Institutional Finance

Lecture 06: Portfolio Evaluation and Hedge Funds

Markus K. Brunnermeier

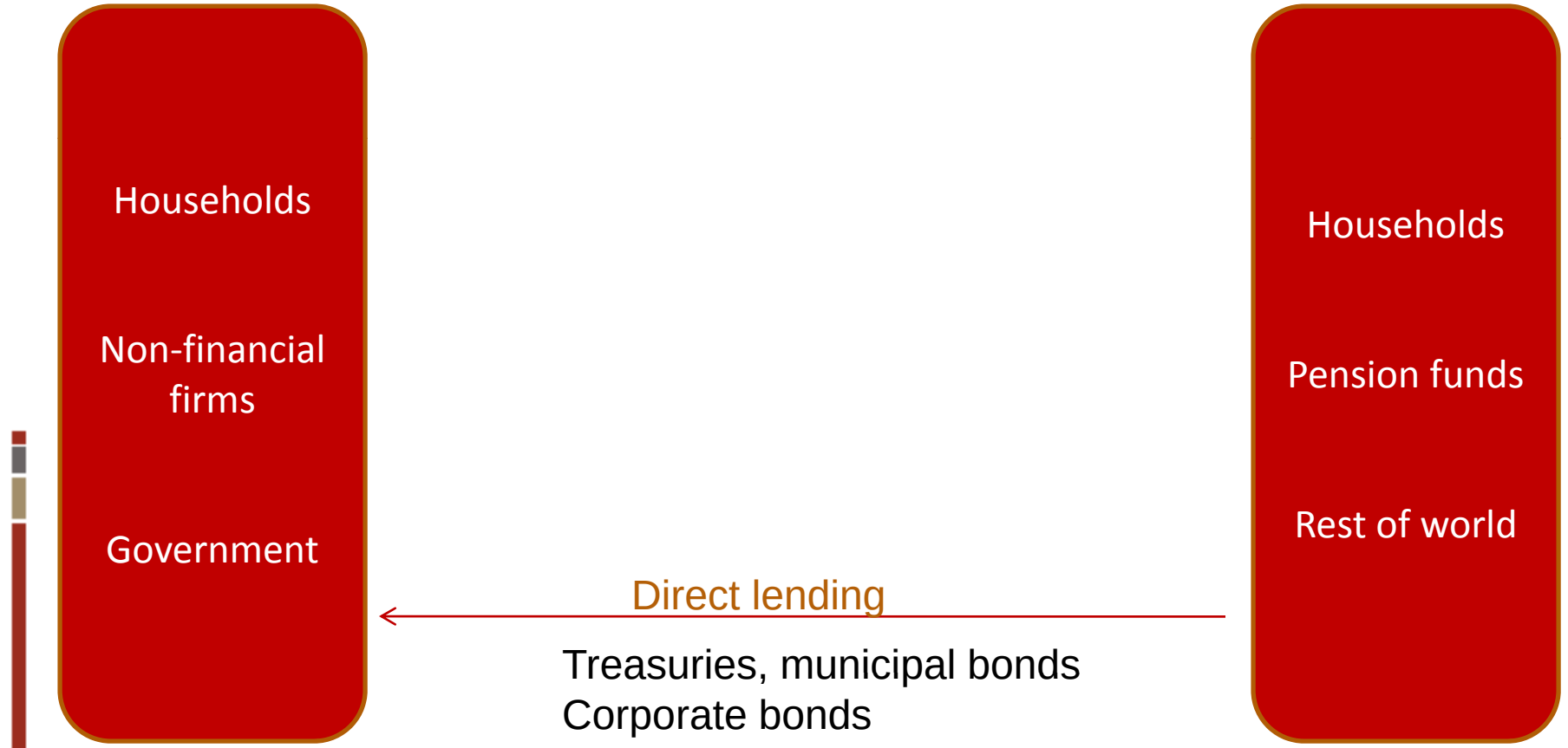
Preceptor: Dong Beom Choi

Princeton University

OVERVIEW

- A Primer on Hedge Funds
  - History, Compensation
    - Hedge Fung and Hsieh, 1999, A Primer on Hedge Funds, *Journal of Empirical Finance*.
  - Hedge Fund Strategies
    - CSFB-Tremont http://www.hedgeindex.com;
    - Fung and Hsieh, 2004, Extracting Portable Alphas from Equity Long-Short Hedge Funds, *Journal of Investment Management*
    - Malkiel and Saha, 2005, Hedge Funds: Risk and Return, *Financial Analysts Journal*
- Performance
  - alpha versus beta
    - stale prices
    - non-linear payoffs
  - Focus I: Merger Arbitrage
    - Mitchell and Pulvino, 2001, Characteristics of Risk and Return in Risk Arbitrage, *J of Finance*
- Liquidity Risk and Risk Management
  - Fund flows
  - Liquidity Spirals and Leverage
  - Correlation across Hedge Funds
  - Focus II: 2007 Quant crisis

