Hedge Funds and Hope

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William McChesney Martin the Fed Chairman from 1951 to 1970, famously quipped that it was the Fed's role to "take away the punch bowl just when the party was getting good." The investment party was good. In the 10 years from 1990-1999, stocks' average return was 18.21% per year. A positively intoxicating punch. We are now in the situation, to push McChesney's analogy, of finding a suitable chaser to mitigate the post-boom hangover. At first appearances hedge funds appear to be the chaser of choice.

After the era of greater than 18% annual returns, the siren song of hedge funds is alluring for several stated reasons:

- Returns are always positive and can be spectacularly attractive.
- Hedge Funds are not market directional.
- The long Bull market has left many with significant assets to invest.
- Hedge Funds are run by superior investors, whose insights into the market are subtle and beyond the reach of amateur investors. (A reaction to Do-it-yourself day trading?) The best of the heretofore heroes of mutual fund investing are now running hedge funds.
- Hedge funds venture into areas that were previously taboo and hence create positive return at the expense of the uncreative and less flexible. Bigger fools are now smarter, so to preserve our advantage we have to be even smarter, more creative, and more flexible.

If we are to be prudent investors, it is worth doing homework to validate these claims.

Standard procedure is to use historical data to infer the mean-variance trade-off of a particular asset class relative to other asset classes to calculate optimal asset allocations.

How does this work with hedge funds relative to stocks and bonds? A cursory analysis validates the promises described above. The ratio of return to risk on a stand-alone basis for hedge funds has been very attractive. Furthermore, when interrelationships are considered, the hedge fund asset class becomes even more attractive. Any form of mean-variance portfolio construction optimization chooses very high allocations to hedge funds.

Sadly, digging a little deeper provides only validation for the adage that there is no free lunch.

Digging Deeper.

There are at least four classes of issues that need resolution before we can accept the results that suggest high allocations to hedge funds.

1. Are hedge funds an asset class?

2. Are the returns published as indicative of hedge funds, truly indicative? Furthermore, if they are, are they a good inference for future returns?
3. How should we use asset allocation tools to understand how hedge funds inter-relate with traditional asset classes?
4. If hedge funds are attractive in theory, are they attractive in practice? In particular, do practical issues like transactions costs, fees and taxes effect the take-home return of hedge funds relative to asset classes like stocks and bonds?

We will address each of these issues in turn. The analysis will produce a set of "normalized" hedge fund returns that are more directly comparable to stock and bond returns. It will also go through a portfolio construction exercise that recognizes the non-normality in the distribution of hedge fund returns even after they have been normalized. The final results show that allocations to hedge funds are much lower than those using published return data naively. The allocations are not zero. Hedge funds do play a valuable role in investor's total portfolios. The lower allocations also appear more intuitively correct with respect to our notions of the return compensation for risk and diversification possibilities.

1. Are Hedge funds an Asset Class?

a. Are hedge funds homogeneous?

Hedge funds have been defined as "a pooled investment vehicle that is privately organized, administered by professional investment managers, and not widely available to the public." [President's Working Group on Financial Markets, 1999]. Due to their private nature, hedge funds escape much of the regulation that forces more transparency on the published data that describes other investments. Hedge funds have less restriction on borrowing, short-selling, and derivative use than more regulated investment vehicles like mutual funds. This is not necessarily bad, but it allows for a significantly *wider range* of investment strategies. In practice, there is really no such thing as a "typical hedge fund". Some hedge funds are hedged in that they attempt to be market neutral, whereas others may use long and short investing, but have significant single market exposure. Others will have significant exposures to several markets in asymmetric ways.

Every hedge fund data provider attempts to deal with this issue by dividing their return histories into several classes that are broadly descriptive of the activity of the fund. Given the lack of regulatory convention, classification is usually self-reported by the investing organization. The following table shows the categories (and summary return data) used by the Hennessee Group. This breakdown is typical. It is also the source we have used for data. The "Hennessee H.F. Index" is a composite index created by equal-weighting component indexes. For comparison we also included the MSCI US, MSCI EAFE and Salomon WGBI Index's summary data to show stock and bond returns. Asness, Krail and Liew [2001], and Brooks and Kat [2001] show that hedge fund return data from other distributors is not dissimilar to the Hennessee data. While composition methods vary, all distributors show significant variation of returns *within* category but broadly similar return and risk patterns in the aggregated categories.

Table 1

	Avg. Annual Return	Avg. Annual Standard Deviation	Sharpe Ratio
	1994-2000	1994-2000	1994-2000
Convertible Arbitrage	9.69%	4.61%	0.90
Distressed	10.80%	6.34%	0.85
Emerging	3.78%	15.47%	-0.04
Event Driven	14.79%	7.84%	1.21
Financial Equity	13.82%	13.22%	0.70
Growth	16.56%	14.33%	0.84
International	13.31%	9.07%	0.89
Latin America	4.49%	28.05%	0.11
Levered Bonds	5.79%	7.22%	0.06
Macro	7.55%	8.93%	0.26
Market Neutral	9.45%	3.07%	1.25
Mult. Arbitrage	11.05%	2.99%	1.82
Opportunistic	15.87%	7.89%	1.34
Pacific Rim	5.00%	13.87%	0.02
Risk Arbitrage.	13.02%	3.50%	2.12
Short	-2.65%	22.97%	-0.25
Value	14.09%	8.82%	1.01
Hennessee Idx	11.90%	7.75%	0.85
MSCI US	14.55%	15.12%	0.67
MSCI EAFE	4.11%	14.38%	-0.03
WGBI	7.74%	3.15%	0.68

Traditional asset classes like stocks or bonds are also quite broad in the range of investment implications, but there is sufficient convention and regulation that we can largely understand properties of an investment vehicle by a few choice descriptors. (e.g. Intermediate Duration, Investment Grade Domestic Bonds). Given this description alone, we can probably recreate a historical return series that reasonably approximates the actual fund's. Narrowly defined hedge fund classes like those in Table 1 do not map to a particular provider's returns any certainty.

b. Are hedge funds conceptually similar to stocks and bonds?

A stock or a bond is a legal claim on a physical asset. Hedge funds are an intellectual claim on legal claims on physical assets. Thus there is an extra layer of uncertainty. In addition, the certainty of the legal claim is much higher than the intellectual claim. Practically, this has implications that a return pattern will have *more* variability and *less predictable* variability than an asset that is more directly linked to physical assets. For example, a stock's price will increase roughly in line with the productivity of the underlying company. Furthermore, higher investors' interest in that stock is likely to drive its price higher. On the other hand, given a particular market return, there may only

be a tangential linkage to the linked hedge fund return. Additional investor interest in hedge funds is more likely to erode returns rather than improve them.

Thus hedge funds are not homogenous and are not an asset class in the sense that we traditionally use it. In essence, a hedge fund investor is buying "pure alpha" – or exposure to a manager's skill, not any particular asset class. Assessing "pure alpha" is very different than assessing traditional asset classes. Some of this has consequences that are observable in return data which will need adjustment if it reliable conclusions are to be reached.

