Risk and Performance Measurement For Alternative Investment

Presented at

Investment Performance Measurement Conference

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Outline

- Difference Between Traditional and Absolute Returns in Investment Management
- Current State of Risk Management and Performance Measurement
- Measure of Association: Implications for Investment Management
- Challenges Involved

The Difference

- The Differences Between Benchmark-Based and Absolute-Return Management Result From:
  - Competing Views on Sources of Investment Returns
- Which Then Result in Differing:
  - Investment Processes;
  - Risk Management Practices; and
  - Expectations for Money Managers.

Different views on sources of returns.

COMPETING VIEWS ON SOURCES OF RETURNS

- Asset Allocation as Dominant Source of Returns
- Absolute Returns Expected from Each Investment
- Hybrid View

There are three different views.

I. Asset Allocation

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- **The view that *asset allocation* is the dominant source of returns …**

- **… has resulted in *benchmark-based management*.**

Some believe that asset allocation accounts for most returns.

I. Asset Allocation

(Continued)

- Performance Attribution Studies
- CAPM
- Long-Term Structural Returns
- Industry Organization
- Investment Process
- Risk Measurement and Monitoring
- Consequences

A. Performance Attribution Studies

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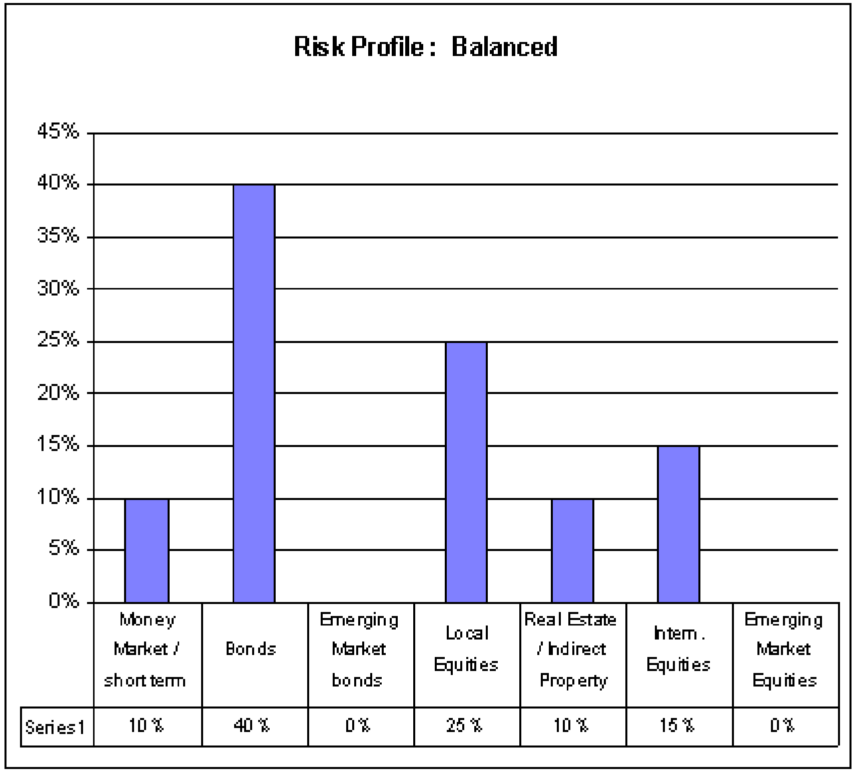
- **The decision by an institutional investor on how to allocate among a number of asset classes is the key performance driver.**



Asset allocation is the most important driver.

<u>A. Performance Attribution Studies</u>

(Continued)

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- **Asset allocation is more important than security selection.**

- ***Asset allocation policy on average accounted for 93.6% of total return variation across time amongst the corporate plans studied.***

  – Brinson,G.P., L.R. Hood, and G.L. Beerbower, “Determinants of Portfolio Performance,” <u>Financial Analysts Journal</u>, July – August 1986.

A. Performance Attribution Studies

(Continued)

Current Policy Portfolio (October 2000)

		Minimum	POLICY	Maximum	Benchmark
1.	Domestic equities	12 %	22 %	40 %	80 % S&P 500, 10 % S&P 400, 10 % Russell 2000
2.	Foreign equities	10	15	20	93 % EAFE, 7 % Salomon Extended ex US MS
3.	Emerging markets	3	9	13	IFC Global and EMBI+
4.	Private equities	10	15	20	Cambridge Associates Weighted Composite
	Total Equities:	40	61	75	
5.	Absolute return portfolio	0	5	10	60 % Sal Global Eq, 20 % Morgan Global Bonds, 20 % LIBOR + 5 %
6.	High-yield bonds	0	3	5	Salomon High-Yield and Bankrupt
7.	Commodity-related[a]	3	6	9	GSCI and NCREIF Timber leverage adjusted
8.	Real estate	4	7	10	NCREIF Property Index, 50 % leverage
	Total	12	21	32	
9.	Domestic bonds	5	10	20	Lehman 5+ year Treasury Index
10.	Foreign bonds	0	4	10	J.P. Morgan Non U.S.
11.	Inflation-indexed bonds	2	7	12	Salomon 5+ year TIPS
12.	Cash	(8)	(3)	10	One month LIBOR
	Total Fixed Income:	8	18	30	
		Overall Total:	100 %		

Harvard Management Company (2001)

B. CAPM

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- **Under the Capital Asset Pricing Model (CAPM), in equilibrium all assets and portfolios have the same return after adjusting for risk.**

- **Empirical studies had justified the use of the CAPM for a quarter of a century.**

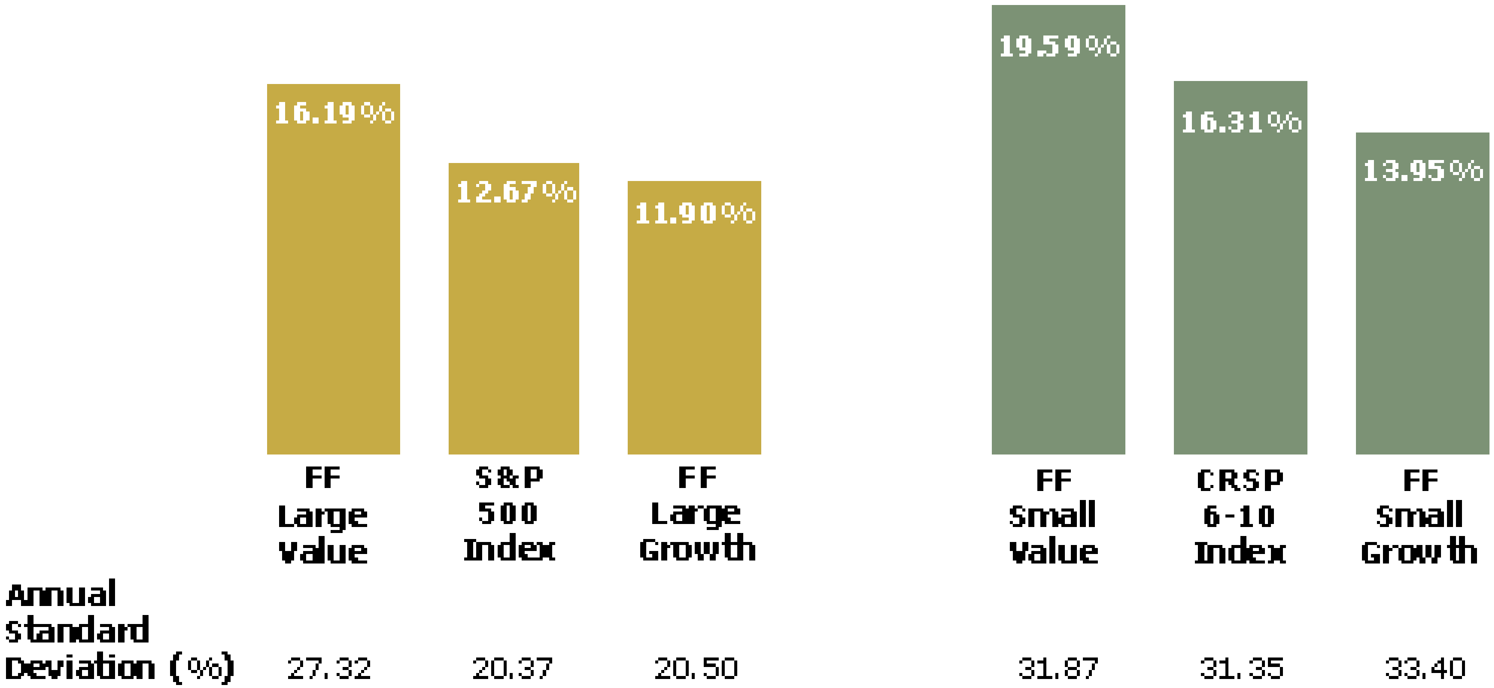
- **In the main, the only way to earn more returns is to take on more market risk or “beta.”**

They believe that the market is efficient, and that there is no free lunch.

C. Long-Term Structural Returns

US Equities
Arithmetic Average Rates of Return
Annual Data: 1927-2001

But higher risk does not mean higher returns.



Risk cannot be measured by standard deviation alone.

- *Value and growth data courtesy of Fama/French.*
- *S&P data courtesy of © Stocks, Bonds, Bills and Inflation Yearbook™, Ibbotson Associates, Chicago (annually updated works by Roger C. Ibbotson and Rex A. Sinquefield).*
- *CRSP data courtesy of the Center for Research in Security Prices, University of Chicago.*

D. Industry Organization

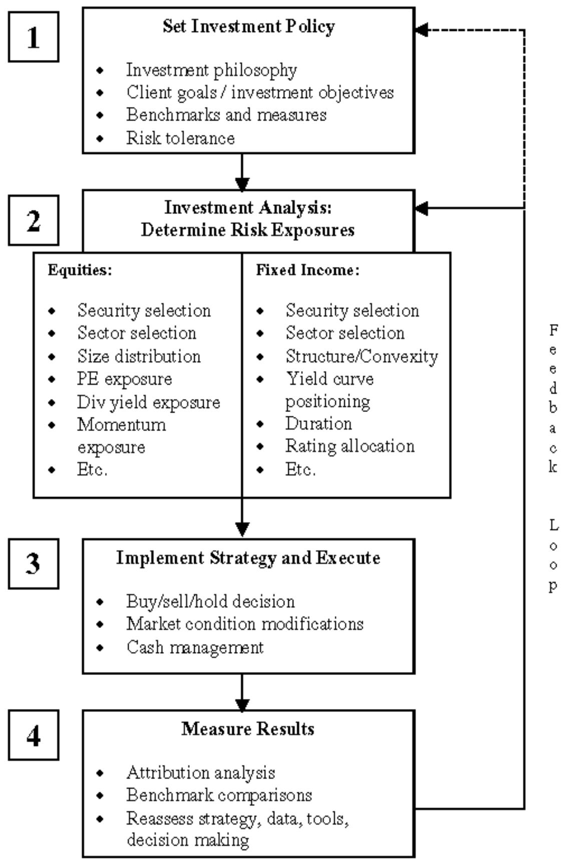
- **Pension fund consultants and financial planners advise on the long-term asset allocation mix.**
- **Each asset class within the mix is assigned a benchmark.**
- **The investment managers are responsible for providing investment results that are relative to the benchmark.**
- ***The investor owns the risk of the benchmark.***

Investors are exposed to market risk (which until recently was considered acceptable).

E. Investment Process

- **The investment process is centered around ensuring that any deviation from the benchmark is an active investment decision.**

- **The scaling of each active bet should correspond to the degree of confidence in that bet.**



Nuveen Investments

So, deviation from benchmark must be justified.