STYLIZED FINANCIAL SYSTEM



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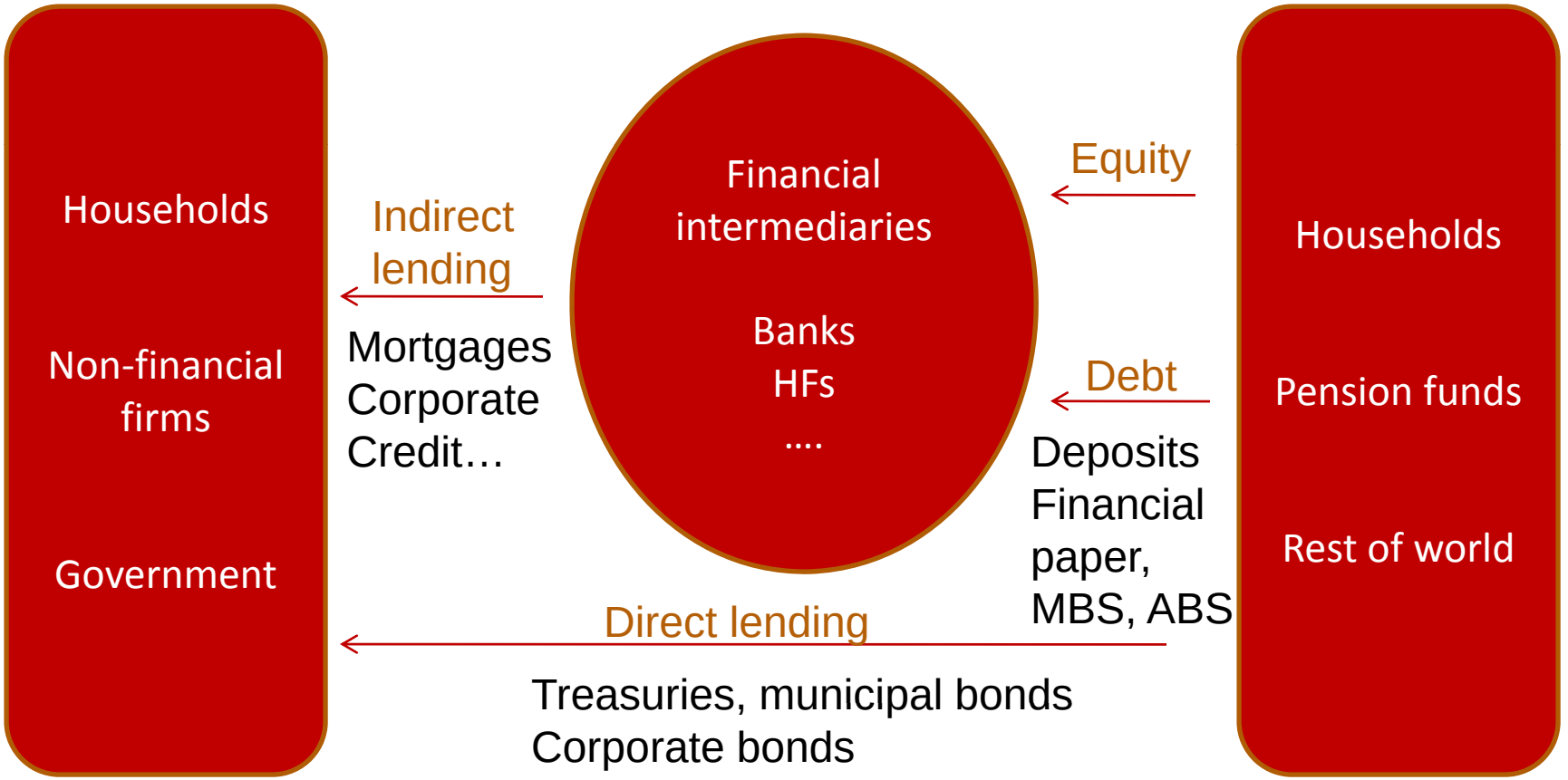
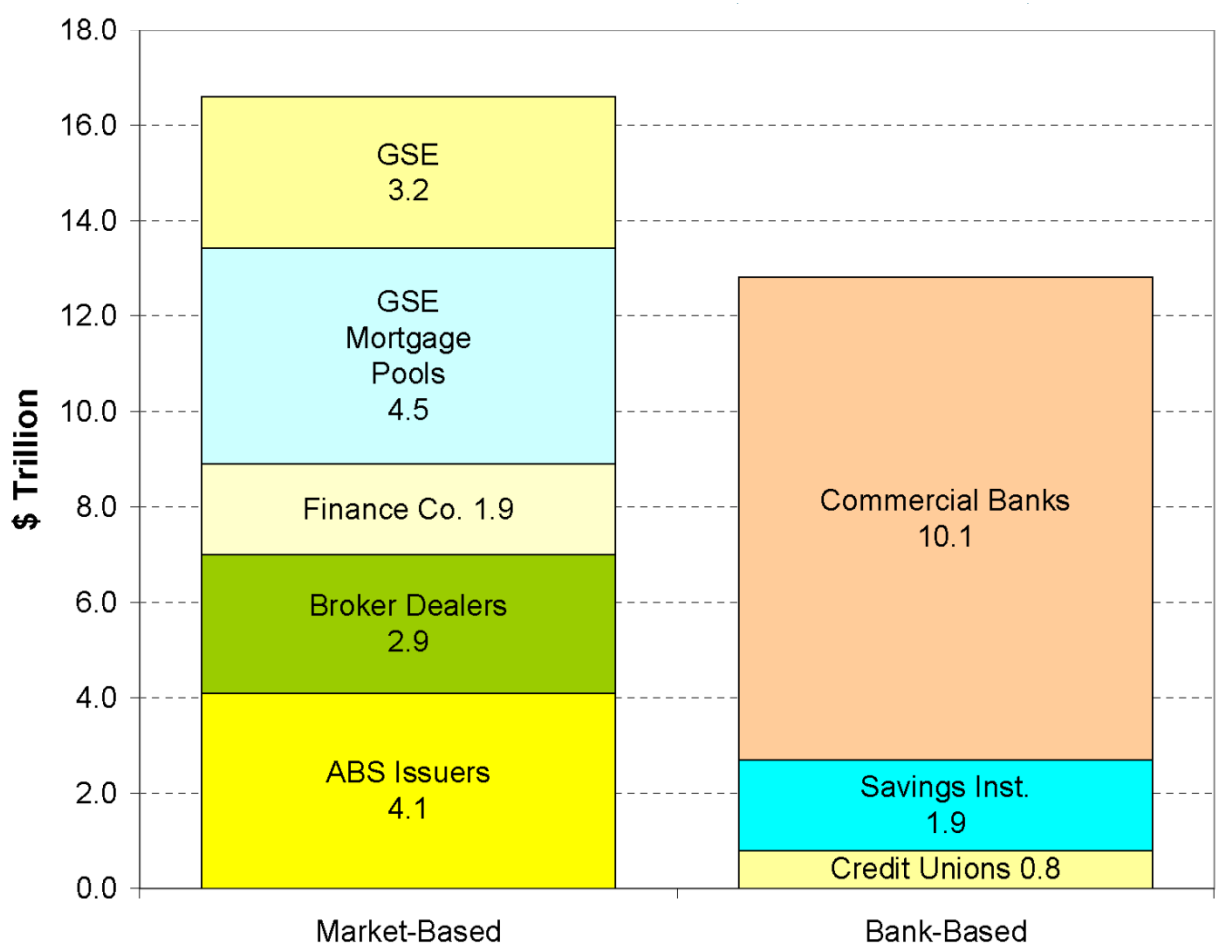


