
Portfolio Construction With Alternative Investments

Chicago QWAFAFEW

Barry Feldman

bfeldman@ibbotson.com

August 22, 2002

ibbotsonAssociates

Overview

- Introduction
- Skew and Kurtosis in Hedge Fund Returns
- Intertemporal Correlations with Standard Asset Classes
- Representation of Investor Preferences
- Ibbotson Associates' Simulation-Based Optimization

Introduction

- Are hedge funds and other alternative investments the wave of the future?
- Are hedge fund returns skill-based alpha-generators or efficiently-priced returns to bearing hidden risks?
- How much of an investor's portfolio should be in alternative asset classes?

Introduction, continued

- Almost all real financial assets violate the standard assumptions of modern portfolio theory to some degree
- Conventional performance measures and portfolio construction techniques are blind to these hidden risks
- Some alternative investments trade risk that can be seen for risk that is much less visible: “trading moments”
- Prudent construction of portfolios with alternative investments such as hedge funds and CTAs requires robust optimization techniques

Introduction, continued

- Most quantitative models of investor preferences are also lacking
- Standard risk-return picture oversimplifies
- Value-at-Risk and other “downside” and risk measures do not provide an adequate model of investor preferences
- Another approach: a model from behavioral finance

A Quick Statistical Portrait of Hedge Funds As Financial Assets

- Hedge fund indices are less representative of hedge funds than equity indices are of mutual funds
- Given the lack of transparency of individual hedge funds, however, hedge fund indices provide a window into the statistical characteristics of particular hedge fund strategies
- We should be cautious about making inferences about the performance of individual hedge funds from hedge indices
- Consider a selection of HFRI indices with 150 months of continuous reporting (from January 1990)

A Quick Statistical Portrait of Hedge Funds As Financial Assets, continued

Index	Mean	Std Dev	Sharpe Ratio	Skew	Kurtosis
HFRI Convertible Arbitrage	11.98%	3.76%	3.19	-1.35	3.38
HFRI Relative Value Arbitrage	13.63%	4.29%	3.18	-1.10	10.97
HFRI Equity Market Neutral	10.82%	3.60%	3.01	-0.03	0.25
HFRI Fixed Income	11.43%	4.00%	2.86	-0.35	4.69
HFRI Statistical Arbitrage	10.44%	4.24%	2.46	0.04	0.35
HFRI Merger Arbitrage	11.80%	4.95%	2.39	-2.95	12.84
HFRI Disessed Securities	15.01%	7.22%	2.08	-0.67	5.76
HFRI Fund Weighted Composite	15.56%	8.29%	1.88	-0.67	2.84
HFRI Macro	17.87%	10.39%	1.72	0.25	0.20
HFRI Emerging Markets	15.58%	18.22%	0.86	-0.77	3.45
LB Aggregate Bond	8.14%	4.09%	1.99	-0.25	0.09
Domestic Hi-Yld Corp	8.32%	8.61%	0.97	-0.40	4.87
S&P 500	12.23%	16.36%	0.75	-0.44	0.61
Russell 2000	12.05%	21.00%	0.57	-0.48	0.92
NAREIT-Equity	12.40%	13.93%	0.89	0.25	0.40

A Quick Statistical Portrait of Hedge Funds As Financial Assets, continued

- Most hedge fund “styles” achieve high Sharpe ratios at the expense of high levels of kurtosis and negative skew
 - *High kurtosis*: A greater-than-expected number of large returns for a given standard deviation
 - *Negative skew*: Larger returns tend to be negative
- The HFRI fund-weighted composite has high negative skew and significant kurtosis, suggesting that most hedge funds should be analyzed in a context that takes account of higher moments

Individual macro and market neutral hedge funds kurtosis much greater than that of indices