2. Are published Hedge fund Returns Indicative?

a. Biases in Data Construction:

Traditional asset classes have two advantages over "pure alpha" strategies. First, even aggressive active strategies have a large systematic market component and a good starting point for understanding return patterns is to use underlying index data. In that way we have a long history of returns and correlations. "Pure alpha" strategies do not look like any index and have consistent histories associated with a particular style, typically more abbreviated than traditional asset classes. Second, most traditional instruments are heavily regulated, so that their reported numbers have some depth and reliability. The regulatory and self-policing conventions (e.g. AIMR conventions) for the reporting of realized stock and bond returns minimize the temptations for submitting only better returns and the dropping of embarrassing returns. There are also strong conventions on how returns are calculated, weighted through time, and prices marked-to-market. Many of the distortions are unavoidable in hedge funds. For example, mark-to-market pricing may be impossible for many illiquid securities. Firms often go to elaborate lengths to acquire objective third-party price estimates, only to find them gravely off when the security is actually sold. Stale or managed prices often lead to returns that have significant positive serial correlation. Brooks and Kat [2001], perform a number of statistical tests that show that hedge fund returns exhibit significant serial correlation, whereas stocks and bond returns do not. A number of hedge fund categories, like Convertible Arbitrage and Distressed Securities, have first order serial correlation coefficients as high as 0.5 at the 1% significance level. Clearly, serial correlation, if real, is a source of potential profits. Sadly, it appears conclusive that it is merely an artifact of pricing practices for less liquid funds.

Survival bias is a common problem with self-reported performance data. Bad funds are simply closed, leaving only better performance in the data. With hedge funds there are no conventions and rules about "owning" a performance track record. Hedge funds are typically paid a management fee and an incentive fee, typically 20% of the profit of the strategy. Many contracts have a "high-water mark" clause that specifies that no incentive fee is payable after a loss until the loss has been made up. It is not uncommon for a fund to fall so far underwater that the chance of ever reaching the high-water mark is

sufficiently small that it simply pays the hedge fund promoter to go out of business and start afresh with a new name.

Good databases can account for this bias. But the databases extant have not. Academic studies have estimated that returns are overstated by as much as 3% per annum because of survival bias (Brown, Goetzmann and Ibbotson, [1999]. Also, Fung and Hsieh, [2000]). Fung and Hsieh also estimate an additional 1.4% per annum overstatement in returns due to biases arising from the funds chosen to be included in the hedge fund indexes (as opposed to those dropping out). The inclusion bias stems from selection criteria to be met for inclusion in the indexes, but also that submission of data is usually for sales distribution reasons with little incentive for reporting smaller funds that fail to take-off.

In this study we adjusted returns by subtracting 2% per annum. We believe that this is a conservative but fair adjustment since it brings Sharpe Ratios into line with what we would expect given some rough idea of the composition of the hedge fund based on its classification.

b. <u>Are past returns indicative of future returns?</u>

The standard footnote gives us the answer to this question, but the "hedge" nature of hedge funds suggests that returns are not market directional, and hence replicable in kind in the future.

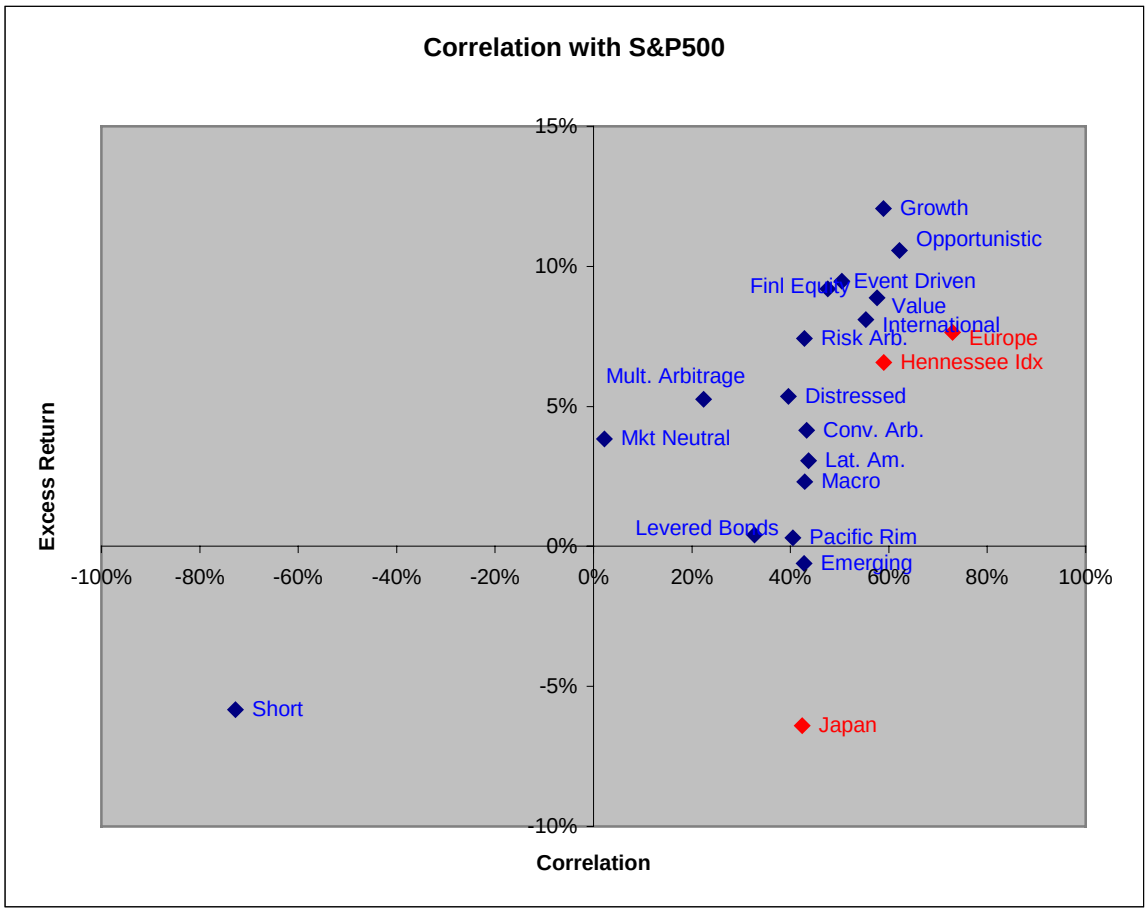


Chart 1

Simple correlation studies show that the market *is* embedded in most hedge funds. Hedge funds are substantially correlated with the US stock market. Moreover, the better the past returns, the higher the correlation with the market. Chart 1, shows a plot of hedge fund index returns plotted against S&P500 index returns over the same period. The attractive returns that were supposedly market independent, are simply the same bull market returns that were achieved by stocks. Publicly available data for hedge funds does not exist for dates prior to the bull market. Therefore it is difficult to refute the case that the correlation was causal rather than coincidental.