SHADOW BANKING SYSTEM

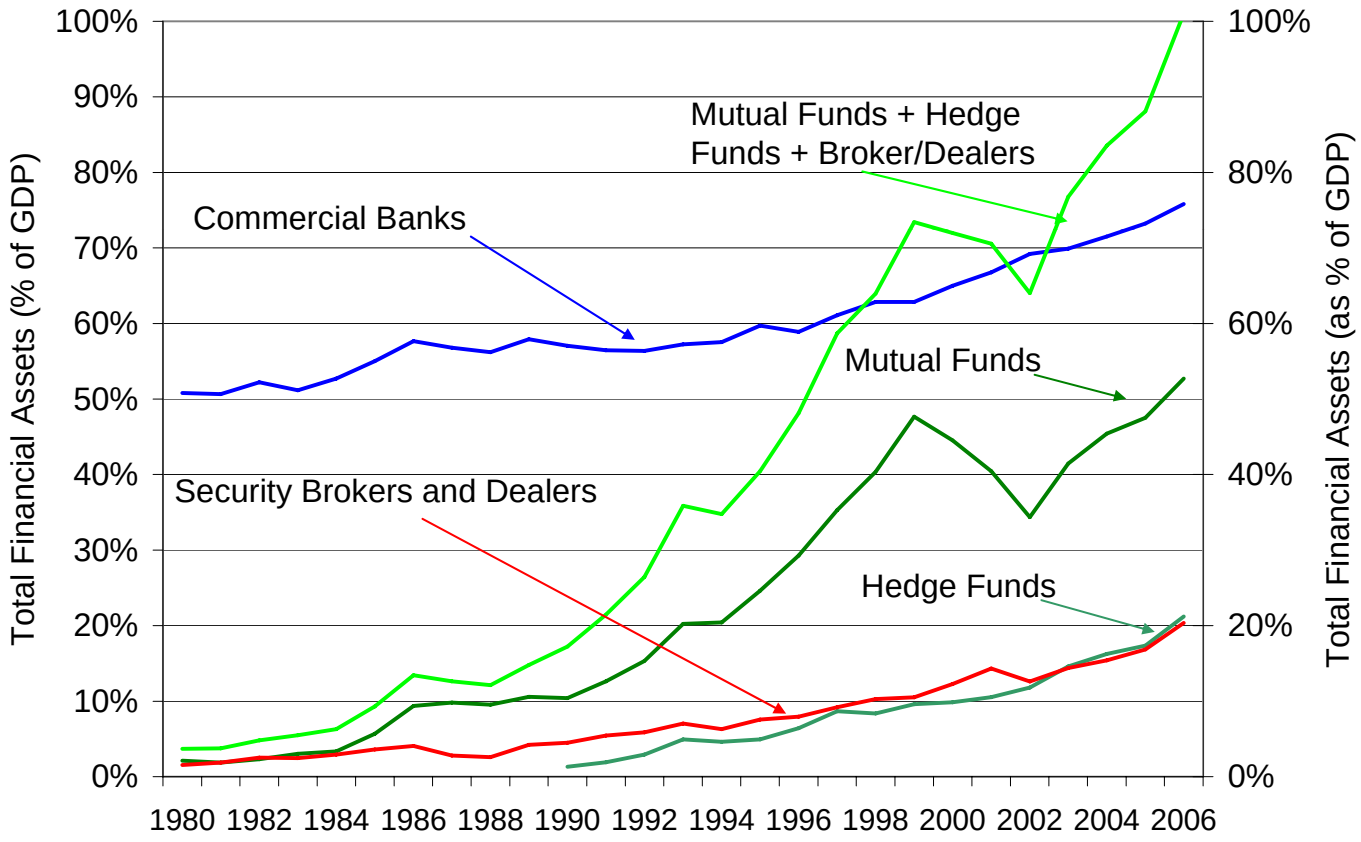
- Traditional banking model
- Originate-and-distribute banking model
  - Securitization
  - Special purpose vehicles (SIVs etc.)

MARKED-BASED VS. BANK-BASED



Source: Shin

TOTAL FINANCIAL ASSETS AS % OF GDP



WHAT ARE HEDGE FUNDS?

- private investment vehicles for individuals or institutional investors.
- Typically organized as limited partnerships, in which the investors are limited partners and the managers are general partners.
- As general partners, the fund managers usually invest in a significant portion of their personal wealth into the partnership to ensure the alignment of economic interests among the partners.
- Investors to the partnership are charged a performance-based fee where the potential payout to successful managers can be significantly higher than the fixed management fee.
- A major difference in return characteristics between hedge funds and mutual funds is due to differences in their trading strategies.
- Hedge funds deploy dynamic trading strategies whereas most mutual funds employ a static buy-and-hold strategy.
- Hedge funds typically leverage their bets by margining their positions and through the use of short sales.

  · In contrast, the use of leverage is often limited if not restricted for mutual funds.

HISTORY OF HEDGE FUNDS

- First hedge fund by Albert Wislow Jones in 1949.
  - primary strategy used long-short equity positions and leverage.
  - incentive fee based on performance.
- Until 1966 hedge funds remained relatively obscure
- In 1966 article in Fortune described Jones' funds to have returns (net of fee) substantially higher than the best performing mutual funds.
- Rapid expansion in 1967-68
- Setback during the bear markets of 1969-70 and 1973-74, when many funds suffered losses and capital withdrawals.
- Hedge funds faded back into obscurity until 1986, when an article in Institutional Investor reported that Julian Robertson's Tiger Fund had compounded annual returns of 43% during its first six years of existence, after expenses and incentive fee. This reignited interests in hedge funds, with the formation of many new hedge funds.

HEDGE FUND COMPENSATION

- Managers can receive certain types of performance-based fees that are prohibited to mutual funds.
- The typical compensation for hedge fund managers is a
  - 2% management fee and
  - 20% performance fee with high water mark.
- substantially higher compared to mutual funds.
  - Mutual fund performance-based fee must satisfy the "fulcrum" rule:
    - gains and losses must have a symmetric effect (over- and underperformance relative to a benchmark must result in the same amount of positive and negative incentive fees for a mutual fund manager
  - HF are not subject to “fulcrum” rule and managers typically receive asymmetric fees
- Embedded “put option” is highly debated
    - On the one hand, the significant amount of personal wealth that hedge fund managers place at risk alongside investors inhibits excessive risk taking.
    - On the other hand, there are extreme circumstances where the disproportional payout from the incentive fee may outweigh the risk of losing personal wealth even if reputational risks are taken into account.

ORGANIZATION OF HEDGE FUNDS

- Problem confronting a money manager who
  - believes that he has superior investment skills
  - limited own capital
- Financing options
  - Equity
  - Debt – putting up personal assets as collateral - in most cases insufficient
- Disclosure
  - Fund managers adverse to fully disclose his "winning strategy"
  - Excludes organizational forms that must meet a high level of "transparency" and "disclosure"
  - Favors "private vehicles" – explains the lack of "publicly offered" hedge fund products
- Investors demand limited liability and protection
  - disclosure documents are at best cursory and complex
  - "recommendations from a reliable source", managers "reputation" plus performance statistics and computer simulations.
- Commitment of manager's personal capital and the incentive fee structure are often critical elements.

REGULATION OF HEDGE FUNDS

- Securities Exchange Commission (SEC) oversees publicly traded securities, including the corporations that issue them, broker-dealers, investment advisors and mutual funds
  - Enforces federal securities laws designed to protect investors and ensure disclosure
  - Regulates firms that purchase or sale of securities, provide investment advice, and investment companies.
  - ***Securities Act of 1933***
    - requires firms issuing publicly traded securities to register and file disclosure reports.
    - *Exemption for HF:* Claim status of a private placement under the safe harbor provision of Rule 506 in Regulation D
  - ***Securities Exchange Act of 1934***
    - Regulate securities broker-dealers that face potential conflicts in executing customer orders versus own accounts.
    - *Exemption for HF:* as long as they trade only for own accounts. -
  - ***Investment Advisers Act of 1940***
    - requires investment advisors to register and to conform to statutory standards.
    - *Exemption for HF:* have less than 15 clients, don't solicit business from the general public
  - ***Investment Company Act of 1940***
    - severely restricts a mutual fund's ability to leverage
    - *Exemption for HF:* Have no more than 99 investors (recently 499 and < $5million in asset), don't make any public offerings
- CFTC