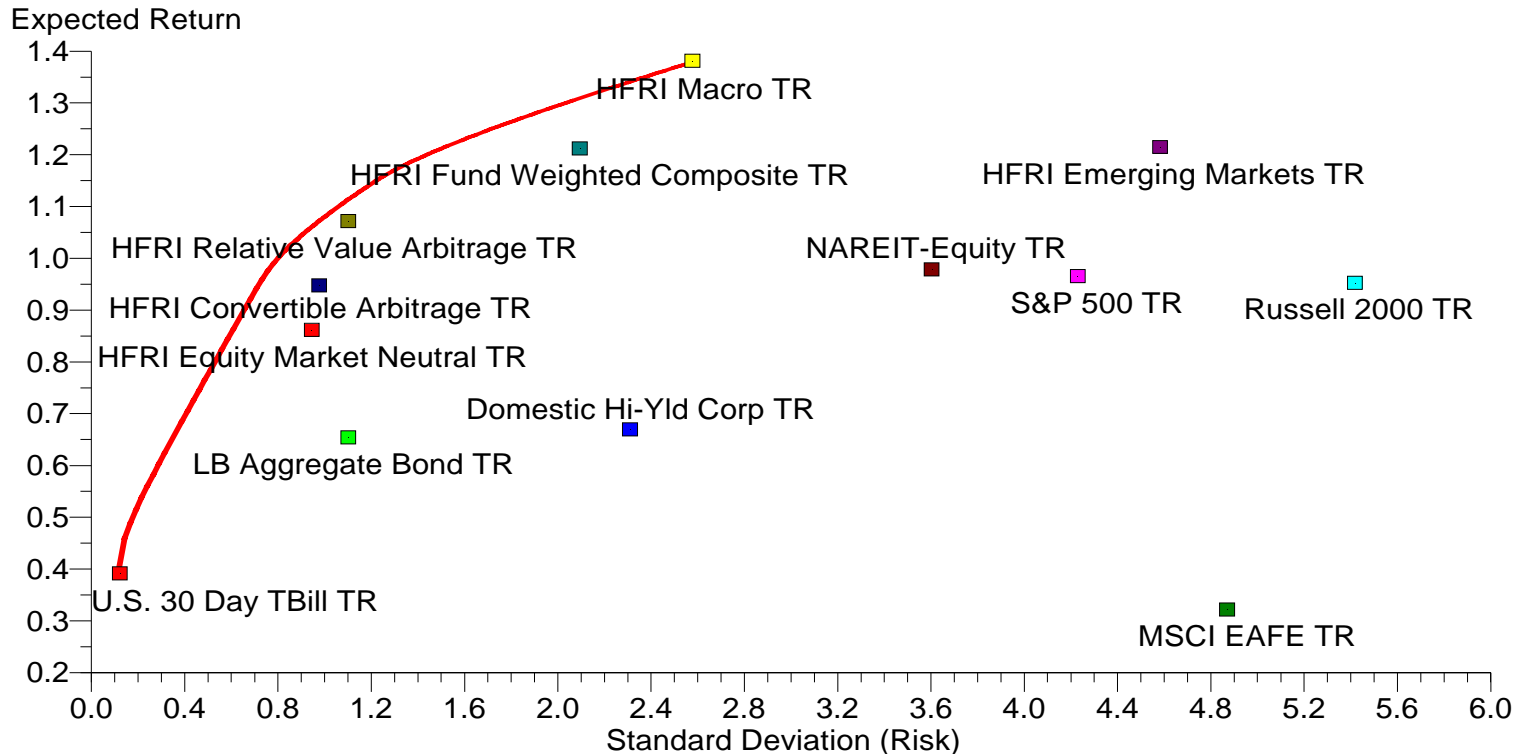
- Some hedge fund indices, particularly equity market neutral and global macro, appear to suggest that individual funds are “well behaved”
- Casual analysis of individual fund data does not support this conclusion

Index or Category	Mean	Std Dev	Sharpe Ratio	Skew	Kurtosis
HFRI Macro	17.87%	10.39%	1.72	0.25	0.20
TASS MACRO FUNDS	14.36%	20.11%	0.71	0.12	28.62
HFRI Equity Market Neutral	10.82%	3.60%	3.01	-0.03	0.25
TASS NEUTRAL FUNDS	12.27%	11.16%	1.10	1.49	18.15