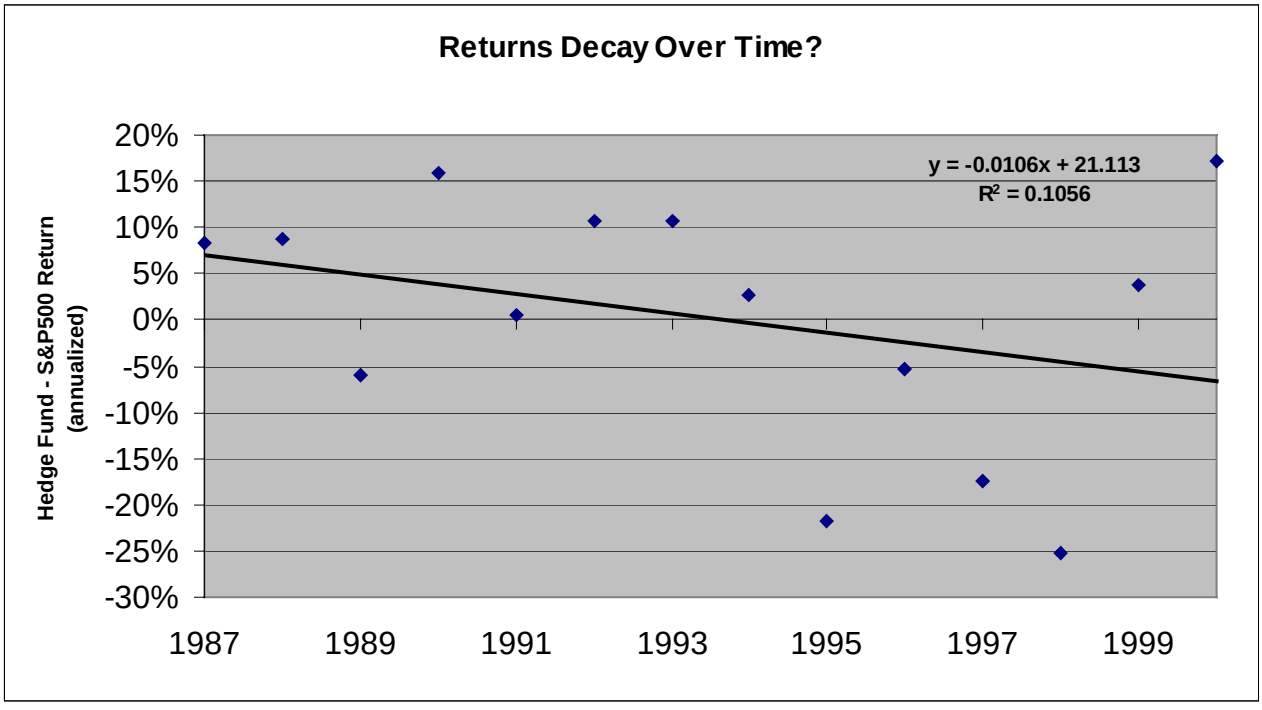
It is easy to use Style Analysis procedures or the like to isolate true alpha. Asness, Krail and Liew [2001] themselves and several other studies they reference, show that at first blush hedge fund alphas after adjusting for market exposure are positive and highly significant. But after they adjust for the biases in data construction described above, market exposure increases, usually sharply reducing alpha (often changing the sign) and reducing its statistical reliability. Hedge funds are less hedged even than they first appear.

b. <u>As the industry matures will returns persist?</u>

The short history of available data is also not confidence building. It is entirely possible that early entrants to the hedge fund business were able to earn returns that were out-of-line with the risk they took. It is estimated that there are now in excess of 6,000 hedge funds being offered, controlling capital of $500 billion. [Forbes 2001]. It seems unlikely that the current universe of funds will be able to exceed their benchmarks by margins achieved in the past by the smaller universe of investors.

Given the short history of available data, it is not possible to state with any statistical certainty that there has been an erosion of return with more entrants. On the other hand,

Chart 2.



crude regression analysis shows a distinct downward slope. Chart 2 shows a regression line drawn through data of median annual hedge fund minus S&P500 return. While the r-square is satisfactory, the few data points give a t-stat of just 1.2.

The large number of participants also speaks to liquidity constraints becoming binding. It has been argued that rather than a certain number of basis points of inefficiency in the market, there are a certain number of dollars of inefficiency. For example, small-cap stocks are sufficiently illiquid so that it is clearly possible that "hidden treasures" can be discovered. On the other hand as more capital pursues these opportunities, they become exhausted. If this situation holds, then extra capital will actually have the reverse effect: adverse market impact.

For the asset allocation work we have not explicitly penalized hedge funds for illiquidity. Rather, we have presumed that the ten years of data include episodes where liquidity has dried up, (In 1994, 1998, for example) and that the shape of the return distribution represents to some extent these episodes. We will adjust for distributions. (See the section on distributions below).

Finally, as described above, the fee structure for hedge funds has evolved so investment managers take some portion of added-value as an incentive fee. Happily, this presumes out-performance. However the share typically around 20% of the out-performance. This too is a significant additional hurdle for managers to overcome when competing with traditional asset classes. At the very least it suggests that fee pressures will develop. Fees subtract from returns. The higher the fee, the lower the realized return. On the other hand if competition forces fees down, it is not unrealistic to assume that investment insight expertise on average will be compromised. Either way, the future portends lower returns.

3. **Use of Asset Allocation Tools with Hedge Fund Data**:

Optimal Asset Allocation is usually performed with some variation of *mean-variance optimization*. Specifically the optimization trades-off expected return (means) versus risk of the asset class (variance/covariance). For stocks and bonds this approach, while having its pitfalls, is well-understood, and when used intelligently produces dependable results.

We have discussed levels and complexion of returns. We now turn to understanding the risk properties of hedge fund returns. Key to this mean-variance optimization is the idea that risk can be adequately described by variance and covariance of securities' returns. This assumption, while not totally benign, gives reasonable results with stocks and bonds if care is exercised. For example, Bayesian smoothing and some understanding of the mean-reversion properties of bond returns yields intuitive and sensible results in asset allocation studies. On the other hand, simple statistics on hedge fund returns show significant differences from normality of distribution and the arrival sequence of returns that build the distribution. First hedge fund returns exhibit significant *skew* and *kurtosis*.

For example, for the overall Hedge Fund index, a kurtosis measure shows a value of 5.32 versus 0.64, 0.24 and 0.96 for U.S. stocks, EAFE stocks and World Government Bonds respectively (defined so that a normal distribution has zero kurtosis). When investors are prompted for their preferences, almost all state that they would be willing to give up outsize positive outcomes in exchange for avoiding equally large negative outcomes. Even without polling investor preference, large negative outcomes can lead to "Gamblers Ruin". That is, when large losses occur with even low probability, the outcome so adversely affects wealth, that even if returns are positive thereafter, cumulative wealth at the end of a holding period is lower than initial capital. The shape of the return distributions is not atypical for option-based products. Even if there are no explicit options embedded in a hedge fund, the way hedge fund portfolios are managed and rebalanced often leads to option-like properties. Not only can this lead to risk being misassessed, it can also lead to the misassessment of value-added. Weisman [2001] creates three different informationless strategies that appear to have information if viewed in a mean-variance framework.

Another tenet of mean-variance optimization is that a typical security's risk can be divided into two mutually exclusive categories. *Systematic* risk and *Idiosyncratic* risk. Finance theory shows that the market does not compensate investors for taking specific risk. Almost by definition, hedge funds are taking most of their risk idiosyncratically. Or as discussed above, where risk is actually largely systematic, it is in ways that may be non-stationary in market exposure.

These issues can be addressed using *Monte Carlo* techniques, which rather than having the simplifying assumption that the distributions of return is fully described by mean and variance, explicitly attempt to forecast the shape of future returns. Of course, this imposes a burden-of-proof on the forecaster to show that predicted return shapes will in fact be realized. This increases the range of statistical uncertainty.