REGULATION OF HEDGE FUNDS

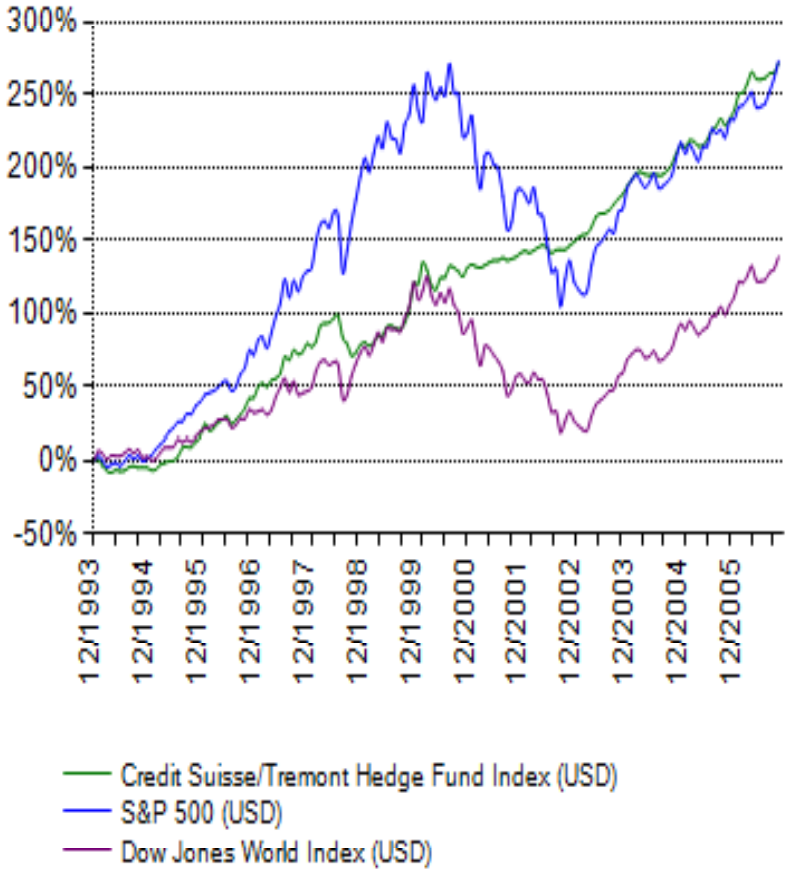
- The Commodity Futures Trading Commission (CFTC) oversees futures industry
  - ***Commodity Exchange Act of 1974*** to regulate the futures markets in the US, the CFTC is mandated to protect market participants against manipulation, abusive trade practices and fraud in the futures markets.
    - Entities that handle *customer funds* or provide *trading advice* in futures contracts must register with the National Futures Association (NFA), a futures industry self-regulatory body approved by the CFTC. In addition, these registrants must disclose market risks and past performance information to prospective customers.
    - If a hedge fund trades futures and options on futures on behalf of its investors, it is generally required to file as a commodity pool operator with the Commodity Futures Trading Commission.

REGULATION OF HEDGE FUNDS

- Hedge funds are not exempted from general regulations designed to monitor and safeguard the integrity of markets.
- The U.S. Treasury requires traders to report large positions in selected *foreign currencies* and *treasury securities*.
- The SEC requires traders to report positions
  - that exceed 5% of the shares of a publicly traded firm
  - Quarterly position for "large" HFs (13F filing)
- The Federal Reserve has margin requirements for stock purchases (Reg T)
- The CFTC requires traders with large futures positions to file daily reports.
- The CFTC and the futures exchanges set *futures margins* and position limits on futures contracts.
- These regulations apply to all market participants, including hedge funds.

HEDGE FUND STRATEGIES

- Credit Suisse Tremont
  - asset-weighted hedge fund index
    - calculated and rebalanced monthly
    - Net of fee and expenses
  - includes only funds, as opposed to separate accounts
  - 4500 funds
    - minimum of US$50 million under management
    - 12-month track record
    - audited financial statements

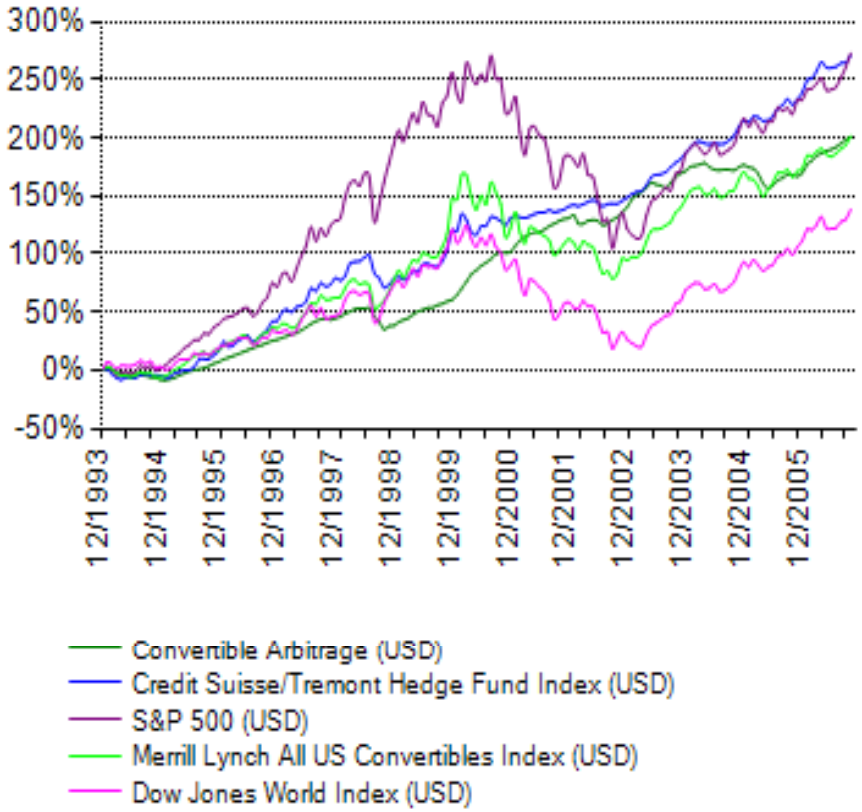


THE 10 STRATEGIES - OVERVIEW

- Convertible Arbitrage: 2.7%
- Dedicated Short Bias: 0.5%
- Emerging Markets: 6.8%
- Equity Market Neutral: 5.3%
- Event Driven: 23.3%
- Fixed Income Arbitrage: 6.9%
- Global Macro: 11.2%
- Long/Short Equity: 28.4%
- Managed Futures: 4.9%
- Multi-Strategy: 9.9%

CONVERTIBLE ARBITRAGE

- convertible securities
- hedge the equity component by shorting the underlying stock or options
- Also, interest rate, volatility and credit hedges
- Hedge ratios adjusted as markets move
- typically designed to create profit irrespective of market moves.