F. Risk Measurement and Monitoring

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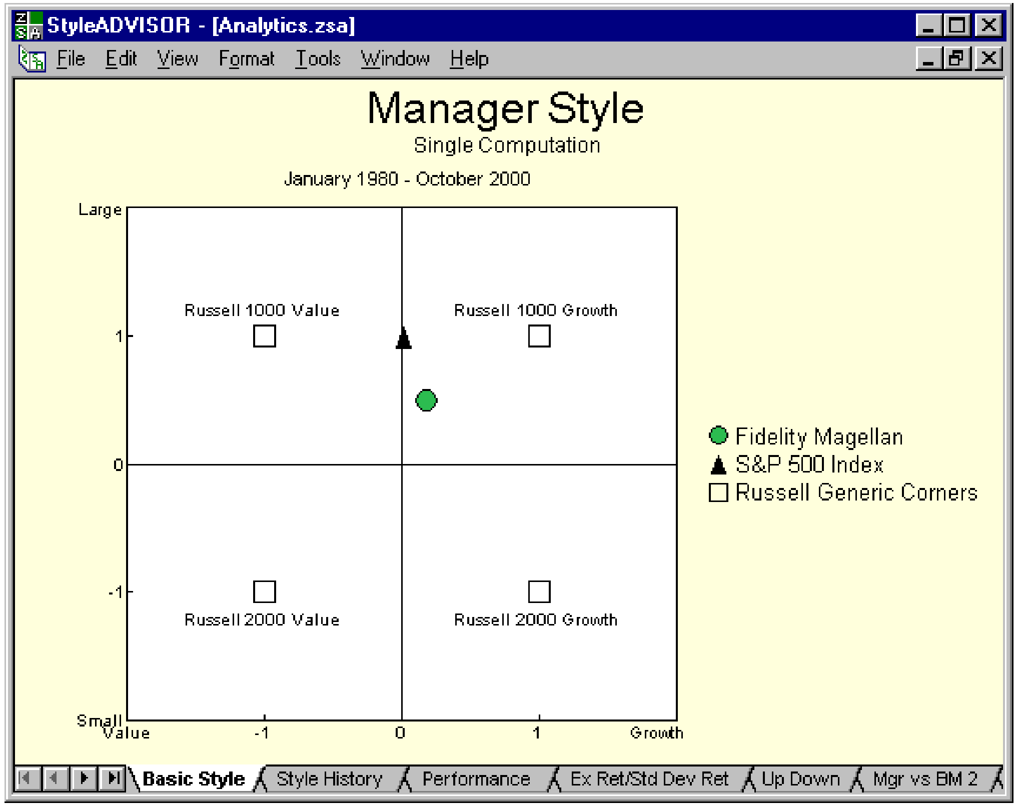
- **The risks that are monitored are as follows:**
  - Style Drift
  - Tracking Error
  - Maverick Risk.

Main risks are style drift, deviation from benchmark, and manager risk.

F. Risk Measurement and Monitoring: Style Drift

- **In the event of style drift, the overall asset allocation plan could be invalidated.**

- **The structural returns of the benchmark are sufficient, so it does not make sense to give a manager too much discretion.**

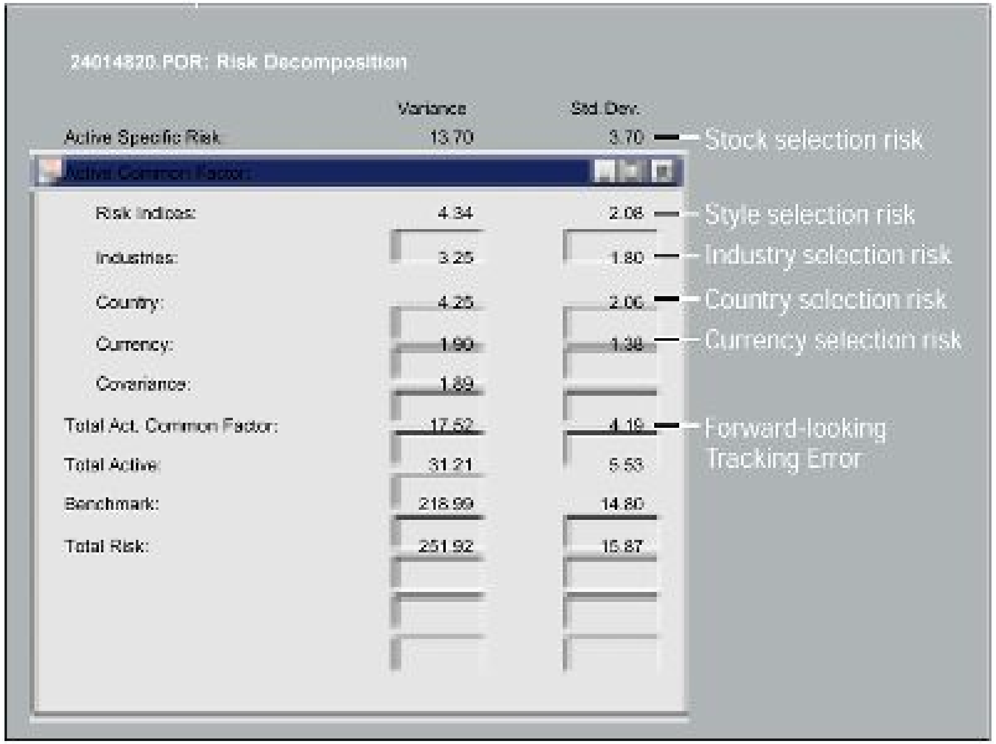


The structural returns are sufficient.

F. Risk Measurement and Monitoring: Tracking Error

- **The total risk of the portfolio is not important.**

- **The manager's risk is always viewed in relative terms.**



We need only to worry about relative risk.

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G. Consequences

- ***A mutual fund can lose over 50% of its market value.***
- **This is acceptable as long as the losses are consistent with its benchmark or product category.**
- **In 2001, this was the case for the aggressive growth equity style.**

One needs to be able to tolerate -50% losses.

G. Consequences
(Continued)

- **The manager can note that the performance is consistent with its product design.**
- **The manager can also note that they will continue offering the product.**
- **Articles on the topic are broadly sympathetic to the manager.**

Performance is consistent with its product design despite sharp fall in NAV.

II. Absolute Returns Expected from Each Investment

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- **The Post-2000 view is starting to depart from some of the preceding assumptions …**

- **… Which has consequences for:**

  – The investment management industry's organization;
  – Investment processes;
  – Risk management and monitoring; and
  – Expectations for managers.

There is a change in view since year 2000.

A. Absolute Returns Expected from Each Investment (Continued)

- Long-Term View on Structural Returns is Shaken
- Valuation Matters
- Performance Attributions Studies Questioned
- Throw Out Equity Benchmarks
- Downside Risk Protection is Crucial
- Consequences
- Risk Management
    - Event Risk
    - Extreme Risk

Expectations have changed and absolute returns are expected.

A. Long-Term View on Structural Returns is Shaken

- **Equities may have returned 12.7% annually since 1927.**
- **But there are long stretches where one had to be very patient.**

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THE MARKET

Mr. Buffett on the Stock Market

The most celebrated of investors says stocks can't possibly meet the public's expectations. As for the Internet? He notes how few people got rich from two other transforming industries, auto and aviation.
FORTUNE
Monday, November 22, 1999

Some believe that the market will take a long time to bounce back.

A. Long-Term View on Structural Returns is Shaken

(Continued)

- **DOW JONES INDUSTRIAL AVERAGE**

  December 31, 1964: 874.12

  December 31, 1985: 875.00

- **"Now I'm known as a long-term investor and a patient guy, but that is not my idea of big move."**

  – "Mr. Buffett on the Stock Market," Fortune, 11/22/99.

There may be extended periods of low returns.

B. Valuation Matters: Bill Gross

- **The returns on equities depends on their beginning valuation and right now valuation remains poor.**

- **"Earnings have been phonied up for years …."**

- **"Companies have been diluting … equity via stock options …."**

There are good reasons for the equity market to stay low.

B. Valuation Matters: Warren Buffett

- **Key value-determining factors:**
  - Interest rates must remain low; and
  - Corporate profitability in relation to GDP must rise.

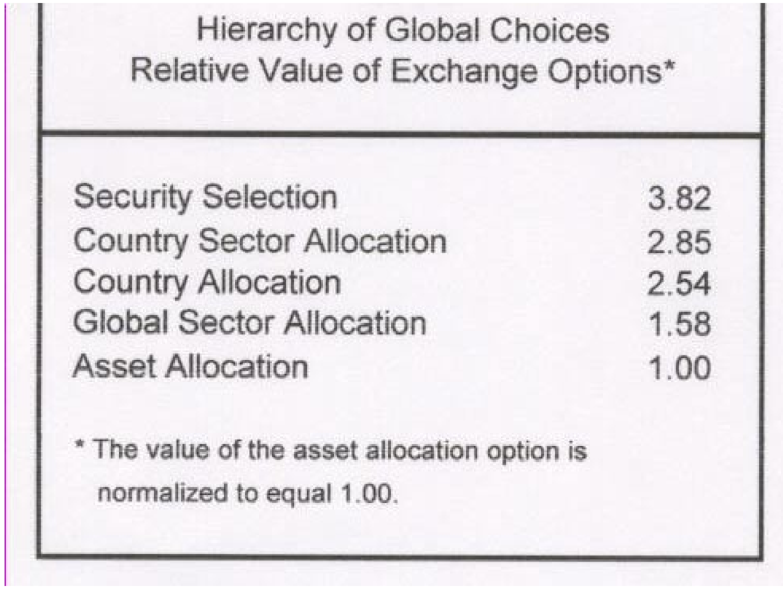
Some believe that in the long run, performance is mostly about valuation.

C. Performance Attribution Studies Questioned

- **Institutional investors have chosen asset allocation as the key area to exercise investment discretion ...**

- **... But it may be that the "natural opportunity set presented by the capital markets" is far greater than what's offered through discretion in asset allocation.**

There may be better investment opportunities than strictly relying on asset allocation.



Hierarchy of Global Choices Relative Value of Exchange Options*	
Security Selection	3.82
Country Sector Allocation	2.85
Country Allocation	2.54
Global Sector Allocation	1.58
Asset Allocation	1.00

* The value of the asset allocation option is normalized to equal 1.00.

- Kritzman, Mark and Sebastien Page, "The Hierarchy of Investment Choice: A Normative Interpretation," Revere Street Working Paper Series, 8/30/02.

D. Throw Out Equity Benchmarks

- **Equity benchmarks produce a high tracking error against underlying liabilities of pension plans.**

- Alan Brown, group Chief Investment Officer of State Street Global Advisors

- **Instead, pension plans may start considering:**
  - **Bigger allocations to bonds;**
  - **Increased use of risk budgeting; and**
  - **Allocations to absolute-return products.**


BENCHMARKS

TIME TO THROW OUT EQUITY BENCHMARKS

A move away from relying on equity benchmarks could herald a new era in asset management.

- Global Investor, November 2002.

This leads to a change in the mindset of some pension funds.

E. Downside Risk Protection is Crucial

- **Once one no longer has faith in equity benchmarks providing target returns, …**

- **… Downside risk management becomes crucial.**

They conclude that it is important to manage downside risk.

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E. Downside Risk Protection is Crucial (Continued)

- **"Investors are not indifferent whether an active manager simply captures the premium of the asset class …."**
- **" …. Or whether he or she tilts the return distribution of the portfolio to the right."**

  - Ineichen, Alexander, "Asymmetric Returns and Sector Specialists," UBS Warburg Working Paper, 10/2/02.

It is absolute returns that the second group of investors are after.

E. Downside Risk Protection is Crucial

(Continued)

- **Ineichen notes that long/short equity sector funds have an opportunity set correlated to their sector.**
- ***Even so, long-term superiority is due to balancing investment opportunities with total risk.***

	AMEX Biotechnology - Pharmaceuticals	HFRI Healthcare/ Biotechnology
Initial investment	100	100
Dec-97	113	101
Dec-98	122	108
Dec-99	274	159
Dec-00	442	240
Dec-01	420	246
Jul-02	252	194
Return 97-99	174%	59%
Return 00-02	-8%	22%
Under water	-43%	-21%
Loss recovery return*	75%	27%
Recovery at 8% pa	Nov-09	Sep-05

Source: Hedge Fund Research, Datastream
* Return required to recover losses.

	NYSE Financials	HFRI Financials
Initial investment	100	100
Dec-97	141	149
Dec-98	148	131
Dec-99	147	129
Dec-00	184	176
Dec-01	169	207
Jul-02	151	209
Return 97-99	47%	29%
Return 00-02	3%	63%
Under water	-18%	0%
Loss recovery return*	22%	0%
Recovery at 8% pa	Feb-05	Index at peak level

Source: Hedge Fund Research, Datastream
* Required return to recover losses

Managing the downside will take you shorter time to recover.

F. Consequences

- **A manager is expected to keep losses under control.**

- ***It is unacceptable for a manager to lose more than 50% of market value.***

Investors expect losses to be kept under control.

F. Consequences
(Continued)

- **Fixed Income Arbitrage: Beacon Hill Plans to Close Hedge Funds**

  From Wall Street Journal Interactive

  The WSJI reports Beacon Hill Asset Management informed its investors that the losses incurred by its two hedge funds, the Bristol Fund and the Safe Harbor Fund, were much greater than originally reported; the losses, as of Sept. 30, were 54% not 25%. *Following these losses Beacon Hill has decided to close down its hedge funds and liquidate its remaining positions.*
  - Albourne Village Website, 10/21/02

Large losses are not tolerated.