Alternately, optimal portfolios can be constructed using traditional methods, but with extra penalties imposed for the undesirable artifacts described above. We have chosen the latter approach because standard software can be used, and for its simplicity.

We used medians instead of means to account for skewness, although this created only mild differences. Penalizing Kurtosis had a much larger role in the outcome. To adjust to kurtosis, instead of squaring deviations from the mean that is at the root of calculating variance, we have raised deviations to the fourth power. This has the effect of penalizing returns that are further from the mean. In addition, we applied this methodology to a normal distribution and scaled the results so that a normal distribution's variance would be same with the square method and the fourth power method. Again, for simplicity, and to err on the side of not over-adjusting, we have assumed that the distributions capture idiosyncratic properties. We also assumed that correlations between hedge fund classes were adequately described in the unadjusted data.

4. **Practical Issues of Hedge fund Investing**:

Hedge funds are often exposed to practical frictions that reduce the total return available to the fund investor.

In the U.S., Pension Funds, Endowments and Foundations are usually tax-exempt. Individuals are not. In the U.S. (and many other countries) capital gains are taxed differently than income. Hedge funds, not atypically depend on strategies that have high turnover. They also use synthetic instruments that must be periodically "rolled" depending on the calendar. (e.g. Exchange-traded Futures). Transactions usually generate tax-events. Needless to say, taxation is complex, and the impact of taxes is usually effected by levels of asset returns prior to trades – that is there is a *path-dependence* to calculating tax impact. With all these caveats it has been estimated that strategies that are highly tax-inefficient need to earn returns of up to 7% greater than tax-efficient strategies. This is a significant additional hurdle for taxable investors.

For this category, we have simply assumed that investors are tax-exempt.

Putting it Together: Summary Statistics, Results and Caveats.

For the asset allocation we grouped hedge fund categories into three categories – low risk, moderate risk and high risk as defined by the standard deviation of past returns. We name the three categories, Alternatives 1, Alternatives 2, and Alternatives 3. The idea is that Alternatives 1 is a substitute for cash/bond asset allocation choices, Alternatives 2 is a substitute for bond/stock asset allocation choices, and Alternatives 3 is a substitute for stocks.

Table 2 shows summary statistics for the Alternatives fund-of-funds, both prior to the adjustments described above, and step-by-step after the adjustments. The final results are what are used for analysis in the asset allocation optimization.

Table 2.

January 1994-May 2001	**Alt1**	**Alt2**	**Alt3**	**Cash**	**Bond**	**Stock**
Return						
Raw return	8.10%	9.86%	13.54%	5.66%	7.74%	14.55%
Correlation w. US stocks	0.04	0.41	0.67	0.04	0.18	1.00
Predicted excess returns	1.25%	4.54%	7.05%			
Adjusted for Survival/Selection Bias	1.25%	2.54%	5.05%			
Adjusted for Equity Exposure	1.25%	2.14%	3.49%			
Risk						
Raw Standard Deviation	2.50%	3.41%	8.14%	0.21%	3.15%	15.12%
Adjusted for skew and kurtosis	3.59%	4.80%	10.04%			

These data were used as inputs in a mean-variance optimization. Optimizations were performed with a target tracking error (the amount of risk over the benchmark) relative to indexes appropriate and to five different levels of total risk. See Table 3. In addition the mean-variance, the optimization used Bayesian smoothing in a variation of the form advocated by Black & Litterman [1991], to ensure that weights for the portfolio would not be greatly changed with small changes in the inputs.

Table 3.

	Risk Level ----->				
	Portfolio 1	**Portfolio 2**	**Portfolio 3**	**Portfolio 4**	**Portfolio 5**
Benchmark (Cash/Bonds/Stock)	60/40/0	30/50/20	0/50/50	0/25/75	0/0/100
Weights (Cash/Bonds/Stock)	49/33/0	22/39/18	0/41/41	0/19/61	0/0/85
Weights Alternatives 1	11	6	0	0	0
Weights Alternatives 2	7	11	9	6	0
Weights Alternatives 3	0	4	9	14	15
Tracking Error	0.8%	0.8%	1.5%	1.5%	1.5%

Clearly, the process of assigning logical weights to alternative assets is more an art-form than a science. While we have given careful thought to the adjustments we have made, and also used techniques that dampen overreactivity, it is possible that collectively the end result represents a solution that is idiosyncratic. Nonetheless, when one assigns judgmental, but arguably quantitatively justified penalties to alternative assets, one ends up with logical, if unexciting allocations to those classes. Beyond the judgmental nature of the assumptions there is one key issue to consider. If an investor has insight into picking the best of the alternatives – the ones with the lowest correlations, lowest volatilities and highest future returns – then all the adjustments are immaterial and irrelevant. For the purpose of large scale products and distribution, we must assume low skill in such selection – for the purposes of individual clients and individual portfolios, we may be able to modify our assumptions.

Finally, hedge funds are a relatively new class. We fully expect that as the available data become more definitive and refined, we will revise and refine asset class expectations, allocations and approach.

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Hedge Funds and Hope

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Presenter, Roland Lochoff

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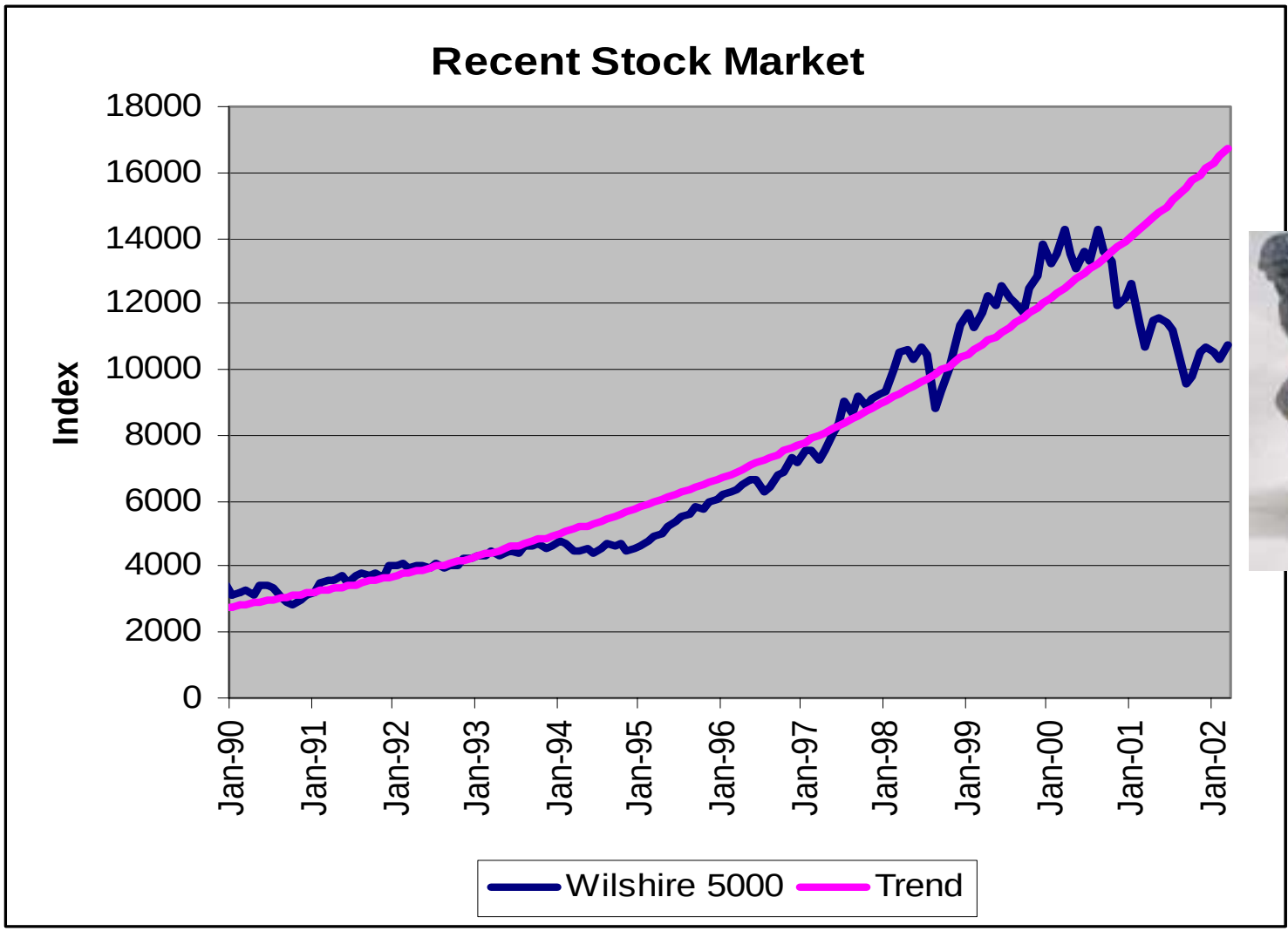
Bull Markets are Habit Forming