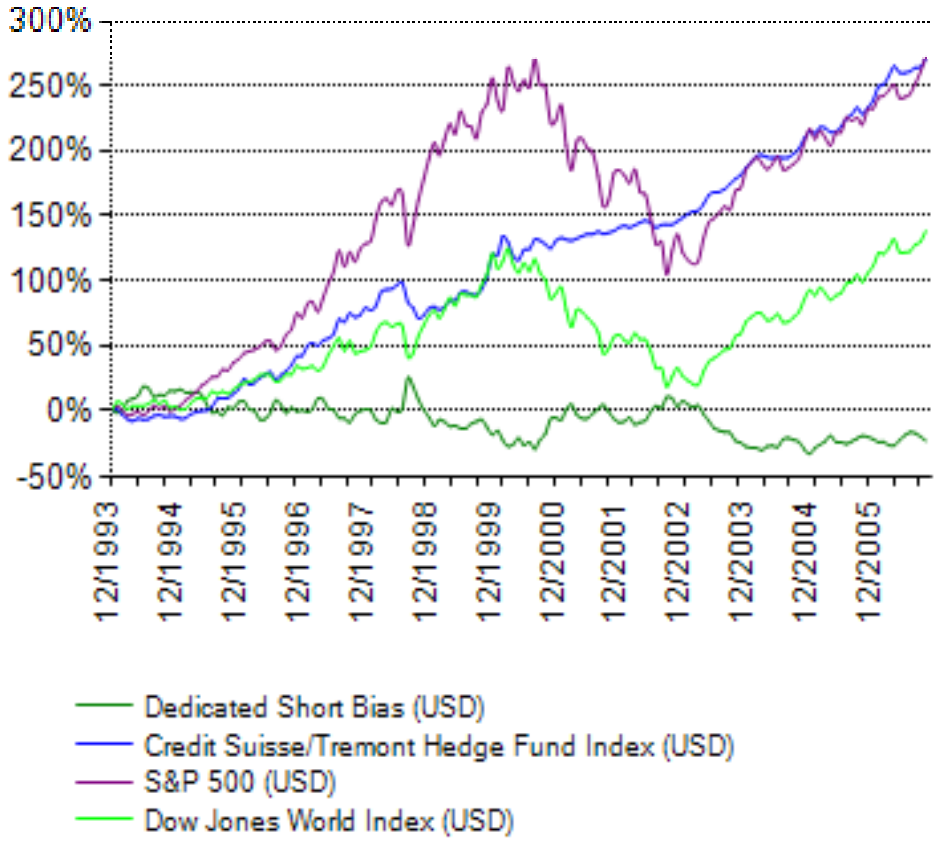


ASIDE: CONVERTIBLE BONDS/ARBITRAGE

- Price of convertible bonds
  - Investment value = the price if it were a straight bond
  - Conversion value = value if converted into its equity equivalent (e.g. converted into 5 shares of stock with price $10, then $50)
    (usually, price of bond > max {investment value, conversion value})
  - Option value (time value)
- Convertible arbitrage
  - short position in the stock
  - delta hedging: divide price of the convertible by stock price conversion premium and then multiplying by option delta.
  - Example:
    - Convert's price is $1000, current stock price is $50, conversion premium is 50%, so value of the stock price conversion premium is $75. Option delta is 0.65.
    - Number of shares to short, hedge ratio, is then: ($1000/$75)*0.65=8.6667.
    - For small stock price movements this short position provides hedge.
    - Creates a market neutral position
    - During volatile markets this hedge breaks down, but can be profitable
    - Cash in the coupon payments

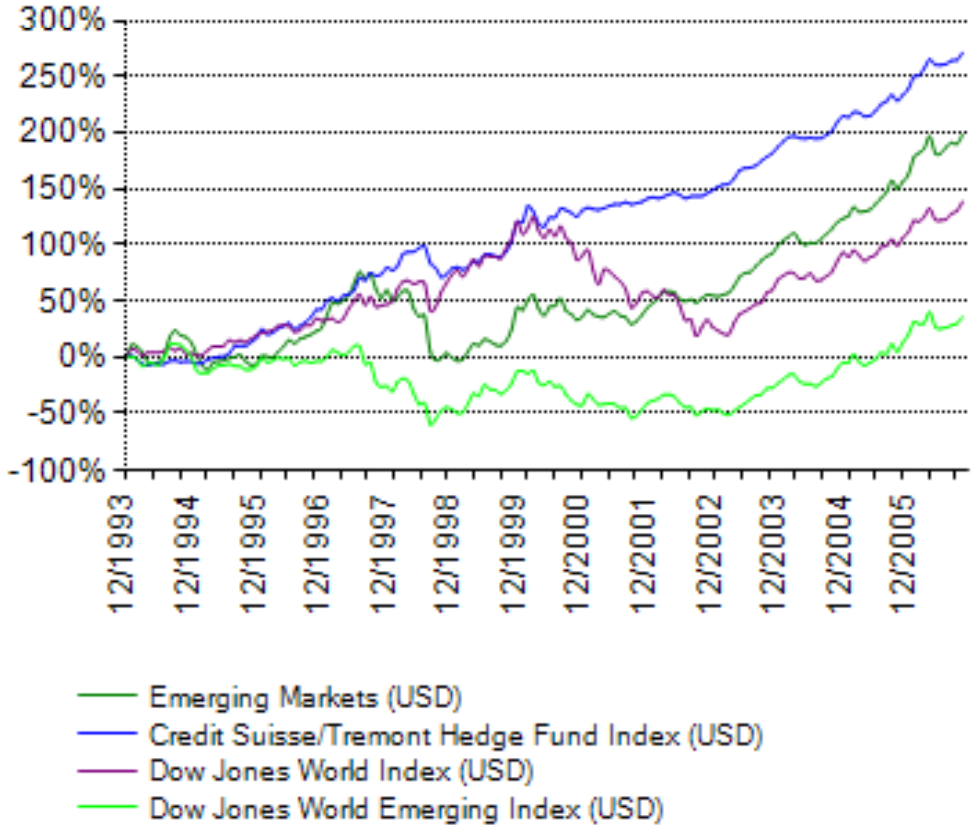
DEDICATED SHORT BIAS

- Overall net short portfolios of long and short equities
- focus on companies wi weak cash flow generation is common
- Risk management consists of offsetting lc positions and stop-loss strategies.