G. Event Risk: Individual Managers

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- **Since it is unacceptable for an absolute-return manager to have large losses, individual managers pay particular attention to event risks.**

- **An example of an "event risk" analysis for a total-return portfolio follows …**

Managers pay particular attention to event risk.

G. Event Risk: Individual Managers (Continued)

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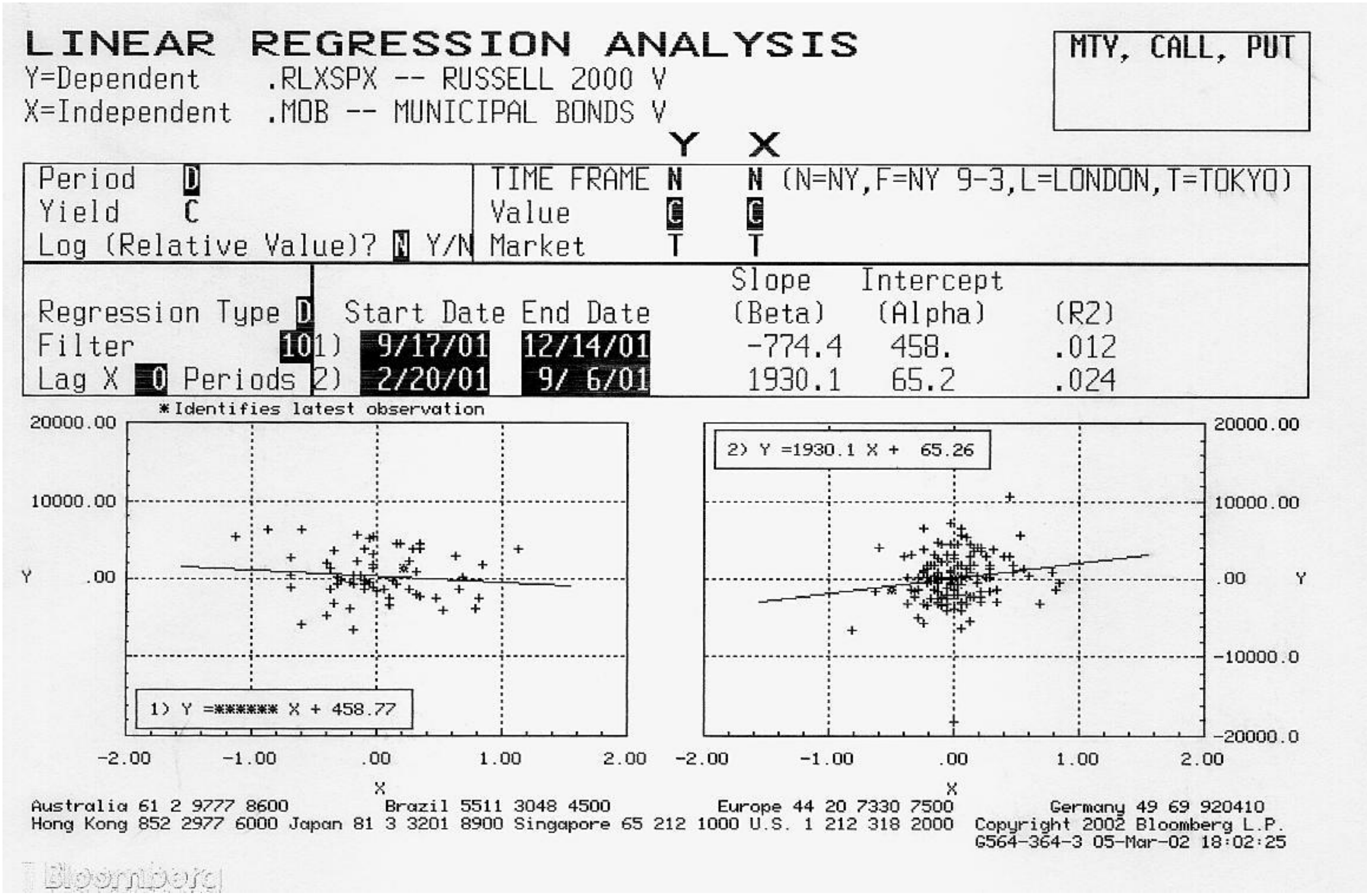
- **This example portfolio consists of a long Russell 2000 vs. a short S&P 500 futures strategy and a long Municipal Bond vs. a short U.S. Bond futures strategy.**
- **These strategies are normally unrelated as illustrated in the graphs on the next slide.**

These strategies are “normally” not correlated.

G. Event Risk: Individual Managers (Continued)



There are no linear relationships "normally".

G. Event Risk: Individual Managers (Continued)

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- **But during a scenario test of the portfolio's sensitivity to event risk, we find that the combination of the two trades results in an exposure to a liquidity shock.**

But, we are exposed to liquidity risk when there is a shock.

G. Event Risk: Individual Managers (Continued)

Event	Maximum Loss
October 1987 stock market crash	**-4.11%**
Gulf War in 1990	**-4.12%**
Fall 1998 bond market debacle	***-6.42%***
Aftermath of 9/11 attacks	**-3.95%**

One may have a return of -4% to -6% in the aftermath of different types of shocks.

G. Event Risk: Individual Managers (Continued)

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- **Worst-Case Event** | **Maximum Loss**

Worst-Case Event	**Maximum Loss**
Fall 1998 bond market debacle	**-6.42%**

- **Value-at-Risk based on recent volatilities and correlations** — **3.67%**

A flight-to-quality event is the worst scenario for the portfolio.

G. Event Risk: Individual Managers (Continued)

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- **The short legs of each spread are the more liquid of the pair.**

- **So both of these trades are at risk to a flight-to-quality event as happened during the Fall of 1998.**

During flight-to-quality events, a portfolio of long relatively illiquid instruments and short liquid instruments will do poorly.

G. Event Risk: Fund-of-Fund Managers

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- **Similarly fund-of-hedge-fund managers attempt to model their portfolio's return distribution …**

- **… When all the strategies are influenced by a dominant event.**

Similarly, Fund of Funds may be subject to event risk.

G. Event Risk: Fund-of-Fund Managers (Continued)

- **An investor frequently uses the normal distribution to represent returns of a diversified portfolio since one assumes it is OK to use the Central Limit Theorem.**

- **Under this theorem, as the number of randomly distributed independent variables becomes large, the distribution of the collection's mean approaches normality.**

- **This would be OK for a portfolio's return if its strategies would never be influenced by a dominant event.**

It may appear to be all right during "normal" times but not so when there is a crisis.

G. Event Risk: Fund-of-Fund Managers (Continued)

- **One idea is to represent an investment's distribution as a combination of two distributions: one for peaceful times and a second for eventful times.**

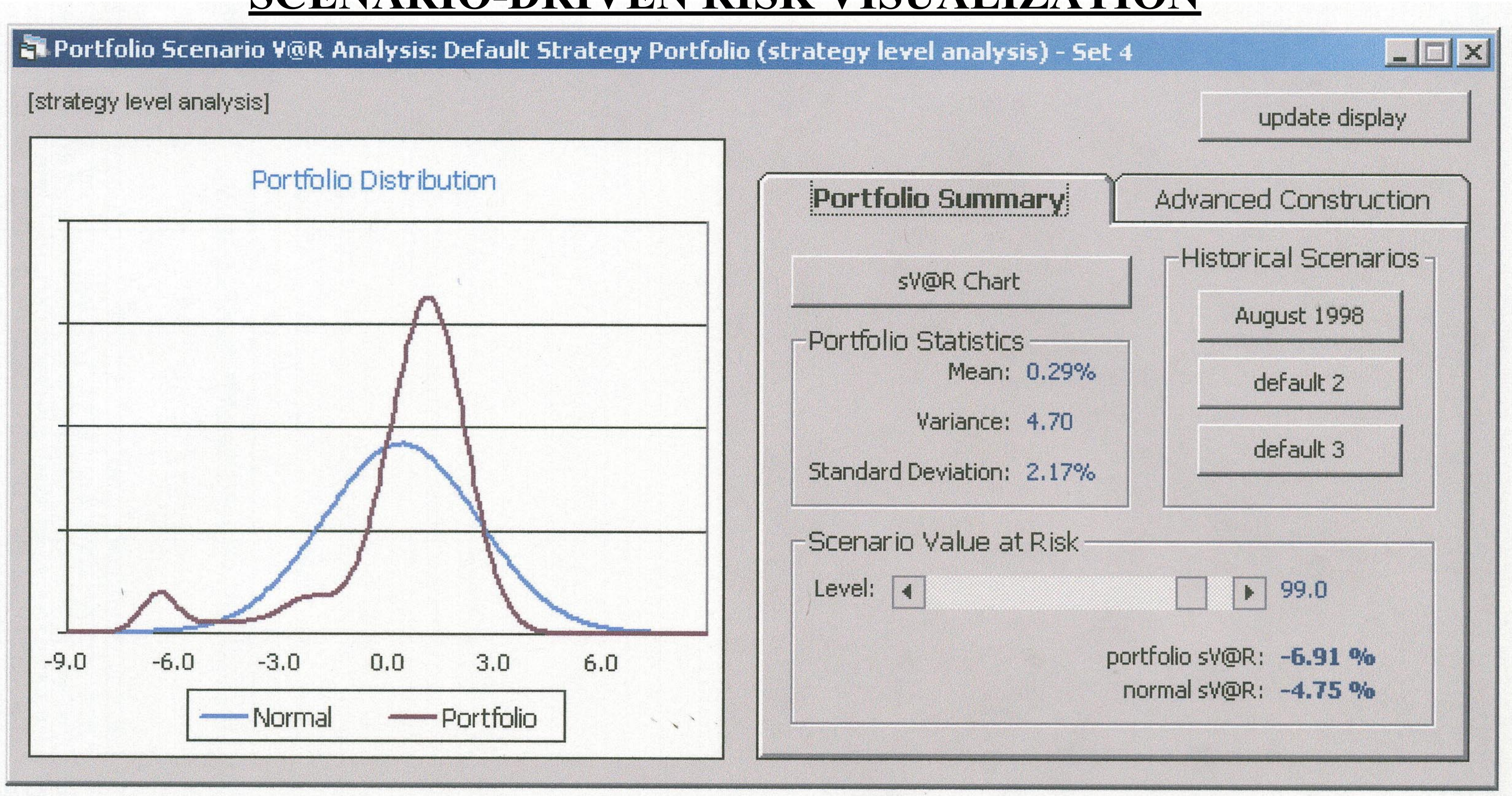
- **The distribution during eventful times would not just include higher volatility, but also the greater correlation among strategies that tends to occur during crises.**

- **A risk manager would explicitly determine the proportion of crisis returns in the combined distribution.**

Manager has to ensure that the portfolio is diversified during crises.

G. Event Risk: Fund-of-Fund Managers (Continued)

SCENARIO-DRIVEN RISK VISUALIZATION



- Johnson, Damien, Nick Macleod, and Chris Thomas, "Modelling the Return Structure of a Fund of Hedge Funds, " AIMA Newsletter, April 2002.

The "Camel" distribution embodies returns from periods of shocks!

G. Extreme Risk

- **Conditional Value-at-Risk (CVar) vs. Value-at-Risk (VaR)**

- **"[Whereas] VaR measures the maximum loss for a given confidence interval, … CVaR corresponds to the expected loss conditional on the loss being greater than or equal to the VaR."**

  – Agarwal, Vikas and Narayan Naik, "Risks and Portfolio Decisions involving Hedge Funds," Forthcoming Review of Financial Studies (2003).

The CVaR measures expected loss given loss ≥ VaR.

G. Extreme Risk
(Continued)

- **When the goal is to keep extreme losses under control …**
- **... CVaR should be used as the risk constraint during portfolio construction.**

CVaR is preferred over VaR.

