

*SEC Training - Risk Management*  
*Washington, D.C., February 27, 2006*

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# *The Concept of Risk*

## *What Is Risk?*

- How likely is a given outcome to occur?
- How much does that outcome scare you?

# *The Risk Equation*

Risk = Uncertainty + Consequences

*A 5%  
position  
loss...*

- ...at 1:1 leverage is an inconvenience.
- ...at 5:1 leverage is a disaster.
- ...at 10:1 leverage puts you out of business.
- ...at 20:1 leverage bankrupts you.

*MFA Sound Practices  
for Hedge Fund Managers*

*MFA*  
*Sound Practices*

- Management and Internal Trading Controls
- Responsibilities to Investors
- Valuation Policies and Procedures
- **Risk Monitoring**
- Regulatory Controls
- Transactional Practices
- Business Continuity and Disaster Recovery

# *Sources of Uncertainty*

*(guaranteed incomplete)*

- Market
  - Economic Growth
  - Interest and Inflation Rates
  - Foreign Exchange
  - Credit and Counter-party
- Operational
  - Lack of Discipline
  - Lack of Flexibility
  - Operational Errors and Deficiencies
- Strategy
  - Non-Stationarity
  - Overfitting
  - Lack of Realism
- Event Risk
  - Regulatory Changes
  - Political Upheavals

# *Risk Monitoring*

Source: MFA's 2005 *Sound Practices for  
Hedge Fund Managers*, p. IV-2

- Reports to Senior Management
- Develop and Implement a System of Checks and Balances
- Conduct Back Tests and Stress Tests
- Quantify and Monitor Current Exposures

# *Risk Classification*

Source: MFA's 2005 *Sound Practices for Hedge Fund Managers*, pp. IV-3 to IV-9

- Market Risk
- Liquidity Risk
- Credit Risk
- Leverage Risk
- Operational Risk
- Valuation Risk

# Monitoring Risk

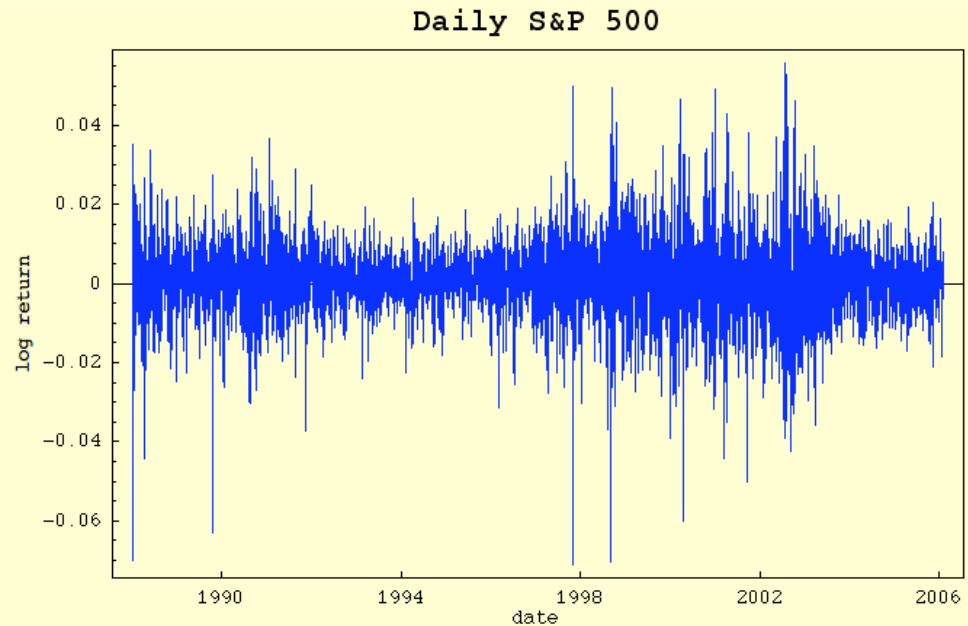
Source: MFA's 2005 *Sound Practices for Hedge Fund Managers*, pp. AI-1 to AI-22