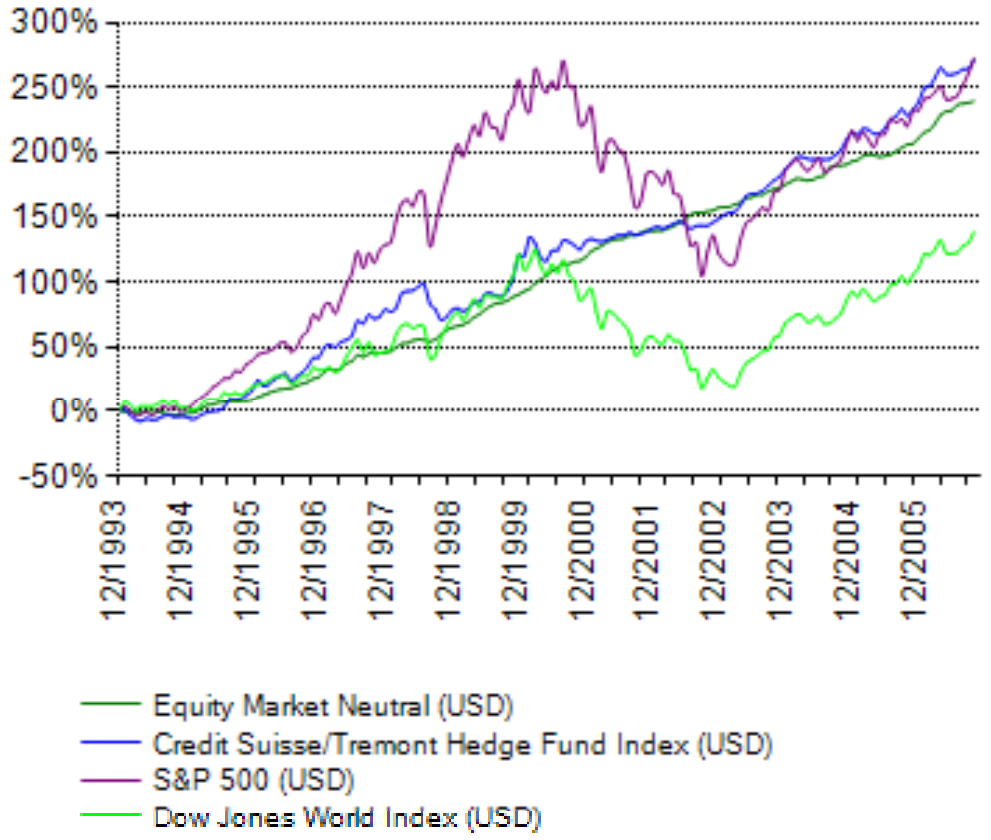
EMERGING MARKETS

- investments in currencies, debt instruments, equities and other instruments of "emerging" markets countries (typically measur by GDP per capita).
- Latin America, Eastern Europe, Africa, and Asia
  - BRIC
  - Next-11
- sub-sectors, including arbitrage, credit and event driven, fixed income bias, and equity bias.



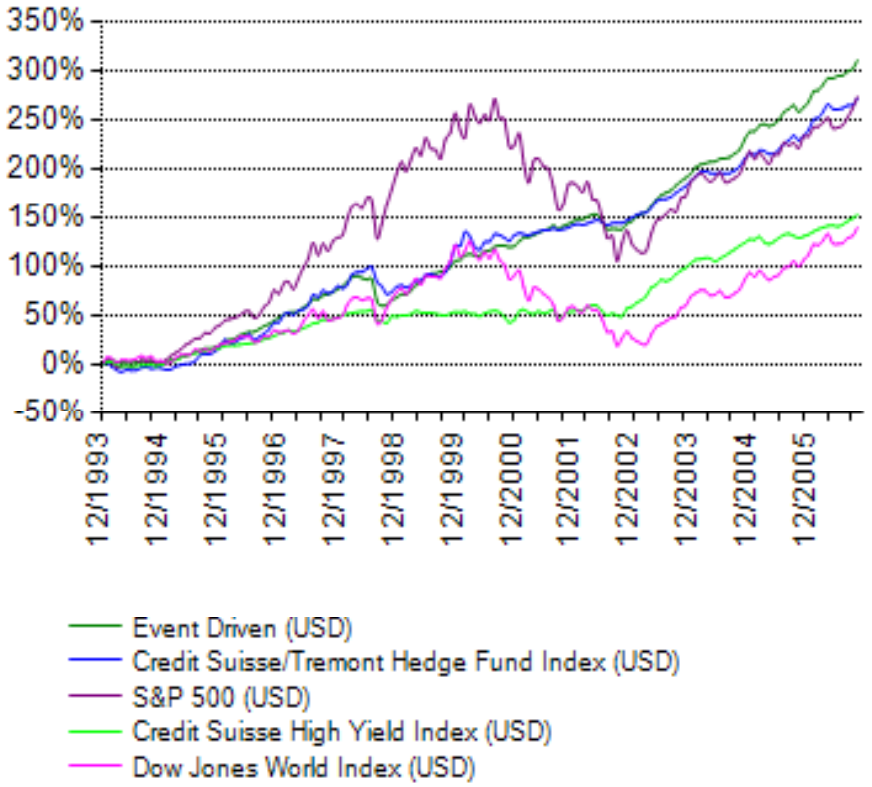
EQUITY MARKET NEUTRAL

- exploiting pricing relationships between different equities or related securities
- typically hedging exposu to overall equity market
- Sub-sectors
  - Statistical arbitrage
  - Quantitative long/short
  - Fundamental long/short
  - Index arbitrage
- Leverage is common



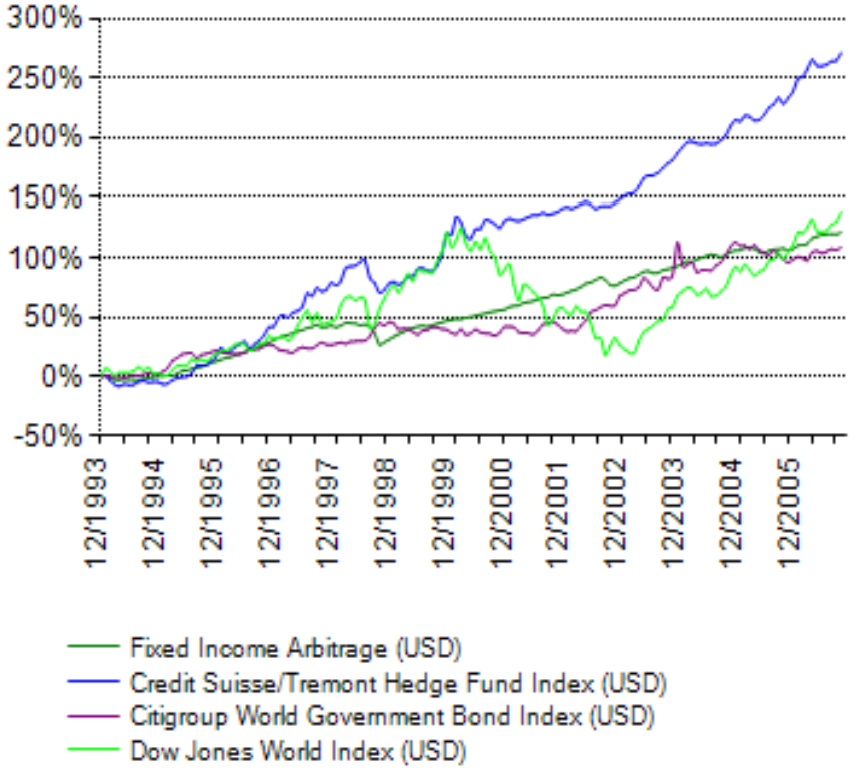
EVENT DRIVEN

- Subsectors
  - Risk (Merger) Arbitrage Specialists are typically long the stock of the company being acquired and short the stock of the acquirer.
  - Distressed/High Yield Securities Fund managers invest in claims of companies in financial distress or already in default. They trade at substantial discounts, since they are difficult to evaluate and have a lack of street coverage.
  - Reg. D - investments in micro capitalization public companies that are raising money in private capital markets.