III. Hybrid View: A Blend of Asset Allocation and Absolute-Return Approaches

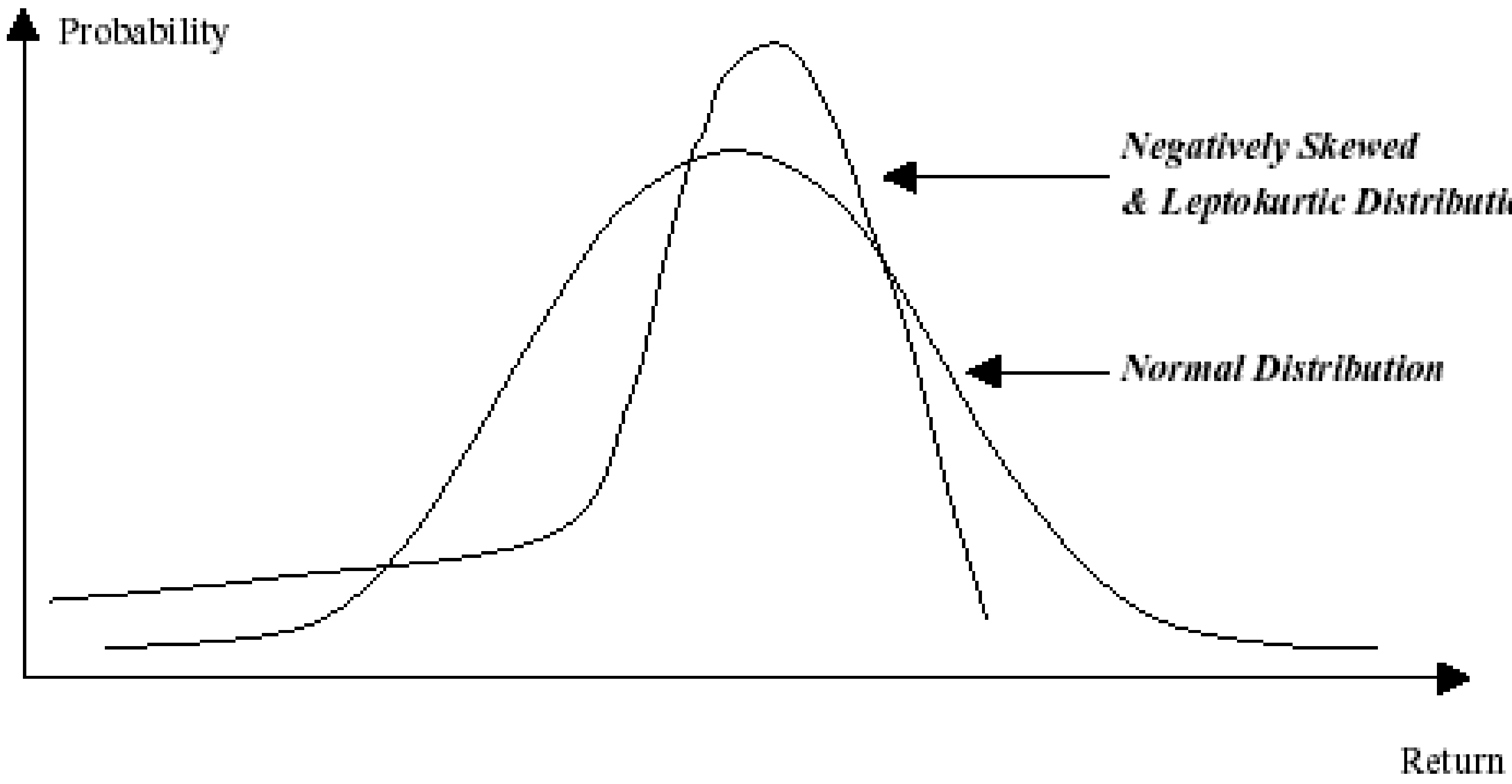
- Main Source of Returns Still from Asset Allocation
- Extra Returns through Niche Opportunities
- These Niche Opportunities are Risk Premia Strategies
- Investment Process for Risk Premia Strategies
- Performance Metrics ----Next Section

The last group believes that returns come from both asset allocation and risk premia strategies.

Outline

- Difference Between Traditional and Absolute Returns in Investment Management
- Current State of Risk Management and Performance Measurement
- Measure of Association: Implications for Investment Management
- Challenges Involved

Distribution of Hedge Fund Return



Most returns are not "normal".

Portfolio Construction for Risk Premia Strategies

- In addition to CVaR, another measure is "modified VaR," which takes into consideration the skewness and kurtosis of a distribution.

- Skewness describes how asymmetric a distribution is.

- Kurtosis is linked to the existence of extreme returns.

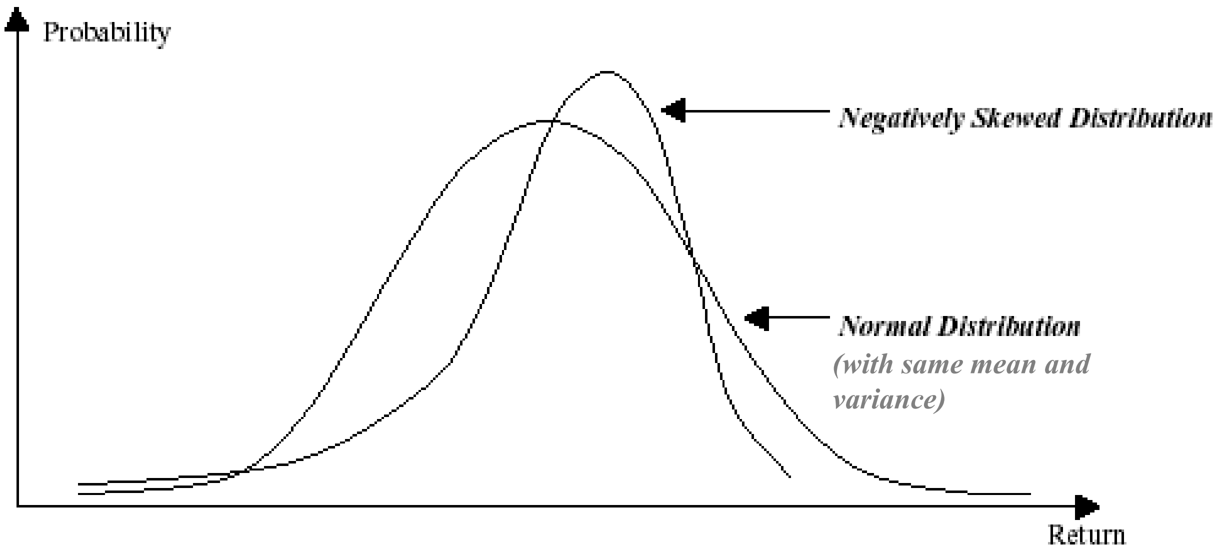
It is not difficult for risk managers to capture different "shapes."

Skewness : The 3rd Moment

Skewness refers to the asymmetry of a distribution

$$\hat{S}(x) = \frac{1}{T\hat{\sigma}_x^3}\sum_{t=1}^{T}(x_t - \hat{\mu}_x)^3$$

A distribution that is negatively skewed has a long tail on the left (negative) side of the distribution, indicating that the few outcomes that are below the mean are of greater magnitude than the larger number of outcomes above the mean

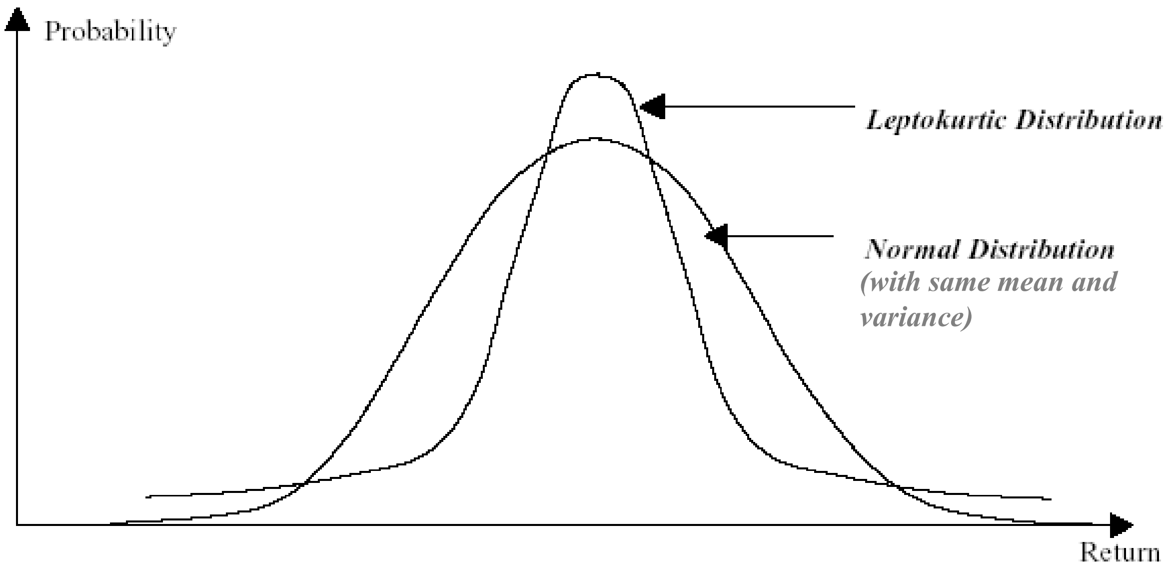


Kurtosis : The 4th Moment

Kurtosis characterises the relative spike or flatness of a given distribution when compared to a normal distribution

$$\hat{K}(x) = \frac{1}{T\hat{\sigma}_x^4}\sum_{t=1}^{T}(x_t - \hat{\mu}_x)^4$$

A distribution that has wider tails and a taller narrower peak than the normal distribution is called leptokurtic ("fat tail" distribution) with high kurtosis

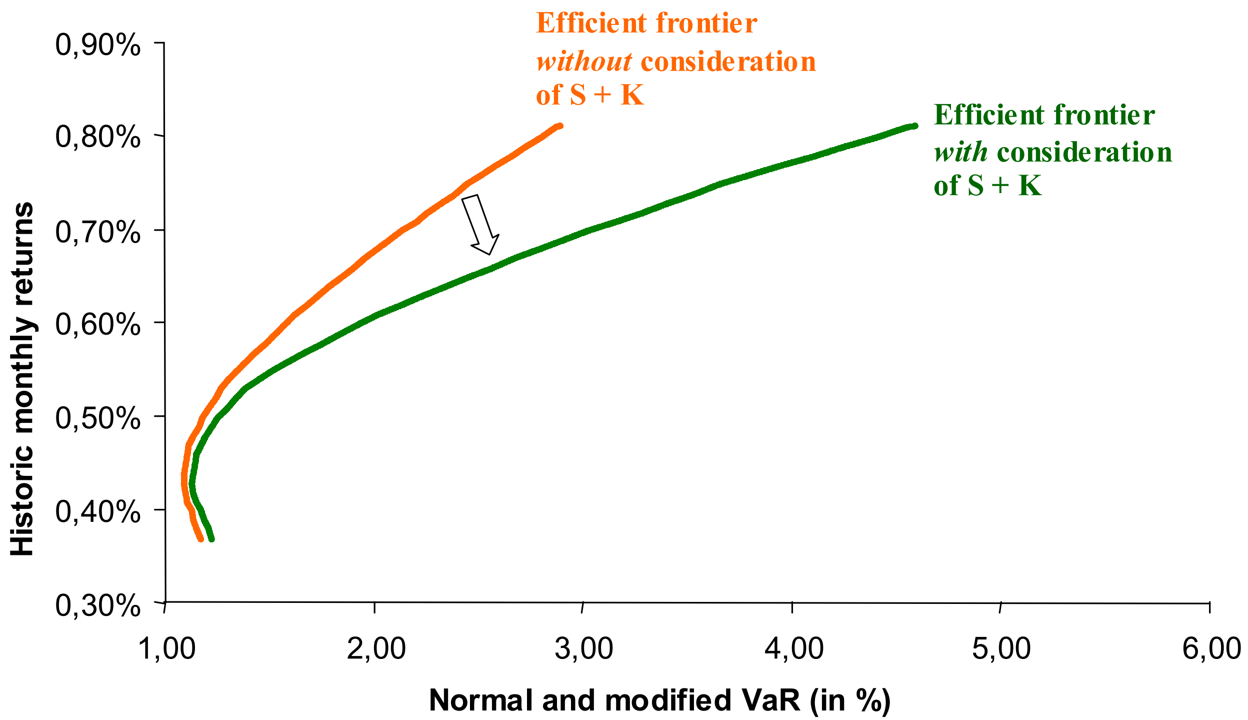


Portfolio Construction for Risk Premia Strategies (Continued)

- On the following slide, the figure illustrates how the efficient frontier is affected when using modified VaR rather than VaR as the risk constraint.
- The sample portfolio includes absolute-return strategies, some of which have asymmetric payoffs.

Modified VaR incorporates risk associated with asymmetric distribution and fat tails.