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Why Hedge Funds?

- Returns always positive and often double digit
- Returns are not Market Directional
- Run by Superior Investors
- Are not Hamstrung by Conventional Taboos
- After Bull Market -- Significant Assets

Sample Asset Allocation

	Current	Benchmark	Optimized	Relative to Benchmark	Transactions	Return Forecast
US EURO-$ 3 MONTH (LDN:FT) - MIDDLE R	0.0%	0.0%	0.0%	0.0%	0.0%	5.43%
RL_HedgeFund UN	0.0%	0.0%	100.0%	100.0%	100.0%	15.99%
RL_MLDomesticMaster UN	40.0%	40.0%	0.0%	-40.0%	-40.0%	8.28%
RL_Wilshire5000 UN	60.0%	60.0%	0.0%	-60.0%	-60.0%	10.46%
Expected Total Return	9.59%	9.59%	15.99%			
Total RIsk	11.20%	11.20%	9.43%			
Expected Excess Return	0.00%			6.40%		
Tracking Error	0.00%			6.42%		
Asset Weight Traded					200.0%	
Trading Cost (bps)					0.0	

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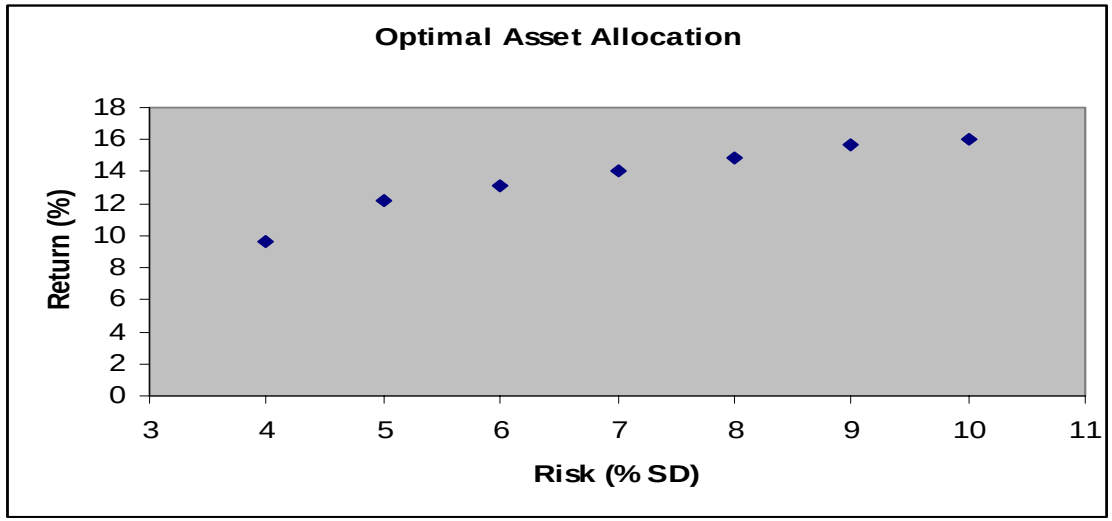
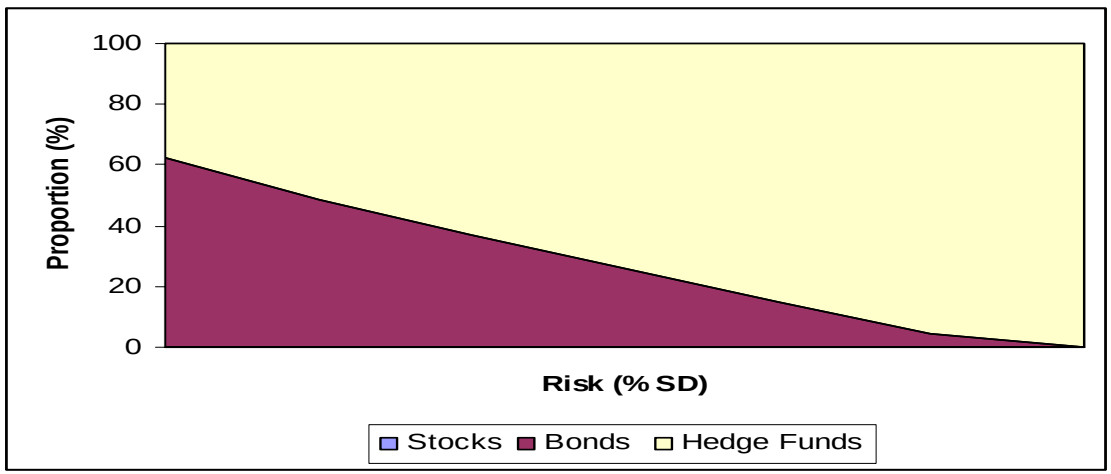
Sample Asset Allocation





- **Where are the Stocks?**

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Sample Asset Allocation

			3 Month Euro $	HedgeFund	DomesticMaster	Wilshire 5000	Volatility
3 Month Euro $			1.00	0.02	0.19	0.01	0.3%
HedgeFund				1.00	-0.06	0.83	9.4%
MLDomesticMaster					1.00	-0.03	3.3%
Wilshire 5000						1.00	18.6%

Key	
	0.5 to 1
	0 to 0.5
	-0.5 to 0
	-1 to -0.5

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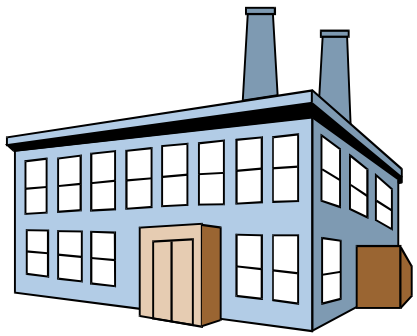
Are Hedge Funds an Asset Class? (Conceptually)



Legal Claim

Funny Money Inc.