Trading Moments: It may be lunch but it isn't free

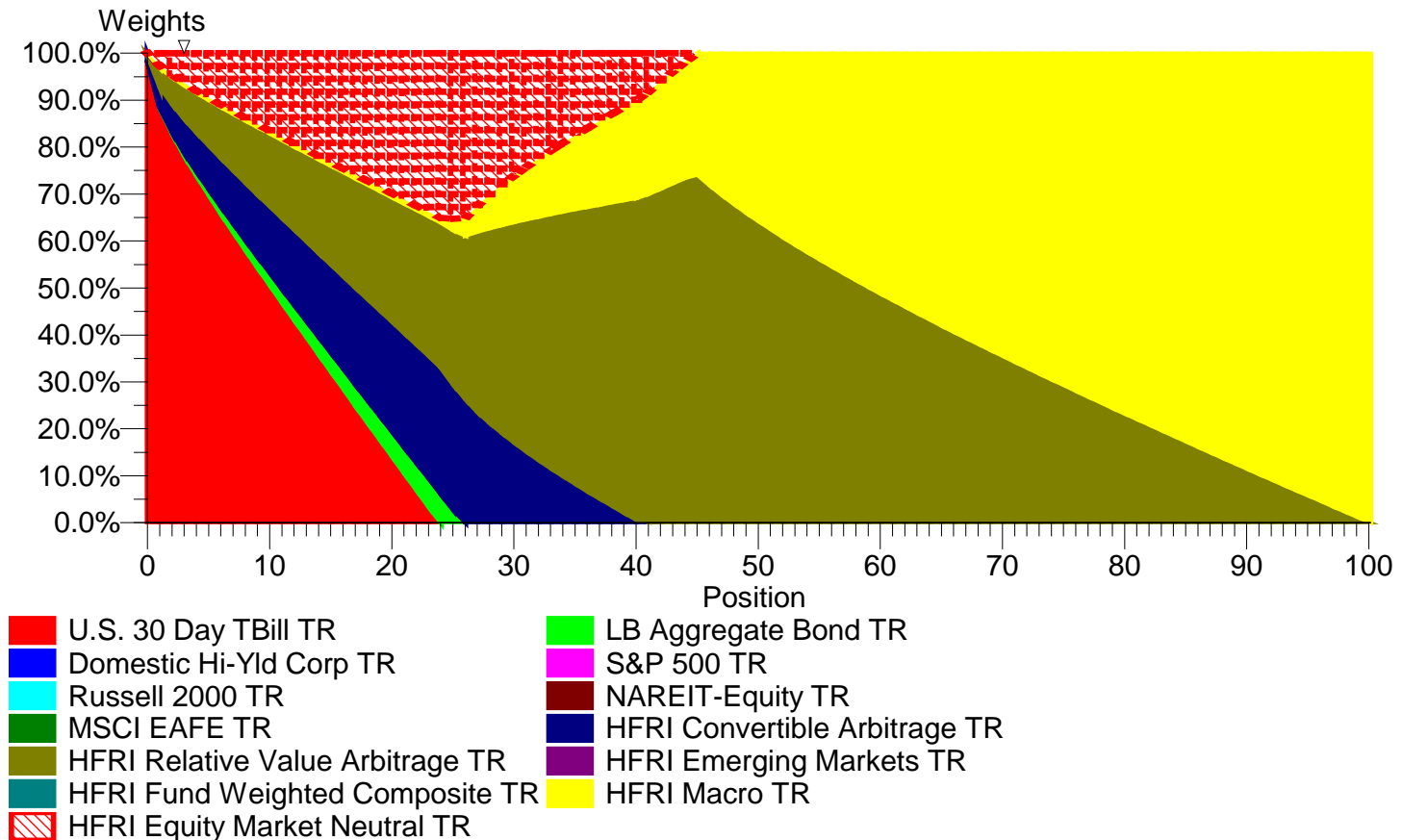
- Standard information statistics and portfolio construction methods can give the illusion that alternative investments are a “free lunch”
 - Sharpe ratios can be misleadingly high (Till 2001)
 - Mean variance methods can over-allocate

Efficient frontier based on mean-variance optimization



This is for illustrative purposes only and not indicative of any investment.
Past performance is no guarantee of future results.
© 2002 Ibbotson Associates, Inc.