Portfolio Construction for Risk Premia Strategies (Continued)



- **Signer, Andreas and Laurent Favre, "The Difficulties of Measuring the Benefits of Hedge Funds," The Journal of Alternative Investments, Summer 2002.**

It leads to higher VaR at each level of return.

Performance Metrics

- Due care must be used in relying on the Sharpe ratio as a performance metric for risk premia strategies.

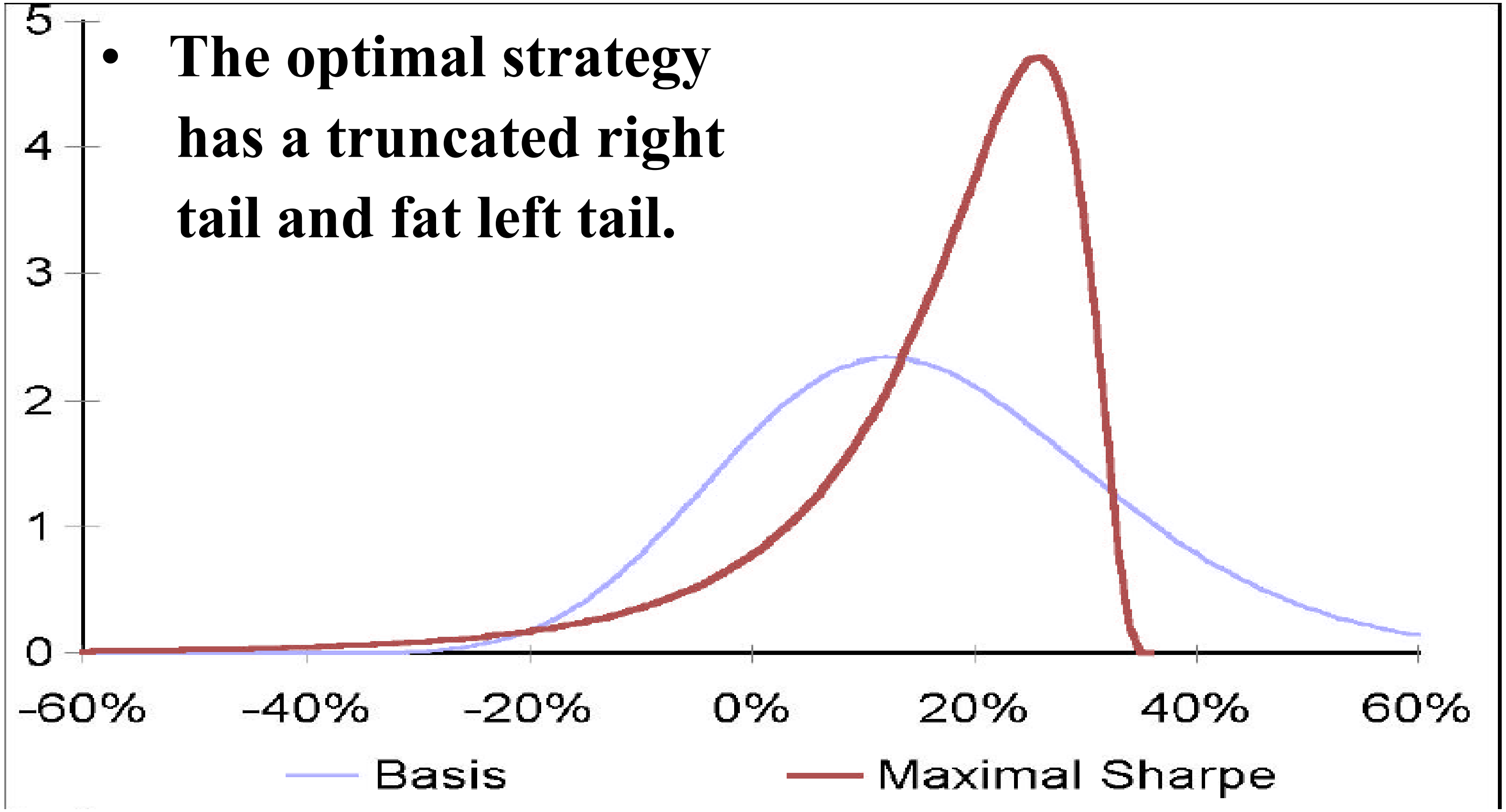
- Four Yale University professors have derived an optimal strategy for maximizing the Sharpe ratio.

It is easy to sharpen the Shape ratio.

F. Performance Metrics

(Continued)

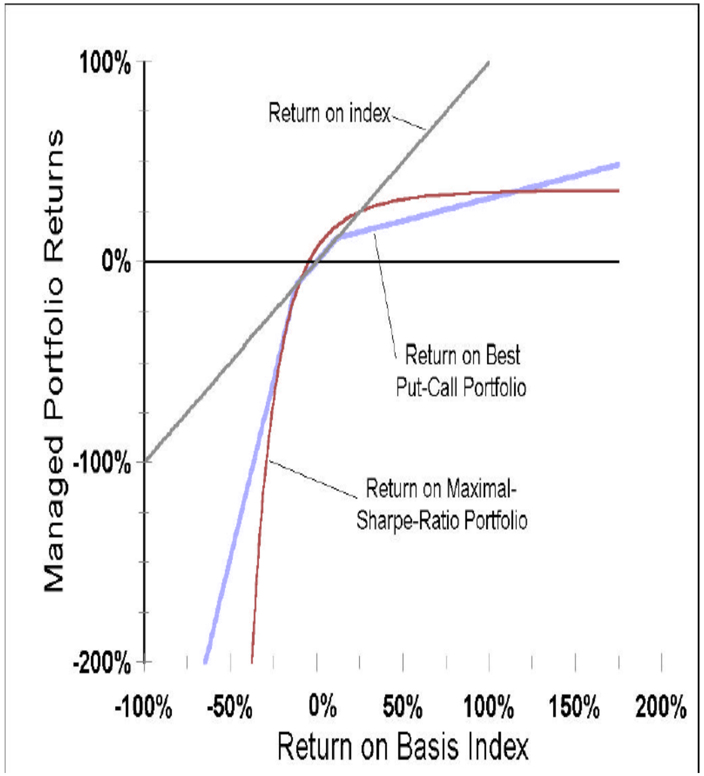
- **The optimal strategy has a truncated right tail and fat left tail.**



- Goetzmann, William, Jonathan Ingersoll, Matthew Spiegel, and Ivo Welch, "Sharpening Sharpe Ratios," Yale School of Management, Working Paper, February 2002.

Performance Metrics (Continued)

This strategy can be achieved by selling certain ratios of calls and puts against a core equity market holding.



-Goetzmann, William, Jonathan Ingersoll, Matthew Spiegel, and Ivo Welch, "Sharpening Sharpe Ratios," Yale School of Management, Working Paper, February 2002.

In Practice

- Key Risk Measures
  - Standard Deviation, Downside Risk, Drawdown
- Key Performance Measures
  - Sharpe, Sortino, Calmar
- Supplemented by Other Quant Analysis
  - Time Window Analysis, Benchmark, Draw Down Analysis
  - Gain/loss, Up Capture, Down Capture, Recovery, Run-down

Alternative Performance Measures

1. Sortino Ratio	The ratio replaces the standard deviation in the Sharp ratio by the downside deviation from a threshold.
2. Omega	The ratio of the gain with respect to the threshold and the loss with respect to the same threshold.
3. Stutzer Index	The maximum possible decay rate of the probability (the excess returns over a threshold will be negative).

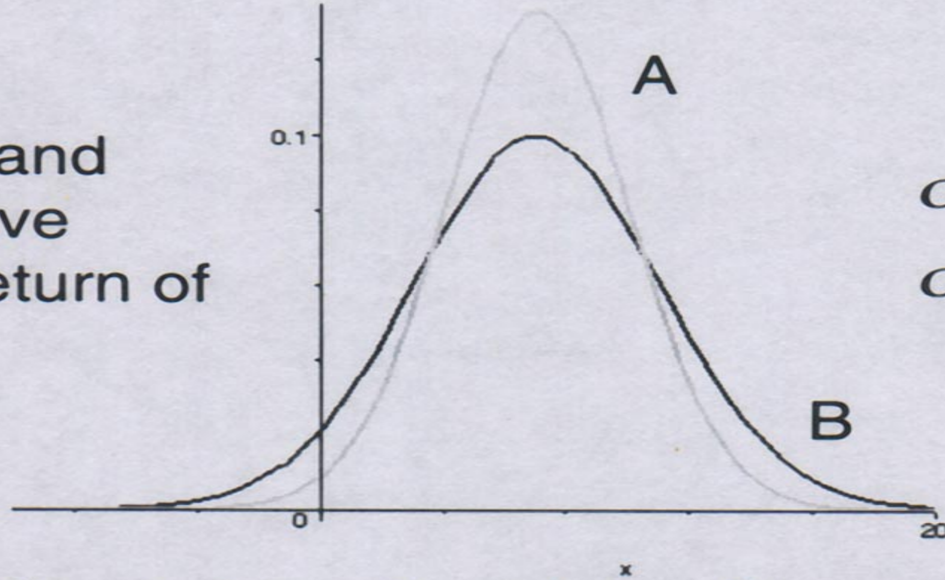
We can do more to incorporate the influence of 3rd and 4th moments.

Omega Measure

Performance and Risk Measurement MUST take return levels into account.

We can do even more to incorporate the Minimum Acceptable Returns.

Assets A and B both have a mean return of 7.



$\sigma_A = 3$

$\sigma_B = 4$

Asset A has the higher Sharpe ratio.

C Keating and F Shadwick, "A Universal Performance Measure", The Journal of Performance Measure, 6 (3)

Omega Measure (Continue)

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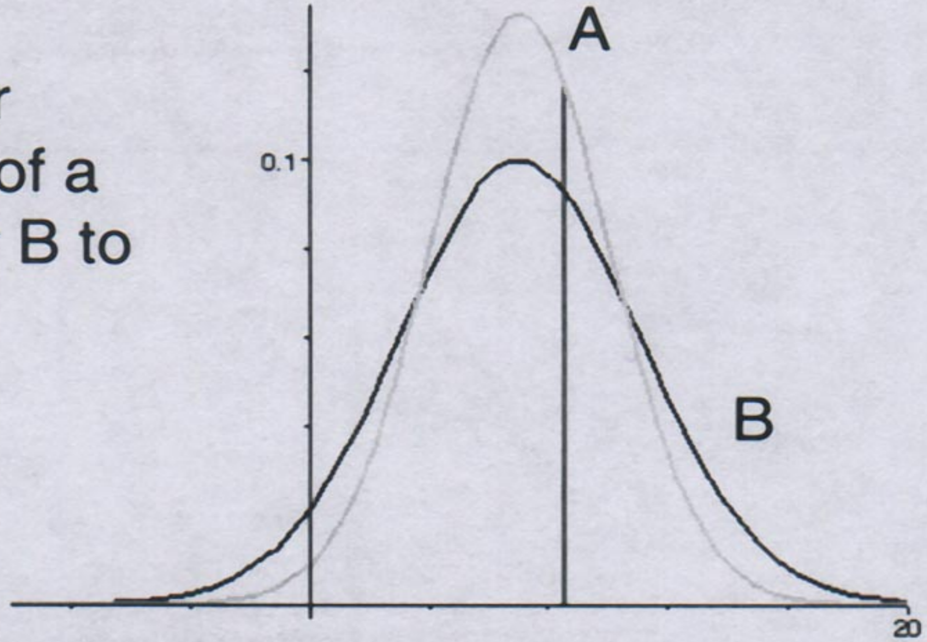
But if your loss threshold is 8.5...

You need to consider the relative chances of a gain or loss with A or B to determine which is preferable.