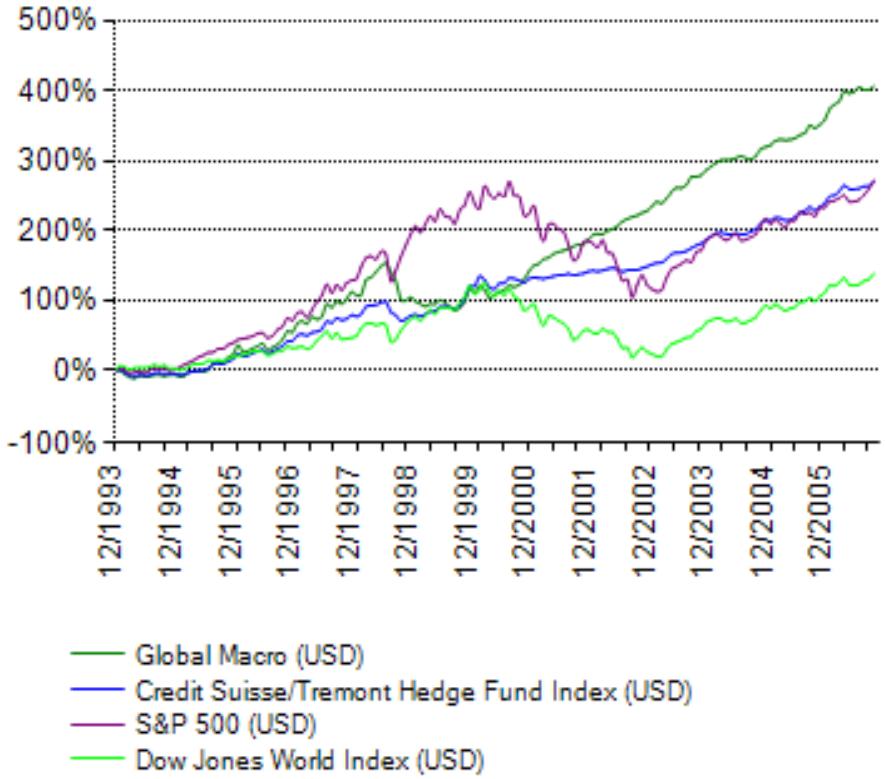
FIXED INCOME

- Different fixed income securities
- Yield curve carry trade
- Instruments
  - interest rate swaps
  - T-Bonds
  - futures
  - vol-trading involving options
  - mortgage backed securities



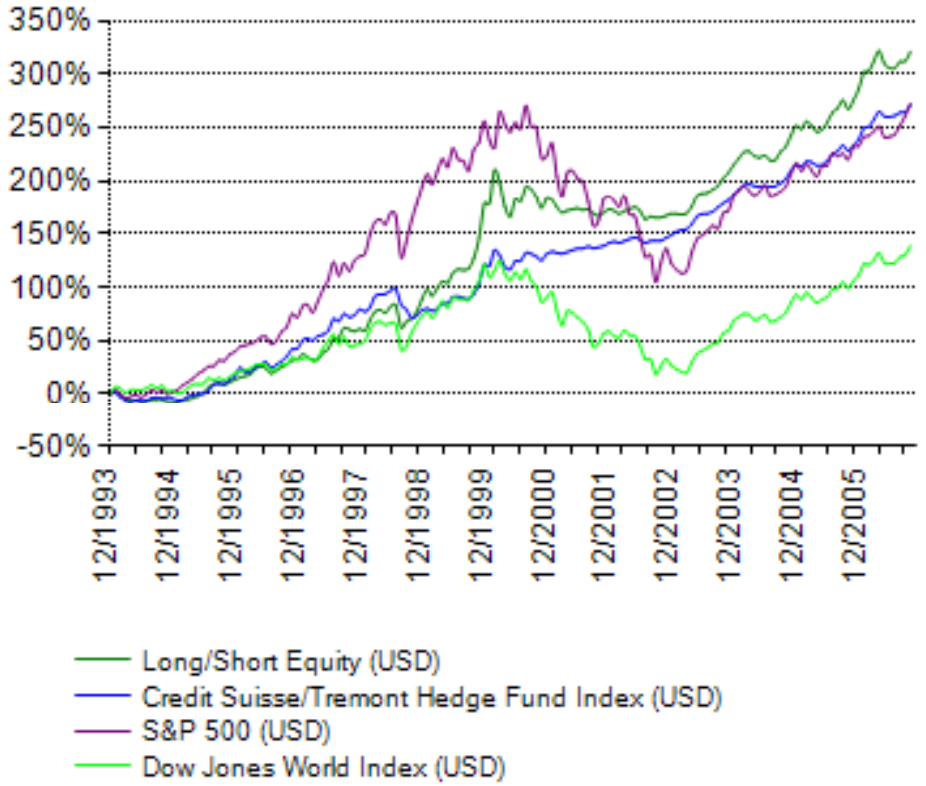
GLOBAL MACRO

- FX carry trades
- Fixed income, currency, equity, commodity (indices)
- Focus on shifts in world economies, political changes or global supply/demand imbalances
- Focus on liquid instruments



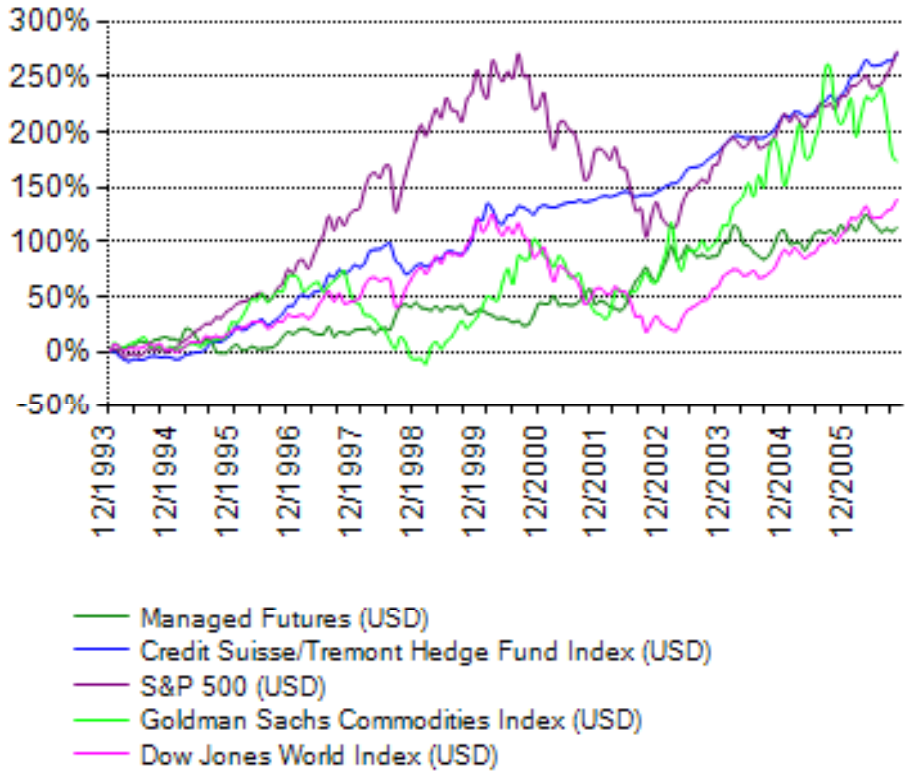
LONG/SHORT EQUITY

- Long and short
  - Stocks
  - Futures/options
- Shift from
  - value to growth,
  - small to large
  - net long to net short
- Focus
  - Global, regional, or sectorial