Intellectual Claim

Core Portfolio of Assets

Hedge Fund

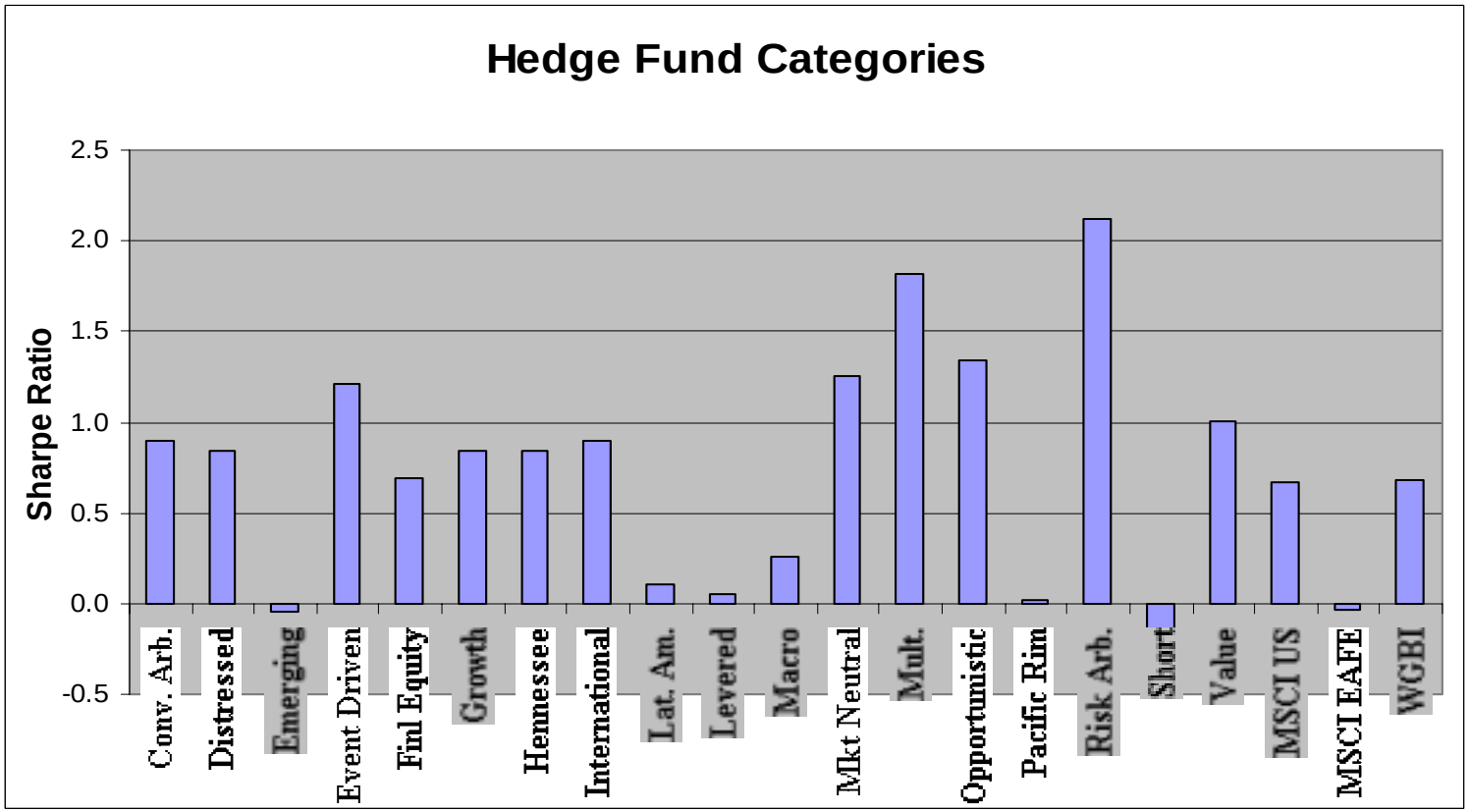
- **Pure α versus $\alpha + \beta$**
- **Assets: Interest ↑ ➡ Price ↑**

  Hedge Fund: Interest ↑ ➡ Price ↓

Are Hedge Funds an Asset Class?

Transparency

- Regulation, Convention, Definition -- Breadth, Style "Adrift"



- Significant Variation ***Within*** Category

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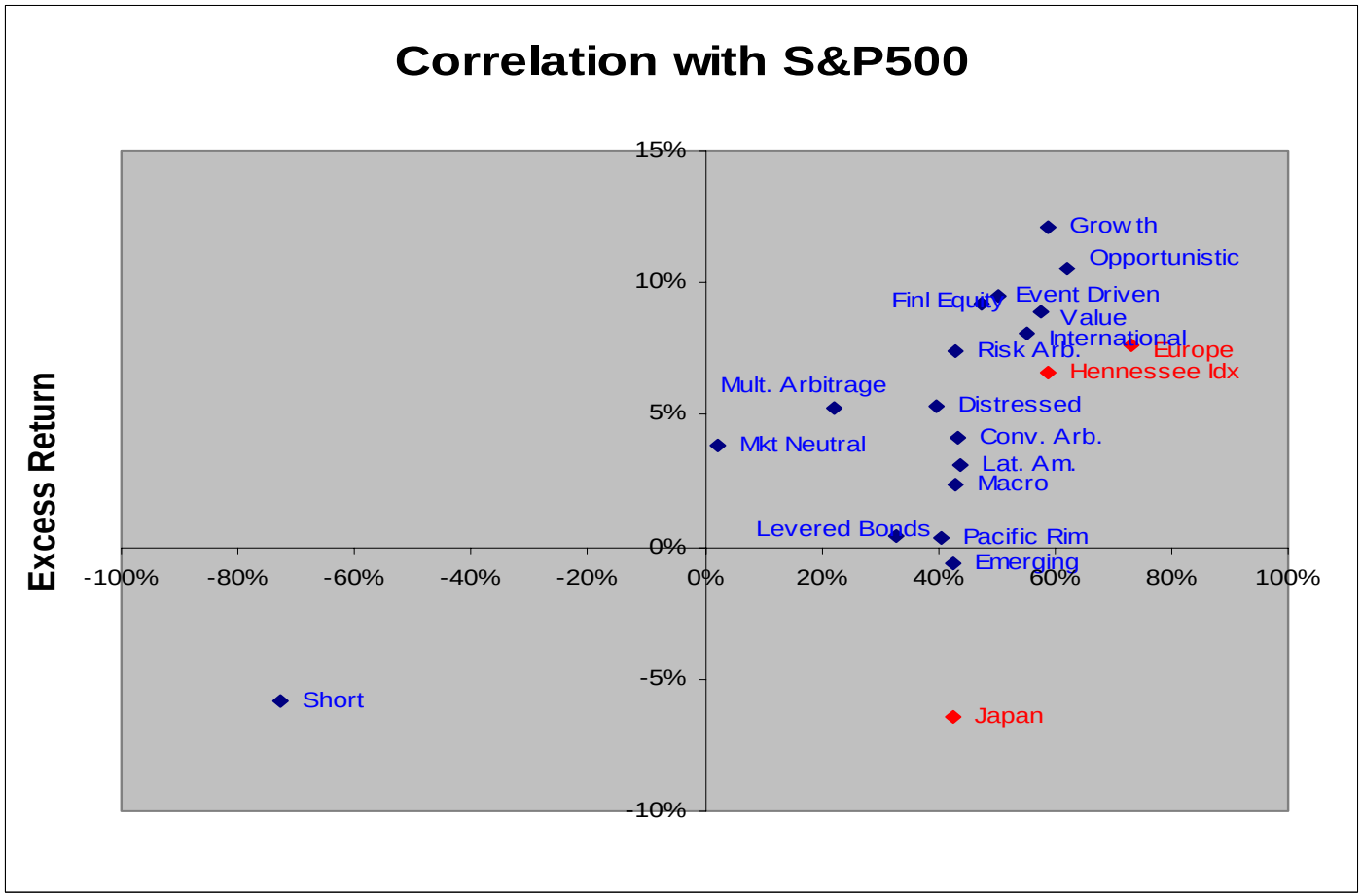
Are Published Returns Indicative?