Asset allocation area chart based on mean-variance optimization



This is for illustrative purposes only and not indicative of any investment.
 Past performance is no guarantee of future results.
 © 2002 Ibbotson Associates, Inc.

Trading Moments: It may be lunch but it isn't free

- Hedge funds and other alternative investments may belong in investor portfolios, but mean-variance methods can't be trusted to tell you how to do it
- *Don't use standard methods to build portfolios with hedge funds!*

Intertemporal Correlations: Another important and often overlooked factor

- Hedge funds and other alternative assets are typically assumed to have low correlations with standard assets
- Asness, Krail, and Liew (2001) show that the simple correlation with standard asset classes may be misleading
- AKL show correlation with past returns is significant
- “Stale prices” provide one explanation for this correlation
- Optionality may provide another explanation

Stale prices or intertemporal correlations? It doesn't matter which ... they're real

Dependent Variable: HFRI Fund-weighted Index

Variable	Coefficient	t-Statistic	Prob.
Constant	0.007	8.29	0.000
SP500	0.083	3.21	0.002
SP500(-2)	0.036	1.92	0.057
RUS2000	0.285	13.95	0.000
RUS2000(-1)	0.069	4.68	0.000
RUS2000(-4)	0.031	2.10	0.038

Correlations of HFRI Equity Market Neutral Index with the Market

- Correlations of HFRI Equity Market Neutral Index with the market appear very low:

S&P 500	0.12
S&P 500 and Russell 2000	0.22

Correlations of HFRI Equity Market Neutral Index with the Market, continued

Dependent Variable: HFRI Equity Market Neutral Index

Constant	0.008	10.01	0.000
RUS2000	0.042	3.10	0.002
RUS2000(-2)	0.050	3.68	0.000
R-squared	0.13		
Adj R-squared	0.12		
F-statistic	11.01		
Prob(F-statistic)	0.000035		
multiple-corr	0.36		

Correlations of HFRI Equity Market Neutral Index with the Market, continued

- Market correlation rises significantly when lagged performance is considered

S&P 500	0.12
S&P 500 and Russell 2000	0.22
Russell 2000 and 2-month Lagged Russell 2000	0.36

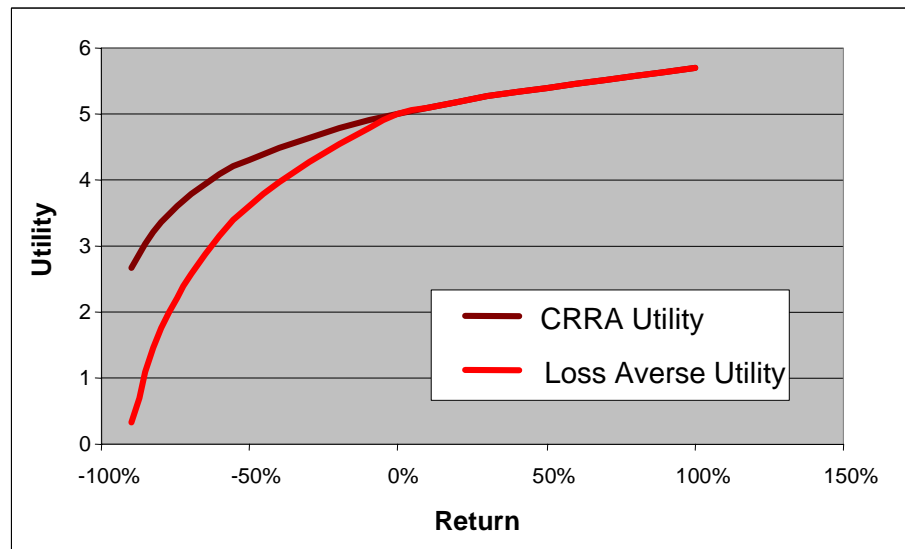
- Portfolio construction must take account of latent as well as contemporaneous correlations