Proportion of returns above 8.5:
Asset A 31% Asset B 35%

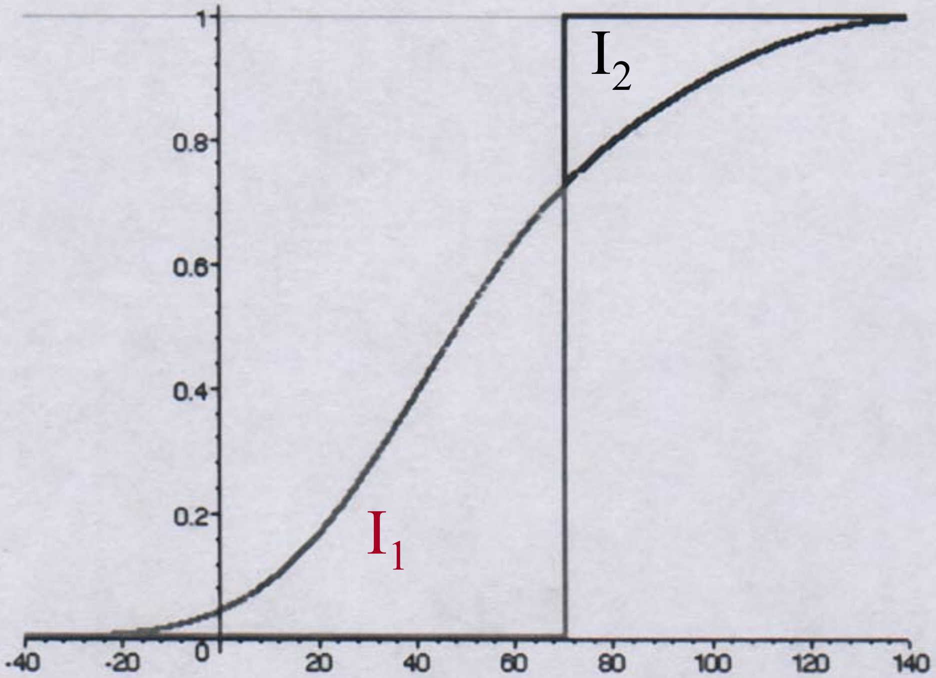
We can work out the gain/loss ratio.

Omega Measure (Continue)

The area outlined in black is: $I_2(r) := \int_r^{\infty} (1 - F(x))dx$

The area outlined in red is:

$$I_1(r) := \int_{-\infty}^{r} F(x)dx$$



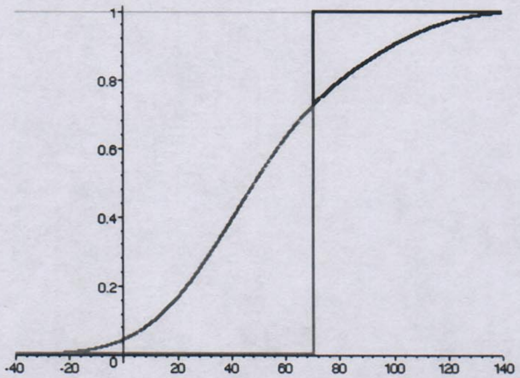
I_1 is associated with loss and I_2 is associated with gain.

Omega Measure (Continue)

The area outlined in black is: $I_2(r) := \int_r^{\infty} (1 - F(x))dx$

The area outlined in red is:

$$I_1(r) := \int_{-\infty}^{r} F(x)dx$$



Omega is the ratio
I_2 / I_1

$$\Omega(r) := \frac{\int_r^{\infty} (1 - F(x))dx}{\int_{-\infty}^{r} F(x)dx}.$$

Ω(r) is a measure of the relative probability weighted gains to losses at the return level r.

The bigger this is, the better the quality of a bet on a return greater than r.

From Alpha To Omega

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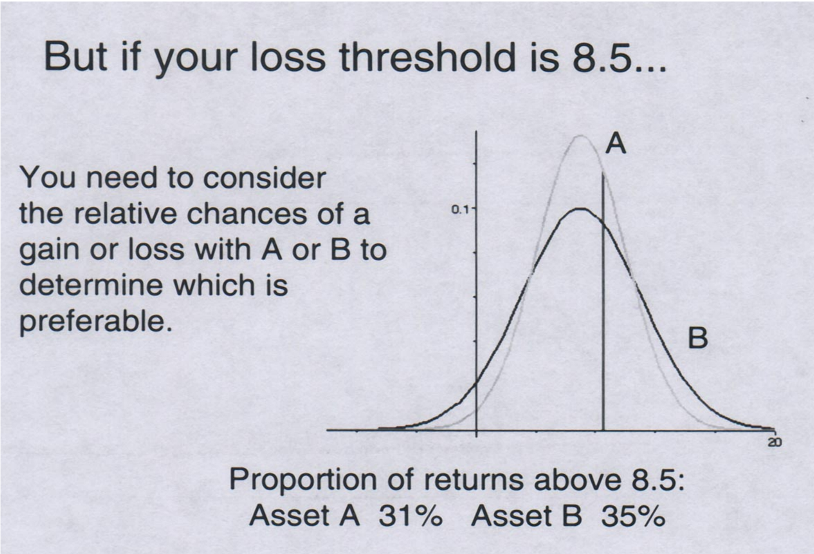
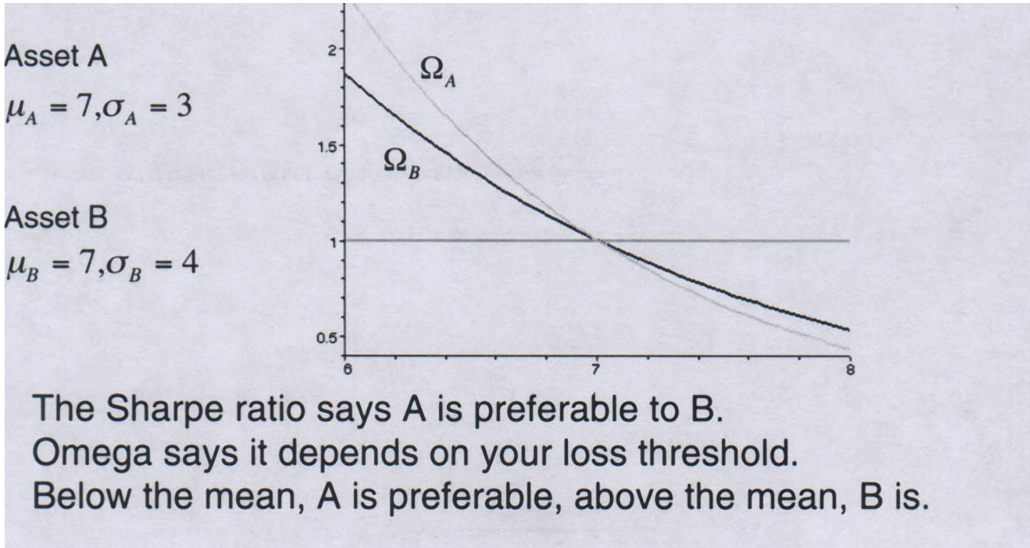
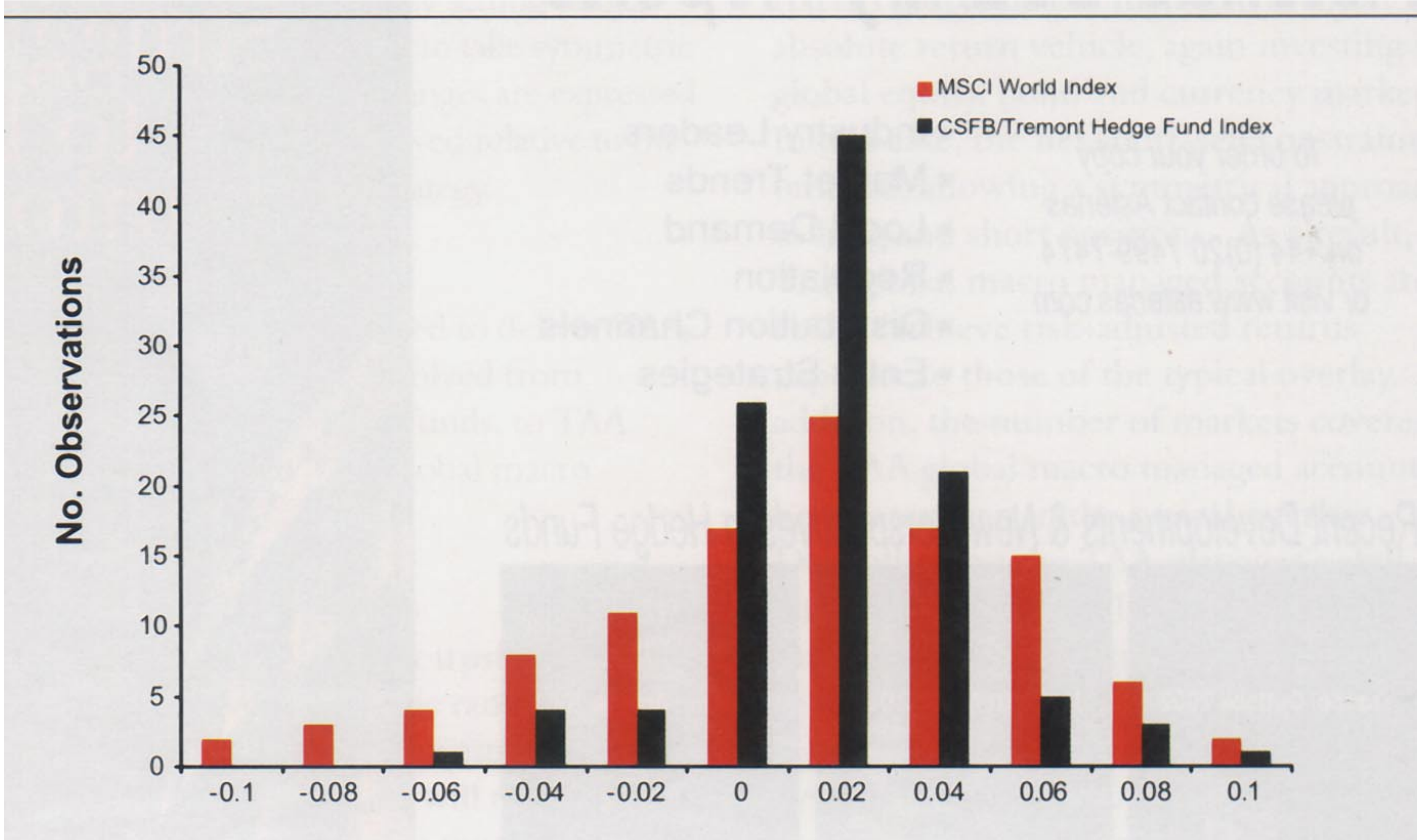
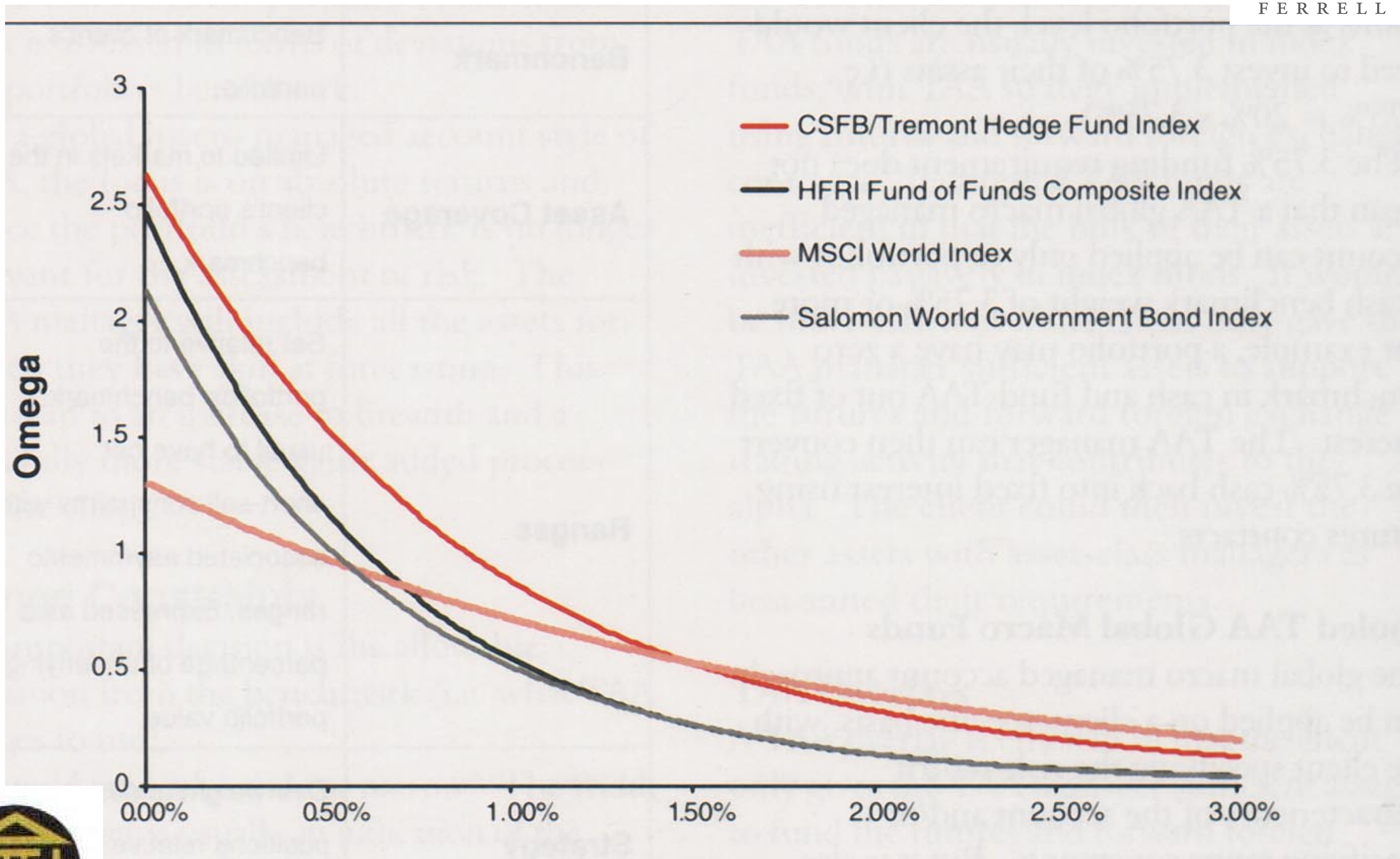