- Biases In Data
  - Selection Bias
  - Calculation Methodologies
  - Marked-to-Market? -- Serial Correlation High & Significant
    (More on this later)
  - Survivor Bias -- High Water Mark Side-Effect?

Are Hedge Funds Hedged?

- Diversifying?
- Fees for Index Exposure?
- Market Exposure due to good timing?



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Are Hedge Funds Hedged?

1. Take out Market (on a monthly return basis)

$$R_{h,t} = \alpha_h + \beta_h R_{m,t} + \varepsilon_{h,t}$$

2. Adjust for Stale/Managed Prices (Serial Correlation of Returns)

$$R_{h,t} = \alpha_h + \beta_{0h} R_{m,t} + \beta_{1h} R_{m,t-1} + \beta_{2h} R_{m,t-2} + \ldots + \varepsilon_{h,t}$$

$R_{h,t}$ = Return on hedge fund h at time t

α_h = Intercept of hedge fund h after adjusting for market

$R_{m,t}$ = Return of stock market at time t

β_{ih} = Elasticity of response of hedge fund h to market of lag i $(i = o, -n)$

Are Hedge Funds Hedged?

Monthly Regressions of Excess Hedge Fund Returns on S&P 500 Returns

						Hypothesis Testing	
Portfolio	Simple Monthly Regression Beta	Contemporaneous Beta (Bo)	Sum of Lagged Beta (B1+B2+B3)	Total Summed Beta (B0+B1+B2+B3)	Difference in Beta	Sum All Betas (=0)	Sum Lagged Betas (=0)
Aggregate Hedge Fund Index	0.37	0.40	0.44	0.84	0.47	(0.0%)	(0.1%)
Convertible Arbitrage	0.04	0.08	0.35	0.43	0.38	(0.0%)	(0.0%)
Event-Driven	0.28	0.31	0.30	0.61	0.33	(0.0%)	(0.0%)
Equity Market-Neutral	0.12	0.13	0.08	0.20	0.09	(0.1%)	(10.8%)
Fixed-income Arbitrage	0.02	0.05	0.31	0.36	0.33	(0.0%)	(0.0%)
Long/Short Equity	0.55	0.57	0.42	0.99	0.45	(0.0%)	(0.9%)
Emerging Markets	0.74	0.79	0.46	1.25	0.51	(0.0%)	(11.8%)
Global Macro	0.37	0.41	0.57	0.98	0.61	(0.0%)	(0.7%)
Managed Futures	0.01	-0.01	-0.17	-0.19	-0.20	(38.3%)	(34.1%)
Dedicated Short Bias	-0.99	-1.01	-0.25	-1.27	-0.28	(0.0%)	(19.7%)

Source: Asness, Krail & Liew

Are Hedge Funds Hedged?

Annual Sharpe Ratios of Unhedged And Hedged (Equity Neutral) Hedged Fund Returns

	Unhedged and Hedged performance		
Portfolio	Monthly Unhedged Sharp Ratio	Monthly Beta-Hedged Sharpe Ratio	Summed Beta-Hedged Sharpe Ratio
Aggregate Hedge Fund Index	0.80	0.31	-0.40
Convertible Arbitrage	1.07	0.95	-0.11
Event-Driven	1.05	0.55	-0.27
Equity Market-Neutral	1.85	1.55	1.05
Fixed-income Arbitrage	0.36	0.28	-0.56
Long/Short Equity	0.94	0.39	0.23
Emerging Markets	0.11	-0.47	-0.82
Global Macro	0.54	0.18	-0.40
Managed Futures	-0.10	-0.12	0.14
Dedicated Short Bias	-0.38	0.61	0.89