- General Techniques
  - No one numerical or statistical measure is complete
  - Employ multiple measures
    - VaR
    - Stress Testing
    - Scenario Analysis
- Funding Liquidity Risk
  - The fund's ability to absorb losses
  - Volatility a key element
- Leverage (in context)
  - Multiple Definitions
  - Not an Independently Useful Measure

# *The Character of Security Returns*

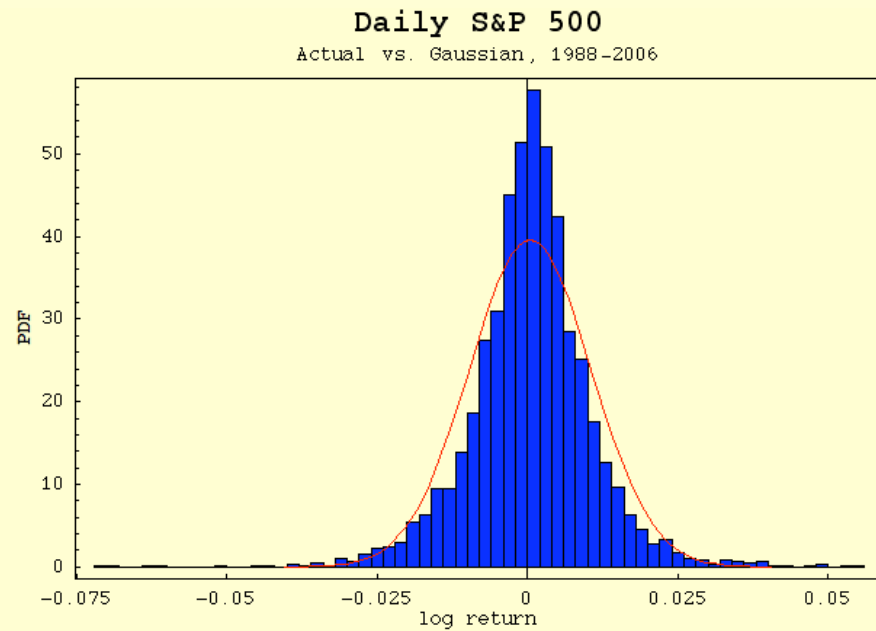
## *Real returns...*

- Heteroskedastic
- Skewed
- Kurtotic



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# Outlier Analysis

S &P 500 Daily Returns  
1988 - 2006

<i>Statistic</i>	<i>Result</i>
Observations	4,558 trading days
Return $\mu$	0.045%
Return $\sigma$	1.0%
Century "Fence"*	(-3.9%, -3.9 $\sigma$ )
Outlier Count	9
Maximum Drawdown	(-7.1%, -7.0 $\sigma$ )
Theoretical Frequency*	4.4 billion years

\* Assuming a Gaussian Distribution with the same mean and standard deviation.

# Outlier Analysis

S &P 500 Monthly Returns  
1956 - 2006

<i>Statistic</i>	<i>Result</i>
Observations	602 trading months
Return $\mu$	0.83%
Return $\sigma$	4.2%
Century "Fence"*	(-12.3%, -3.1 $\sigma$ )
Outlier Count	2
Maximum Drawdown	(-24.3%, -5.8 $\sigma$ )
Theoretical Frequency*	23.2 million years

\* Assuming a Gaussian Distribution with the same mean and standard deviation.

# *Controlling Risk with Hedging*

# *Derivatives & Risk*

- Derivatives transfer risk - either increasing or decreasing it.
- Hedges typically involve some form of “leverage”.
- Overconfidence and bad assumptions have serious consequences.

*Systematic*  
*vs.*  
*Idiosyncratic*

- Certain risk factors are systematic; *i.e.*, they are shared across securities.
- Others are idiosyncratic; *i.e.*, they are unique to each particular security.
- Systematic risk can not be diversified away but idiosyncratic risk can.