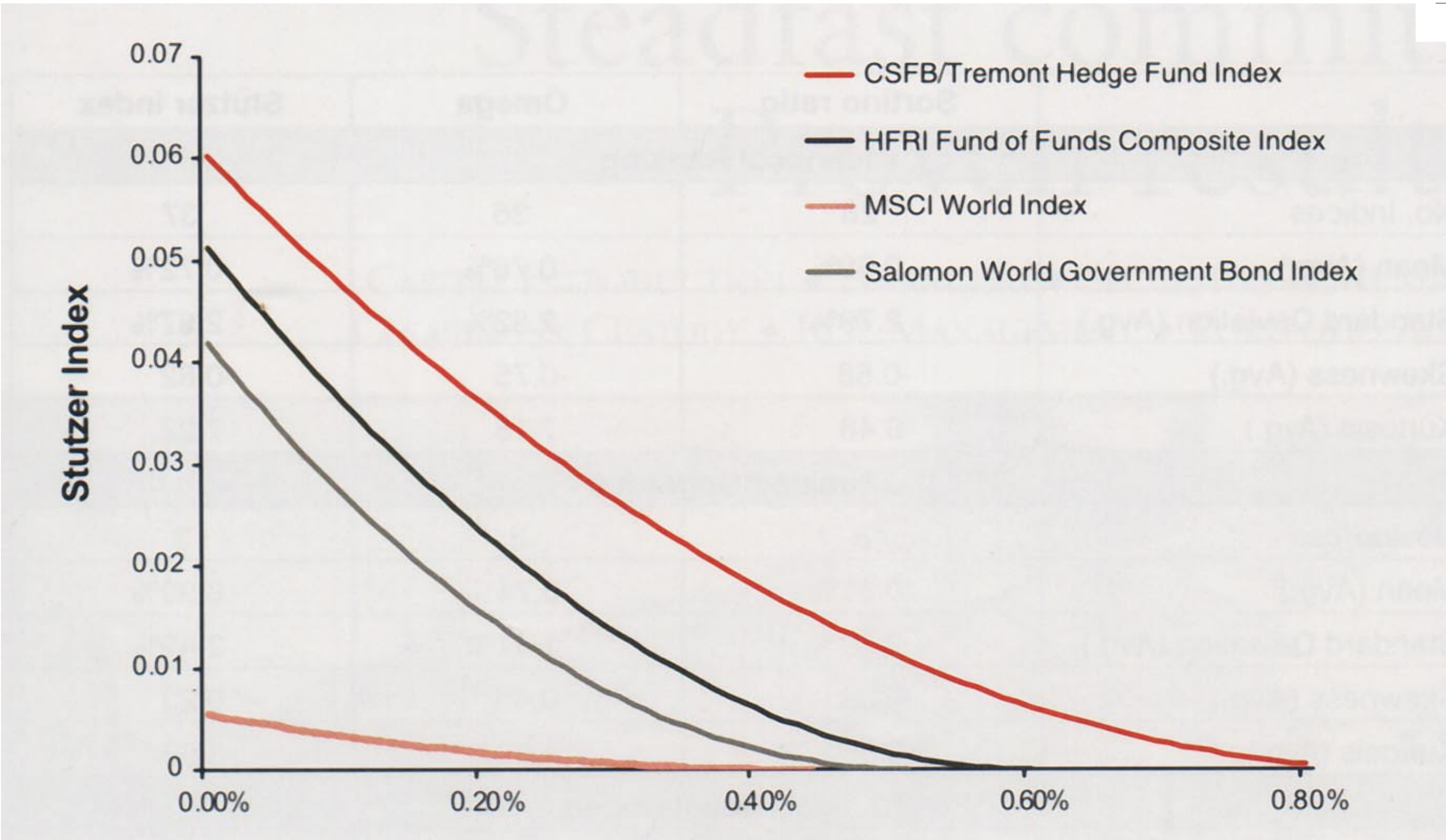
May use it to compare across time for the same fund too!



Hedge Fund Index is not always preferred over MSCI Index



It depends on the threshold level.



Investors are assumed to be more risk averse, and the preference is for absolute return products.

	Sortino ratio	Omega	Stutzer index
Identical Ranking			
No. Indices	28	36	37
Mean (Avg.)	0.69%	0.76%	0.72%
Standard Deviation (Avg.)	2.79%	2.82%	2.67%
Skewness (Avg.)	-0.68	-0.75	-0.82
Kurtosis (Avg.)	6.48	7.18	7.22
Ranking Upgraded			
No. indices	8	3	3
Mean (Avg.)	0.91%	0.74%	0.99%
Standard Deviation (Avg.)	2.79%	1.41%	2.49%
Skewness (Avg.)	0.08	-0.45	0.23
Kurtosis (Avg.)	3.95	4.09	3.69
Ranking Downgraded			
No. indices	8	5	4
Mean (Avg.)	0.79%	0.73%	0.90%
Standard Deviation (Avg.)	1.65%	1.58%	1.88%
Skewness (Avg.)	-2.86	-2.60	-2.95
Kurtosis (Avg.)	17.71	16.85	19.17

"Alternative Performance Measures For Hedge Funds" by Jean-Francois Bacmann and Steve Scholz, (2003)

Third and fourth moments do make a difference to ranking.

Outline

- Difference Between Traditional and Absolute Returns in Investment Management
- Current State of Risk Management and Performance Measurement
- Measure of Association: Implications for Investment Management
- Challenges Involved

Measure of Association

- Correlation
  - Parametric Measurement: Linear Dependence
    - Pearson's product moment correlation coefficient
  - Market Neutrality: Correlation = 0
- Concordance
  - If large (small) value of one is associated with large (small) value of another
  - Kendall's tau and Spearman's rho
  - Market Neutrality: if $(x_i - x_j)(y_i - y_j) = 0$, disconcordance
- Copula

Correlation is a linear measure.

Variable Correlation With S&P

	MAR	MAR	MAR	Alvest	Alvest	Alvest	Alvest	Alvest	Alvest	Alvest
	Market Neutral	Market Neutral Arbitrage	Market Neutral Long/Short	Event Driven	Relative Value	Long/Short	Merger Arb	Cap Stru Arb	Distressed	MSCI Global
Worst	Corr	Corr	Corr	Corr	Corr	Corr	Corr	Corr	Corr	Corr
10%	0.721	0.439	0.149	0.825	0.755	0.621	0.768	0.627	0.784	0.909
10%-20%	-0.053	-0.287	0.008	0.110	0.333	0.190	0.049	-0.025	0.122	0.546
20%-30%	0.440	0.055	0.057	-0.019	-0.290	-0.416	-0.018	0.079	-0.036	-0.227
30%-40%	0.514	0.465	0.461	0.304	0.477	0.618	0.259	0.290	0.276	0.421
40%-50%	-0.107	0.221	-0.178	0.283	0.135	-0.167	0.095	0.449	0.295	0.523
50%-60%	0.318	0.255	0.255	0.540	0.350	0.260	0.514	0.430	0.484	0.273
60%-70%	0.183	0.453	0.214	0.360	0.622	0.317	0.322	0.046	0.261	0.537
70%-80%	-0.059	-0.102	-0.102	-0.116	-0.157	-0.064	-0.204	0.069	-0.222	-0.224
80%-90%	-0.070	-0.101	0.233	-0.087	0.282	0.702	-0.333	-0.095	-0.096	0.618
90%-100%	0.209	-0.273	-0.273	-0.197	-0.269	-0.100	-0.105	-0.029	-0.117	0.580

How market neutral is Market Neutral Strategies?

Market Neutral Strategies are not always market neutral!

	MAR	MAR	MAR	Alvest	Alvest	Alvest	Alvest	Alvest	Alvest	Alvest
	Market Neutral	Market Neutral Arbitrage	Market Neutral Long/Short	Event Driven	Relative Value	Long/Short	Merger Arb	Cap Stru Arb	Distressed	MSCI Global
Worst										
<0.1	0.721	0.439	0.149	0.825	0.755	0.621	0.768	0.627	0.784	0.909
<0.2	0.595	0.550	0.165	0.738	0.710	0.586	0.715	0.536	0.575	0.914
<0.3	0.485	0.365	0.234	0.709	0.631	0.578	0.662	0.463	0.558	0.868
<0.4	0.474	0.358	0.256	0.662	0.572	0.551	0.616	0.418	0.526	0.852
<0.5	0.465	0.381	0.297	0.675	0.556	0.576	0.615	0.361	0.526	0.877
<0.6	0.400	0.345	0.282	0.674	0.544	0.586	0.612	0.302	0.536	0.897
<0.7	0.353	0.332	0.305	0.692	0.556	0.581	0.638	0.323	0.544	0.894
<0.8	0.333	0.325	0.272	0.701	0.554	0.579	0.651	0.334	0.557	0.898
<0.9	0.391	0.335	0.375	0.709	0.585	0.636	0.644	0.390	0.577	0.911
100%	0.338	0.248	0.351	0.616	0.454	0.603	0.582	0.308	0.462	0.916
overall	0.338	0.248	0.351	0.616	0.454	0.603	0.582	0.308	0.462	0.916
down	0.444	0.342	0.238	0.657	0.554	0.523	0.616	0.420	0.500	0.847
up	0.110	-0.032	0.189	0.061	0.030	0.249	0.104	0.147	-0.049	0.730

We need new techniques to account for asymmetric dependence.

Asymmetric Dependence

- Returns appear to be more highly correlated during market downturns than during market upturns
- Correlation structure is different at high/low cutoffs compared to middle of distribution
- Advantages of using copulas:
  - Copulas can be used to generate distributions where correlation increases at extreme cutoffs
  - it completely describes the dependence between and among n variables

Copulas have many advantages.

Copula

- Distribution Functions:
  - $F(x) = P[X \leq x]$, $G(y) = P[Y \leq y]$
- Joint Distribution Function
  - $H(x,y) = P[X \leq x, Y \leq y]$
- Copula
  - $C(u,v) = C(F(u), G(v)) = Prob[F(x) \leq u, G(y) \leq v]$
  - Independent if $C(u,v) = u\, v$

("An Introduction to Copula", Nelson, Springer"Applications of Copulas for the Calculation of Value-at-Risk", Jorn Rank, and Thomas Siegel" (1998))

You can plot a 3-D Copula corresponding to u and v.

Implications

- Asset Allocation: Underestimate the associated risks?
  - Adjustment: using copula or correlation threshold
- Value-at Risk
  - Estimated copulas give Prob(extreme loss)
  - Trade-off depends on fat-tails

"Value at Risk Trade-off and Capital Allocation with Copulas", U. Cherubini and E. Luciano (2003)

You may want to use the max correlation as a threshold.