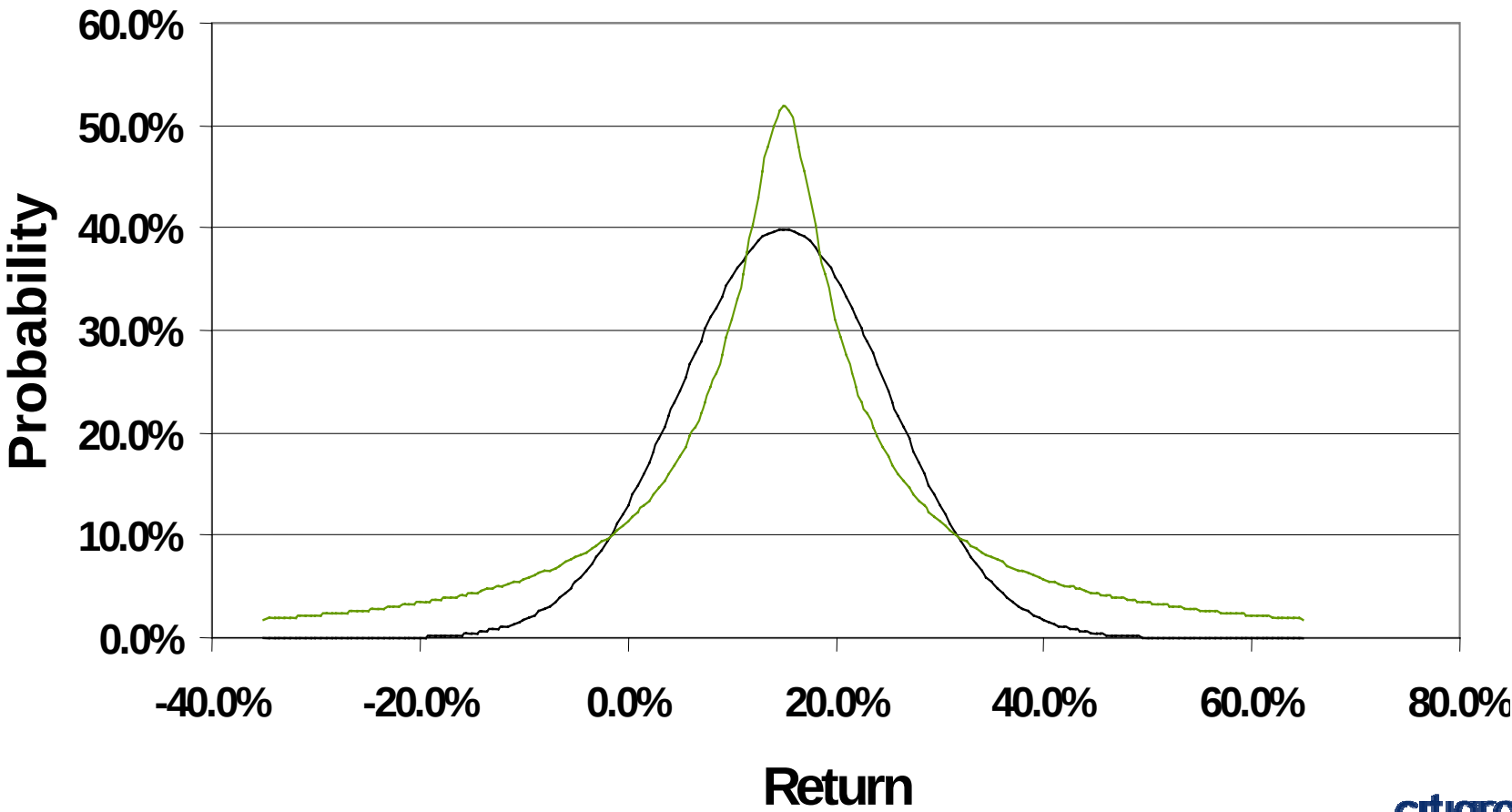
Source: Asness, Krail & Liew

Does the Past Infer the Future?

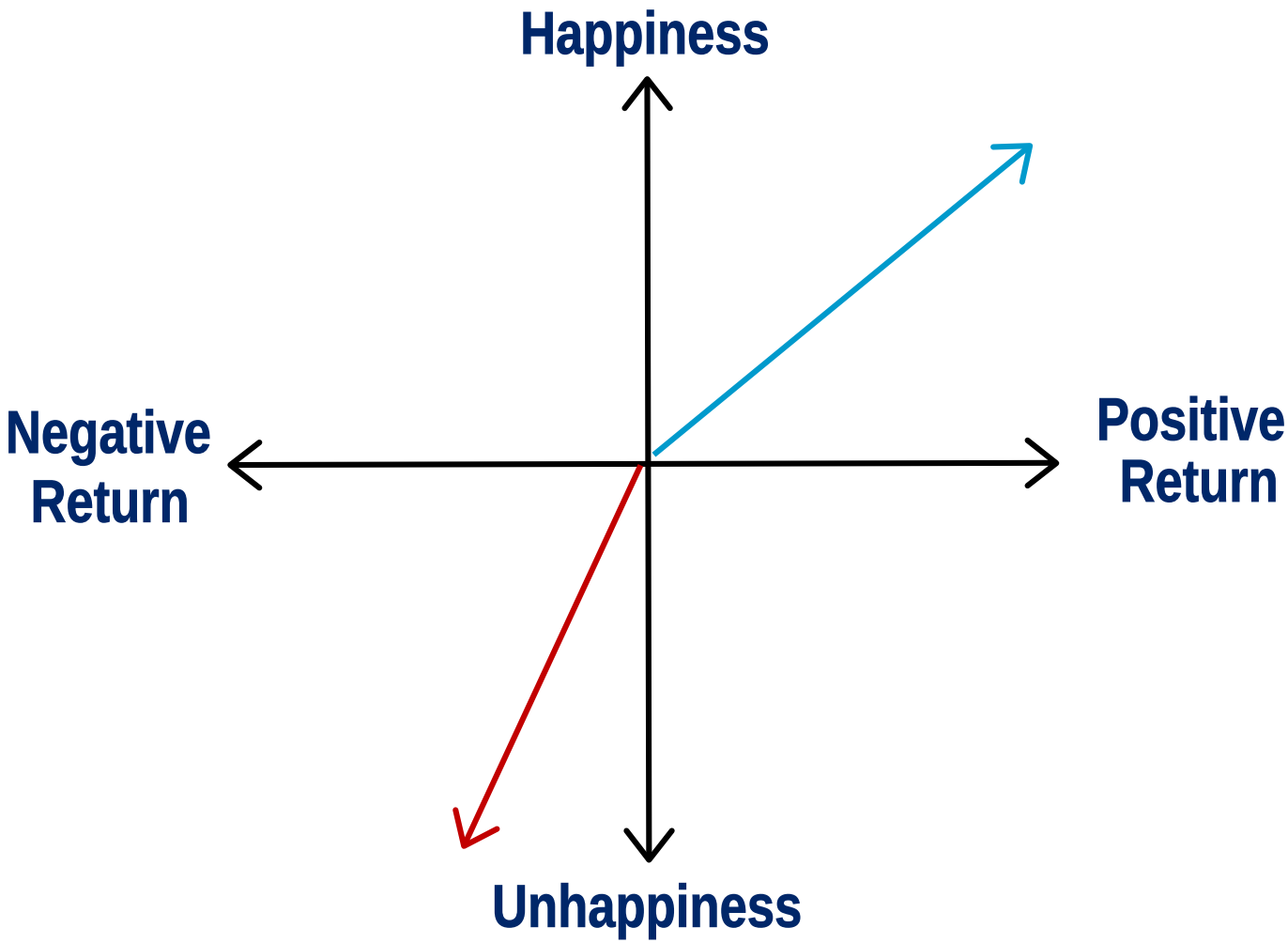
- "The past does not infer the future, but it's the best we have." -- J. M. Keynes
- Short History/Rapid Growth in Number of Funds
- Liquidity Constraints (Dollars of Alpha)
- Dilution -- Performance Fee pressure & Expertise

Turning Toward Risk: Utility and Kurtosis

- Which asset is riskier?
  - Equal standard deviation, different kurtosis



Investor Preference



	Hennessee Index	US Stocks	EAFE	World Bonds	Normal Distribution
Kurtosis	5.32	0.62	0.24	0.96	0

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Return Distributions Suggest...

- Risk of Gamblers' Ruin
- Informationless Strategies that have Information in a Mean-Variance Framework (Weisman)
- Compensation for Specific Risk?

Solutions to Non-Normal Distributions

- Passage of Time
- Monte Carlo Simulation (PDE Interaction?)
- Skew/Kurtosis Penalties

E.g. $U = [\alpha - \lambda_1 * T\mathcal{E}^2 - \lambda_2 * T\mathcal{E}^4]$

- Bayesian Optimization

Putting it Together

	Risk Level ----->				
	Portfolio 1	**Portfolio 2**	**Portfolio 3**	**Portfolio 4**	**Portfolio 5**
Benchmark (Cash/Bonds/Stock)	60/40/0	30/50/20	0/50/50	0/25/75	0/0/100
Weights (Cash/Bonds/Stock)	49/33/0	22/39/18	0/41/41	0/19/61	0/0/85
Weights Alternatives 1	11	6	0	0	0
Weights Alternatives 2	7	11	9	6	0
Weights Alternatives 3	0	4	9	14	15
Tracking Error	0.8%	0.8%	1.5%	1.5%	1.5%

Caveat to the Caveats

- Art not Science (But Conservative)
- Distribution Within Aggregates
- If you can identify real skill, alpha matters more than risk
- Refinement of Data and Methodologies as Industry Matures
- Only at Northfield are the Meals Free of calories

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