# *Arbitrage (Theory)*

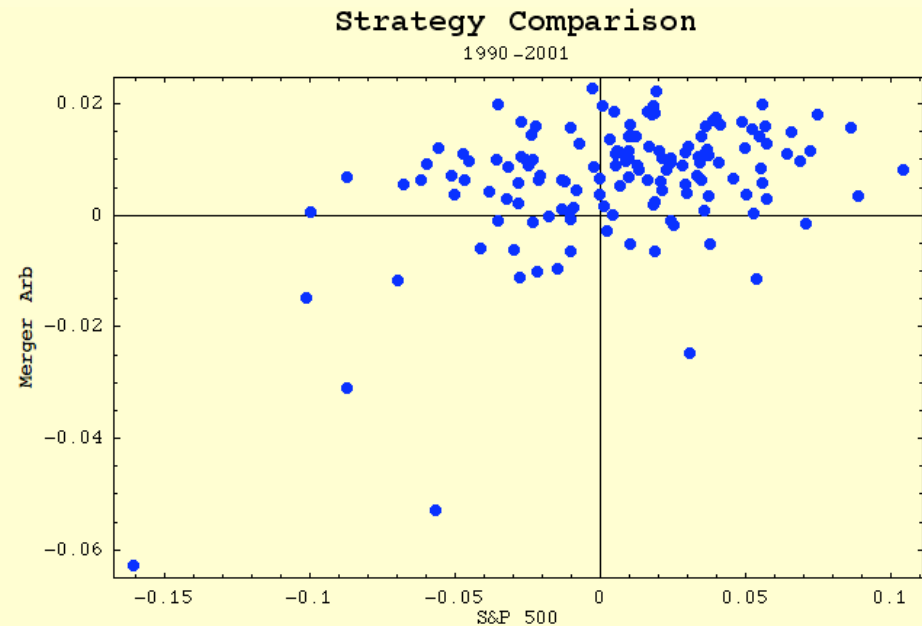
- Relative performance returns can be small but independent.
- Buy a long position in “undervalued” assets.
- Sell a short position in “overvalued” assets.
- Hedge out systematic factors so that only idiosyncratic risks...and returns...remain.
- Diversify aggressively; lever up to an “interesting” return.

# *Arbitrage (Practice)*

- Risk models are not perfect, so there are always missing factors...and unhedged systematic exposures.
- Maintaining a long-short hedge must be done dynamically: Volatility exposure, trading costs, difficulty in selling shorts *etc.* make managing a portfolio operationally difficult.
- Markets evolve, making models obsolete.
- With many arbitrage based strategies managers experience steady and mildly positive returns punctuated by periods of extremely poor performance.

# Merger Arbitrage

## *Case Study*



- Strategy is largely uncorrelated to the market but with...
- Occasional periods of extremely poor performance associated with certain market events
- Returns experienced during sustained periods of good performance are not indicative of true risks.

# Why Hedges Fail

- Following the map...not looking at the road...makes it easy to overlook the obvious.
- Models, even at their best, are not representative.
  - Markets are not continuous.
  - Models depend on statistical estimates; the “true” parameters are unknown.
  - Markets evolve and change all the time.
- Model errors are amplified by high leverage.
  - Risk is underestimated: Leverage is encouraged.
  - Even small errors are deadly.
- Changes in market behavior during stress periods invalidate basic assumptions.
  - Correlations increase during stress periods.
  - Liquidity disappears as supply and demand become imbalanced.
- Two most dangerous comments are...
  - “This time it’s different...”
  - “This time it’s just like...”

# *A Few Useful Quotes...*

# *The Quant's Trap*

Today's scientists have substituted mathematics for experiments, and they wander off through equation after equation, and eventually build a structure which has no relation to reality.

Nikola Tesla (1856 – 1943)

# *The Modeler's Trap*

Life is not an illogicality; yet it is a trap for logicians. It looks just a little more mathematical and regular than it is; its exactitude is obvious, but its inexactitude is hidden; its wildness lies in wait.

G.K. Chesterton (1874 – 1936)

*Thank You!*