Outline

- Difference Between Traditional and Absolute Returns in Investment Management
- Current State of Risk Management and Performance Measurement
- Measure of Association: Implications for Investment Management
- Challenges Involved

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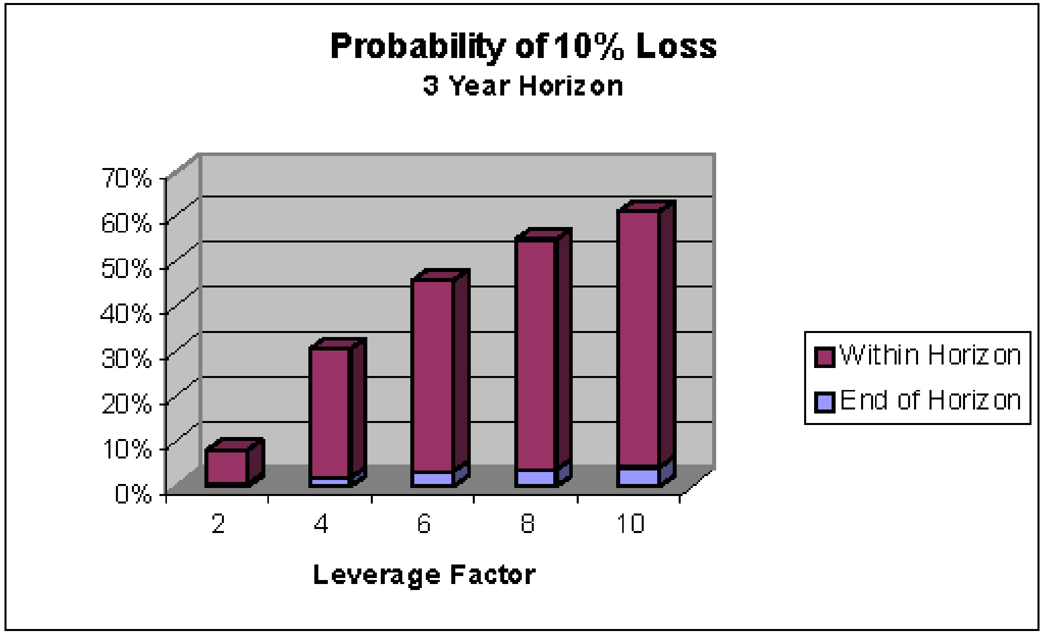
Risk Measurement Vs Risk Management

- Risk Measurement is more a science
- Risk Management is more an art
- Both depends on the sources of return and associated risk
- Both Senior Managers and Quants are important

It is easy to quantify risk, but sometimes
it is quite difficult to manage it.

Risk Management

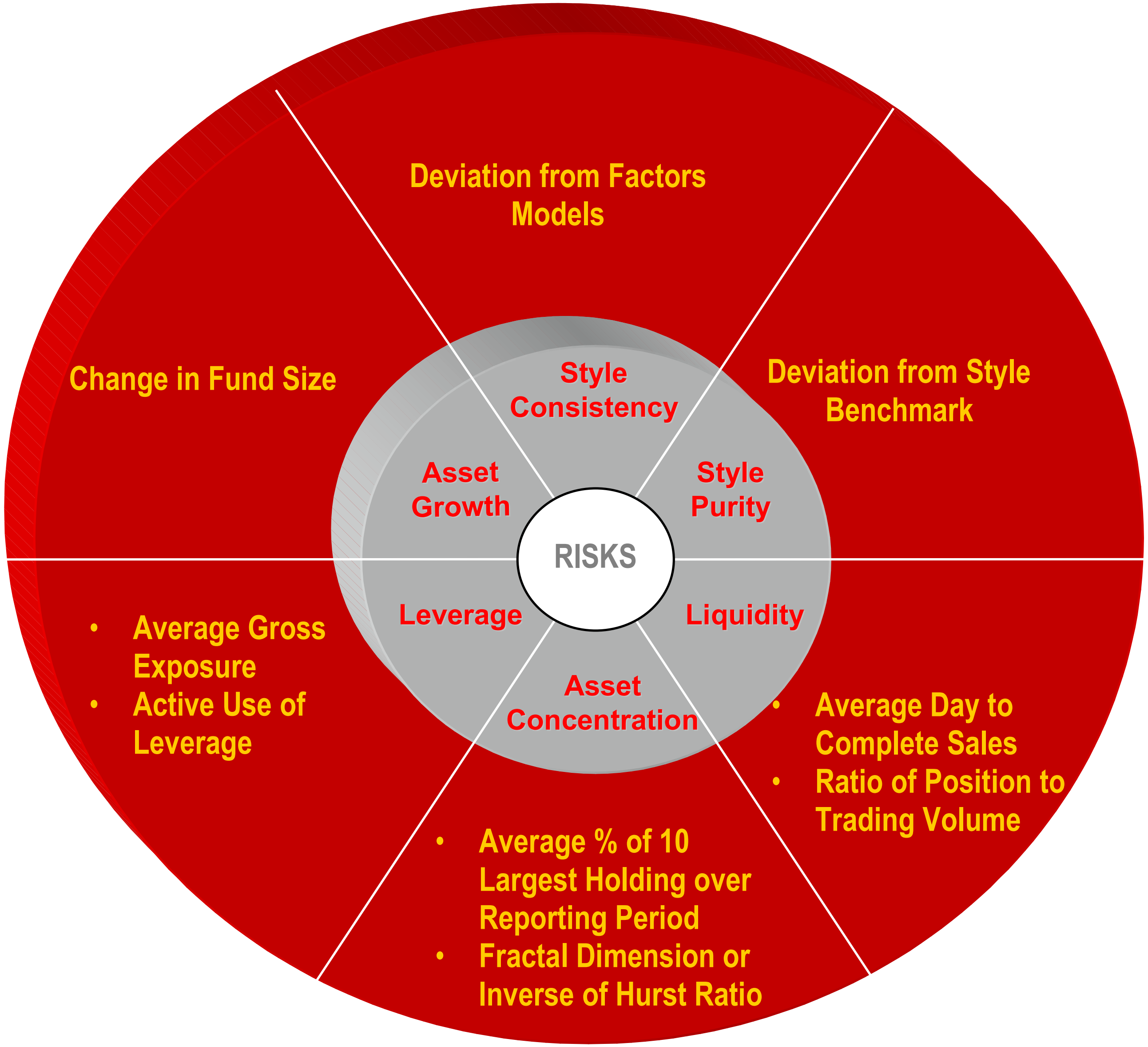
- **Risk measures tend to solely focus on end-period losses.**
- **With the ability to leverage, one must also ensure that investors can tolerate the potential within-period losses.**



- Kritzman, Mark, "Hidden Risks of Hedge Funds, and Asset Allocation versus Security Selection," Presentation to QWAFAFEW, 2/12/02.

The more one leverages, the higher the risks along the way.

Accounting for Practical (Hidden) Risks



Discount to Risk-Adjusted Returns to Account for Various Types of Practical Risk

Sources Of Risks	To Penalise for	Suggested Measurement method	Predicted Discount to Returns
Style Purity	Deviation from Self-reported Investment Style	Deviation from Style Benchmark	The higher the style "impurity" the higher the discount
Asset Growth	Unexpected increases in Fund Size (and Assets Under Management)	Change in Fund Size	The higher the increase in fund size in the period under review, the higher the discount
Leverage	Excessive Leverage	(a) Average gross exposure, (b) Active Use of Leverage (Computed from a comparison of returns with and without the use of leverage following the standards recommended by the Association for Investment Management and Research)	The higher the use of leverage the higher the discount
Liquidity	Low Asset Liquidity	(a) Average Day to Complete Sales, (b) Ratio of Position to Trading Volume	The higher the threat of "illiquidity" the higher the discount
Asset concentration	(a) Single Security Exposure, (b) Erratic Returns	(a) Average Percentage of 10 Largest Holding over reporting period, (b) Fractal Dimension or Inverse of Hurst Coefficient	The higher the asset concentration the higher the discount

If there were more transparency, we could make more adjustments.

No Substitution For Qualitative Analysis

- Understanding Strategy
- Evaluating Investment Decision Process
- Analysis of Risk Controls
- Determining Character/Talent of Manager
- Review of Funds Characteristics (Fees, Liquidity, Structure)
- On-Site Review of Operations

Fabio Savoldelli, "Best Practices For Global Hedge Fund-of-Funds Advisor", 2002

The practitioners use quantitative measures as a preliminary filter.

Common Factors Before An "Extreme Event" Occur

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- Style Drift
- Key Person Risk
- Asset Drift
- Leverage, Common Investor Effect, Emerging Market, Merger Arbitrage, Fund Split Between Two Locations

Experience matters.

Concluding Remarks

- Quantitative analysis is important
- Qualitative analysis is important, if not more
- Two competing views
  – More Transparency
    - Full disclosures of positions of segregated accounts
  – More Disclosures About Risk Management Function
    - Position-level information is not adequate to serve investor needs.

In some cases, a hedge fund will only be willing to offer low-level aggregate disclosure to investors. In that situation, one alternative is to verify the quality of a hedge fund's risk management function …

Instead, risk management disclosure on the independence of a risk manager's position, the authority of the risk manager, quality of the risk manager…..

the involvement of traders and senior managers in the risk management process, the resources available to the risk management function and the nature of the risk manager's report should be offered to investors.

- Barry Schachter, Sac Capital Advisors, quoted in Risk, July 2003

Thank You

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Source of Graphics
(not directly credited in presentation)

- **Slide 10, "Asset Allocation By Risk Profile: Balanced," Asset-Analysis.com, http://www.asset-analysis.com/assetalloc/aamodel5.html**

- **Slide 12, "Harvard Management Company (2001)," Harvard Business School Case Study, 9-201-129, 10/23/2001, Exhibit 4.**

- **Slide 14, Clark, Truman, "The Dimensions of Stock Returns: 2002 Update," Dimensional Fund Advisors Inc., April 2002.**

- **Slide 16, Kuenzi, David, "Strategy Benchmarks From the Investment Manager's Perspective," Forthcoming Journal of Portfolio Management, Winter 2003, Exhibit 1.**

Source of Graphics (Continued)

- **Slide 18, "Manager Style," Style Analysis & Performance Analysis Software, Zephyr Associates Inc., http://www.styleadvisor.com/products/styleadvisor/manager_style.html.**

- **Slide 19, BARRA Risk Decomposition screenshot from BARRA Case Study: Fiduciary Trust International, http://www.barra.com/products/fiduciary.asp**

- **Slide 33, cover of Against the Gods: The Remarkable Story of Risk by Peter Bernstein, John Wiley & Sons, Inc., 1996.**

- **Slide 37, graphs of RLX-SPX vs. MOB futures spreads, The Bloomberg.**

- **Slide 47, cover of Fooled By Randomness: The Hidden Role of Chance in the Markets and Life by Nassim Nicholas Taleb, Texere LLC, 2001.**

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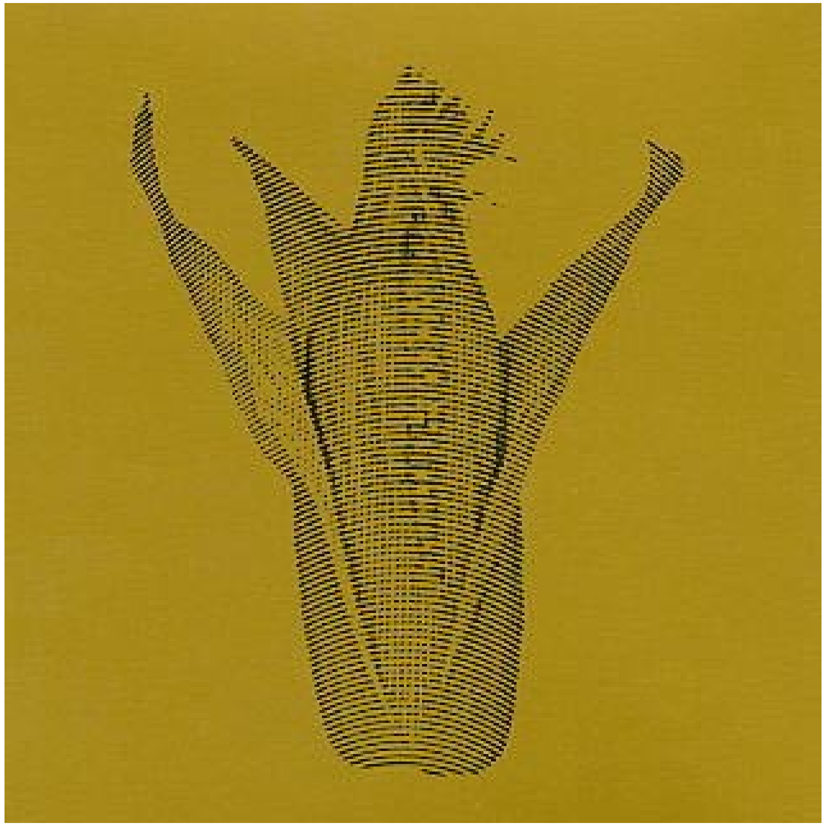

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