Representation of Investor Preferences

- The utility function approach naturally provides for an asymmetric treatment of gains versus losses
- Standard utility functions, such as the constant-relative-risk-aversion family, still do not adequately represent investor's aversion to losses
- The loss-averse utility model of the "prospect theory" of Kahnemann and Tversky (1979) appears to provide superior representation of investor preferences

Prospect Theory

- Prospect theory provides for a “reference point” for gains and losses
- Experiments show that people weight losses relative to a reference point about twice as much as predicted by the constant relative risk aversion utility function



Ibbotson Associates' Approach to Simulation-Based Optimization

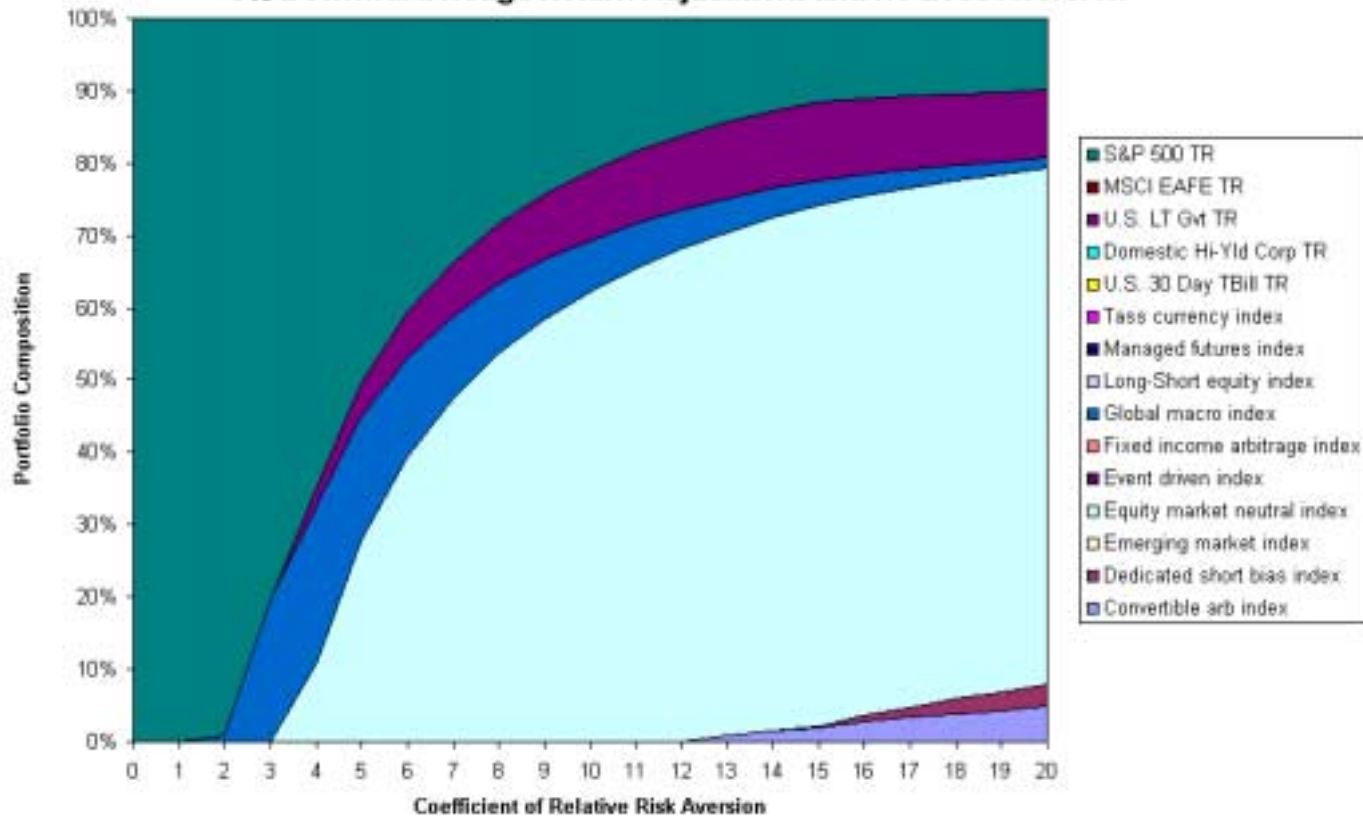
- Characterize the skew and kurtosis of individual assets
- Build time series models to capture correlations between assets across time
- Simulate random asset return histories consistent with individual asset characteristics and time series correlations
- Build portfolios that maximize the utility of investors with prospect theory utility functions

