Performance for January is published March 5th, with a flash available on February 26th

Historical performances of Edhec alternative indices are available starting as of January 1997, and do not suffer from ex-post adjustments

EDHEC Alternative Indices Composition

Edhec Indexes	HFR	CSFB	EACM	Zurich	Altvest	Hennessee	Van Hedge	MAR	HF Net	Barclay
Convertible Arbitrage	X	X	X	X		X			X	
CTA Global		X						X	X	X
Distressed Securities	X		X	X	X	X	X		X	
Emerging Markets	X	X			X	X	X	X	X	
Equity Market Neutral	X	X				X	X	X	X	
Event Driven	X	X	X	X	X	X		X	X	
Fixed Income Arbitrage	X	X				X	X		X	
Funds of Funds	X				X		X	X		
Global Macro	X	X			X	X	X	X	X	
Long Short Equity		X	X	X	X				X	
Merger Arbitrage	X		X	X	X	X			X	
Relative Value	X		X		X	X	X		X	
Short Selling	X		X				X	X		

EDHEC Alternative Indices

Advisory Board

Decisions related to inclusion or exclusion of one index in the construction of Edhec alternative indices are taken by a dedicated Advisory Board on the basis of

- The available history
- The clarity of its construction method
- Its representativity in terms of being a reference index for managers and/or investors as well as whether it takes existing funds into account
- The completeness of the provider's indices
- The stability of the composition
- The regularity with which the data/index is published

EDHEC Alternative Indices

A Better Representativity

Correlation coefficients with respect to representative portfolios (*)

Investment Styles	Edhec Indexes	Competing Indexes
Convertible Arbitrage	0.84	0.77
Distressed Securities	0.94	0.88
Emerging Markets	0.98	0.95
Equity Market Neutral	0.41	0.35
Event Driven	0.96	0.93
Fixed Income Arbitrage	0.81	0.63
Funds of Funds	0.93	0.88
Global Macro	0.77	0.61
Long Short Equity	0.98	0.67
Merger Arbitrage	0.86	0.83
Relative Value	0.89	0.75
Short Selling	0.73	0.71
Average Correlation Coefficient	0.84	0.75

From January 1998 through December 2000

- * These portfolios are regarded as representative because they have been extracted from a data base containing 7 422 funds (bases MAR, HFR and TASS, as well as 2 317 which do not report their performance to any data base)

EDHEC Alternative Indices

A Good Level of Stability

Stability of the composition of Edhec alternative indices (*)

Edhec Style Indexes	Average weighting change
Convertible Arbitrage	0.24%
Emerging Markets	0.07%
Equity Market Neutral	1.18%
Event Driven	0.17%
Fixed Income Arbitrage	2.03%
Global Macro	0.61%
Long/Short	0.57%
Merger Arbitrage	0.05%
Relative Value	0.34%
Short Selling	0.07%
Distressed Securities	0.27%
Funds of Funds	0.08%

From January 2001 through December 2002

- * The numbers in the table measure the average weighting evolution over the period January 2001 through December 2002

EDHEC Alternative Indices

Replication of EDHEC Indices

Tracking Error « *in-sample* » and « *out-of-sample* » (*)

	Edhec		CSFB	HFR
	<i>In sample</i>	<i>Out of sample</i>	<i>In sample</i>	<i>In sample</i>
Convertible Arbitrage	0.73%	1.05%	2.23%	0.74%
Emerging Markets	2.34%	3.39%	4.61%	3.19%
Event Driven	0.95%	1.36%	2.40%	1.03%
Fixed Income Arbitrage	1.11%	1.25%	0.83%	2.70%
Global Macro	0.12%	2.23%	0.17%	0.13%
Long/Short Equity	1.90%	3.25%	4.02%	2.07%
Market Neutral	0.73%	0.86%	1.03%	2.28%

From January 1999 through September 2002

* In an attempt to illustrate the benefits of Edhec indices from the perspective of replication strategies, we have built replicating portfolios from randomly selected funds in the HF Net data base. The replicating portfolios are designed as the result of a « tracking error » minimization program :

$$\min_w TE = \mathbf{s} (R_{PF} - R_B)$$

EDHEC Alternative Indices

Using EDHEC Indices in an Asset Allocation Context

Average turnover for the minimum variance portfolio (*)

	Edhec	CSFB	HFR
Convertible Arbitrage	0%	0%	0%
Emerging Markets	6.10%	7.17%	7.34%
Equity Market Neutral	0%	0%	0%
Event Driven	0%	0%	0%
Fixed Income Arbitrage	0%	0%	0%
Global Macro	0%	3.70%	0%
Long/Short Equity	0%	3.35%	0%
Short Selling	0.80%	1.83%	1.36%

From January 2001 through December 2002

* In an attempt to illustrate the benefits of Edhec indices from the perspective of strategic asset allocation, we have considered the stability through time in the composition of minimum variance portfolios. The construction of the minimum variance portfolio is obtained from the following optimization program :

$$\min_x \text{var} (R_{PF}) = \sum_{i=1}^n \sum_{j=1}^n x_i x_j \text{cov} (R_i , R_j)$$

Extensions

Heterogeneity in Stock Indices

Style	Maximum Return Differential
Small Cap	28.55 (Feb 00: IIA (-4.04) / Dow Jones Indexes (24.50))
Small Cap Growth	31.78 (Feb00 : IIA (1.56) / Dow Jones Indexes (33.34))
Small Cap Value	17.94 (Jan01 : Fama French (0.774) / Dow Jones Indexes (18.71))
Mid Cap	18.08 (Feb00 : Russell (-4.18) / Wilshire (13.90))
Mid Cap Growth	14.45 (Dec91 : S&P Barra (14.45) / Russell (0.00))
Mid Cap Value	8.99 (Dec91 : S&P Barra (8.99) / Russell (0.00))
Large Cap	7.574 (Sept98 : Dow Jones Indexes -0.62) / IIA (6.947))
Large Cap Growth	30.11 (Feb01 : Dow Jones indexes (-18.36) / S&P Barra (11.75))
Large Cap Value	10.99 (Sept90 : Russell (-13.20) / IIA (-2.21))

This table provides the maximum monthly return difference between competing indices
for the same style