Example

- Based on TASS indices to 6/01
- Standard benchmarks: S&P 500, EAFE, Long Term Government Bonds, Hi-Yld Bonds, Cash
- Hedge fund attrition is accounted for by reducing index returns by 3% per annum (Brooks and Kat (2001))
- Two cases considered: without and using loss aversion in the investor's utility function

Simulation-Based Optimization without Loss Aversion

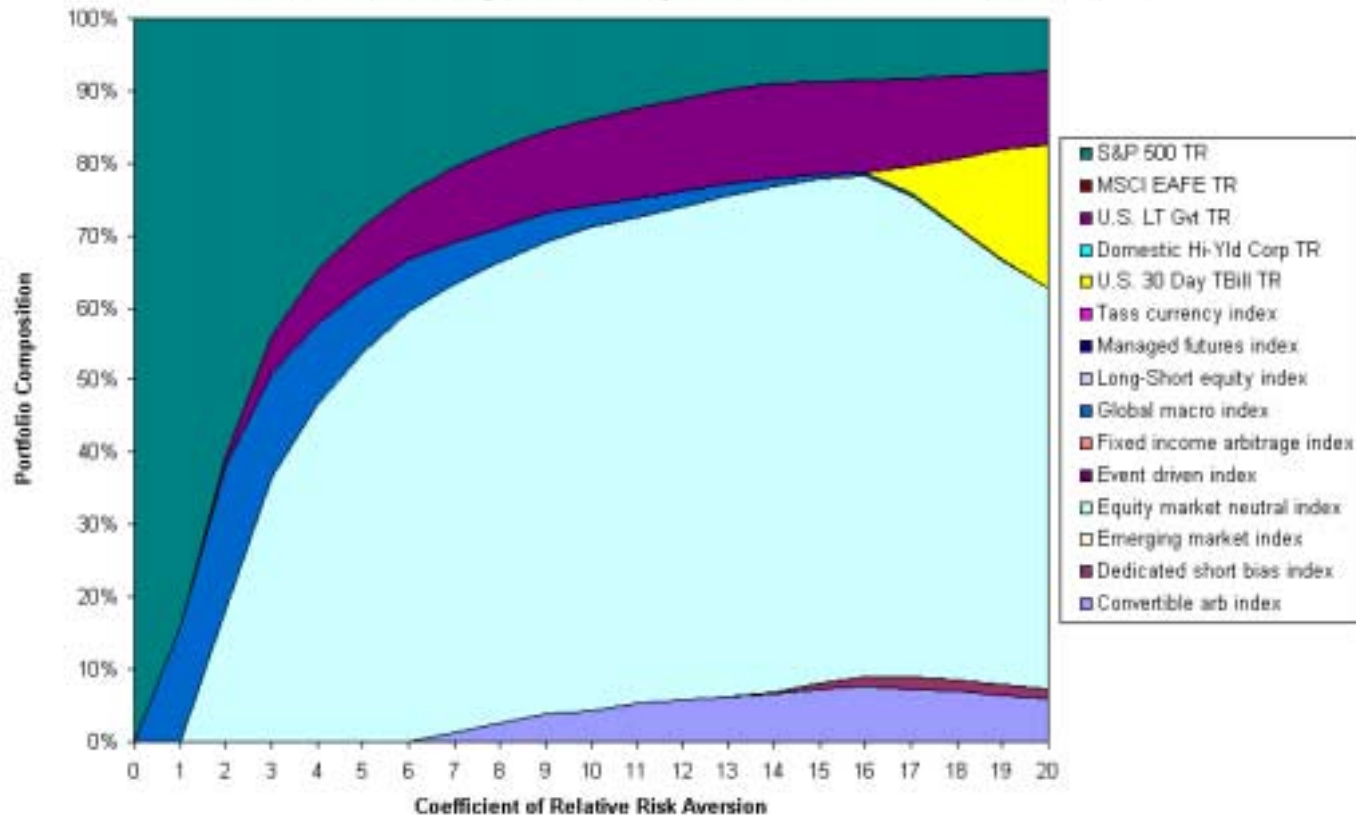
**CHART 1: Portfolio Allocations with One Year Horizon
3% Downward Hedge Return Adjustment and No Loss Aversion**



This is for illustrative purposes only and not indicative of any investment.
Past performance is no guarantee of future results.
© 2002 Ibbotson Associates, Inc.

Simulation-Based Optimization using Loss Aversion

CHART 2: Portfolio Allocations with One Year Horizon
3% Downward Hedge Return Adjustment and 100% Loss Aversion



Discussion

- Using the TASS index data, no hedge fund style outperforms the S&P 500 in the eyes of a risk neutral investor (after survivorship adjustment)
- Increasing risk aversion increases the relative attractiveness of hedge fund styles, particularly global macro and equity market neutral
- (Note that no adjustment is made here to the skew and kurtosis properties of the indices)

Discussion, continued

- Loss aversion has a decisive effect on optimal allocations at low (but non-zero) risk aversion levels
- Global macro and equity market neutral styles appear very attractive to loss and risk averse investors
- Implications: These hedge funds do hedge
- Consistent with theoretical work by Siegmann and Lucas (2002) with respect to investor's demands for financial products and Barberis, Huang, and Santos (2001) regarding impact of loss aversion on the equity risk premium and other large-scale phenomena

Discussion, continued

- These results provide insight into the demand for hedge fund styles
- Note these results are not suitable for basing recommendations to investors because the kurtosis observed at the individual fund level has not been factored into performance expectations

Conclusions

- These results suggest that quantitative methods can be useful for the design of portfolios including alternative investments such as hedge funds
- The simulation-based optimization approach provides a flexible and comprehensive framework that is less *ad hoc* than many methods that can be found in the literature

Conclusions, continued

- Simulation-based optimization is not a panacea
 - Considerable professional judgement is required:
 - Correction for survivorship bias
 - Correction of poor representation characteristics of hedge fund indices
 - Selection of appropriate parameters for investor preferences
- Simulation-based optimization does not tell us the source of hedge fund returns even though does tell us about investor demand
- Thanks to Chandra Goda for computational assistance

References

- Asness, Clifford, Robert Krail, and John Liew (2001): "Do hedge funds hedge?" *Journal of Portfolio Management*, Fall, pp. 6-19.
- Barberis, Nicholas, Ming Huang, and Tano Santos (2001): "Prospect theory and asset prices," *Quarterly Journal of Economics*, v. 116, pp. 1-53.
- Brooks, Chris, and Harry M. Kat (2001): Welcome to the Dark Side: Hedge Fund Attrition and Survivorship Bias Over the Period 1994-2001, University of Reading, h.kat@ismacentre.rdg.ac.uk.
- Kahnemann, Daniel, and Amos Tversky (1979): "Prospect theory: An analysis of decision under risk," *Econometrica*, v. 47, pp. 263-292.
- Siegmann, Arjen, and Andre Lucas (2002): "*Explaining Hedge Fund investment Styles by Loss Aversion: A Rational Alternative*," working paper, asiegmann@feweb.vu.nl.
- Till, Hilary (2001): "Life at Sharpe's end," *Risk and Reward*, September.