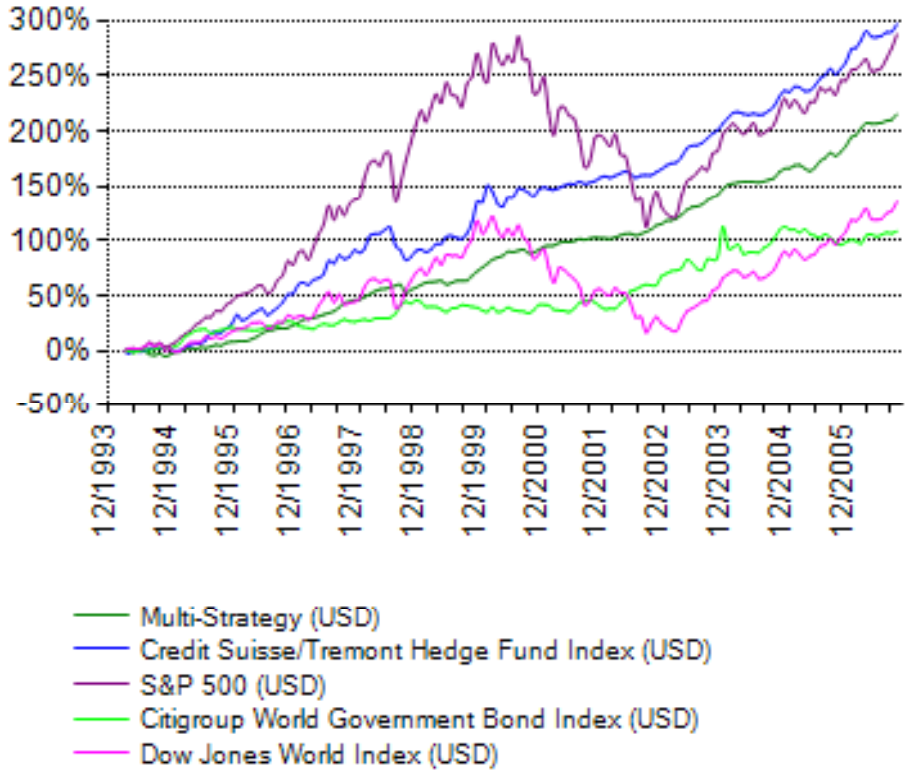
MANAGED FUTURES

- Investment in listed bonds, currency, equity and commodity futures markets globally
- Referred to as Commodity Trading Advisors (CTA)
- Rely on trading programs base on past price data
  - Long-term trend following
  - Short-term counter trend
  - Hybrid systematic/discretionary programs
  - Use stop-loss points to control risk



MULTI-STRATEGY

- Number of different strategies
- (started as convertible arbs and diversified in other strategies)
- Often highly leveraged



OVERVIEW - MONTHLY 1994-2008

Panel A: Hedge Funds Strategies

	Sharpe	Mean	Std Dev	Skew	Kurt	Min	5%	Obs	Weight Dec-06
Long/Short Equity	0.22	0.63	2.83	0.12	6.89	-11.85	-3.52	171	29%
Event Driven	0.36	0.58	1.61	-3.16	24.84	-12.19	-1.83	171	24%
Global Macro	0.27	0.82	3.00	-0.06	6.20	-11.89	-3.58	171	11%
Multi-Strategy	0.33	0.42	1.26	-1.13	5.65	-5.10	-2.00	171	10%
Emerging Markets	0.12	0.53	4.48	-0.74	8.00	-23.45	-7.31	171	7%
Fixed Income Arbitrage	0.11	0.13	1.16	-3.14	18.19	-7.30	-1.88	171	6%
Equity Market Neutral	0.59	0.46	0.79	0.18	3.66	-1.59	-0.80	171	5%
Managed Futures	0.09	0.30	3.46	0.01	3.11	-9.80	-5.24	171	5%
Convertible Arbitrage	0.23	0.32	1.39	-1.58	7.22	-6.04	-1.86	171	3%
Dedicated Short Bias	-0.06	-0.31	4.83	0.80	4.89	-9.13	-7.48	171	1%

Panel B: Financial Institution Indices

	Sharpe	Mean	Std Dev	Skew	Kurt	Min	5%	Obs
Hedge Fund Index	0.25	0.54	2.15	0.00	5.40	-7.97	-2.61	171
Investment Banks	0.02	0.13	5.29	-0.27	3.25	-16.63	-9.31	168
Commercial Banks	0.15	0.78	5.20	-0.60	5.66	-24.45	-7.46	168
Insurance Companies	0.16	0.76	4.64	0.10	6.49	-16.23	-6.30	168
Market	0.13	0.56	4.17	-0.74	3.97	-16.20	-6.44	172

TAKEAWAY FROM HF RETURNS

- Average Hedge fund Index return is comparable to S&P500.
- However, volatility of the hedge fund index is much smaller than S&P 500 (about half).
  - primarily due to the sharp decline of the S&P 500 in 2000 and 2001:
  - hedge funds have, on average, been able to unload the market risk prior to the decline, see e.g. Brunnermeier and Nagel (2004)
- Consequently, the Sharpe ratio for hedge funds is higher than the Sharpe ratio for the S&P500.
- Correlation of hedge fund index with market is low (49%)
  - Varies large across strategies
- Correlation of strategies with HF index is generally high

- Note in Malkiel and Saha (2005) returns are lower. They use equal weighted (instead of value weighted) returns of the TASS database.
  - In general, small funds perform worse than large funds

CORRELATION ACROSS STRATEGIES

CORRELATION STATISTICS (October 2006)

	Credit Suisse/Tremont Hedge Fund Index	S&P 500	MSCI World
Convertible Arbitrage	0.41	0.14	0.13
Dedicated Short Bias	-0.49	-0.76	-0.75
Emerging Markets	0.65	0.48	0.54
Equity Market Neutral	0.33	0.36	0.34
Event Driven	0.67	0.56	0.60
Fixed Income Arbitrage	0.45	0.03	0.04
Global Macro	0.86	0.23	0.19
Long/Short Equity	0.79	0.59	0.63
Managed Futures	0.15	-0.14	-0.08
Multi Strategy	0.22	0.10	0.17

Credit Suisse/Tremont Hedge Fund Index	1.00		
S&P 500	0.49	1.00	
MSCI World	0.49	0.94	1.00

OVERVIEW

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- Performance
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PERFORMANCE – RETURN ISSUES

- Biases
  - Survivor – all alive funds have a 20% death rate
  - Backfill – smooth out returns
  - Self-reported
- Estimation impression of mean returns
  - $\sigma / \sqrt{T}$, if σ=15%, then uncertainty about 5 year mean return is $1.96*15/5^{.5}$=+/-13%
- Stale prices – return smoothing
- Non-linear strategies
  - Small prob. Disaster – historical averages are a poor measure
- little persistence in outperformance
- Conclusion
- Evaluation of average returns or alphas is very noisy
- Evaluation of risk measure or betas is useful

PERFORMANCE MEASURES

- Jensen α (risk that is not due to loading on market risk)
  - For CAPM

$$r_{P,t} = \alpha_P + \beta_P r_{M,t} + \varepsilon_{P,t}$$

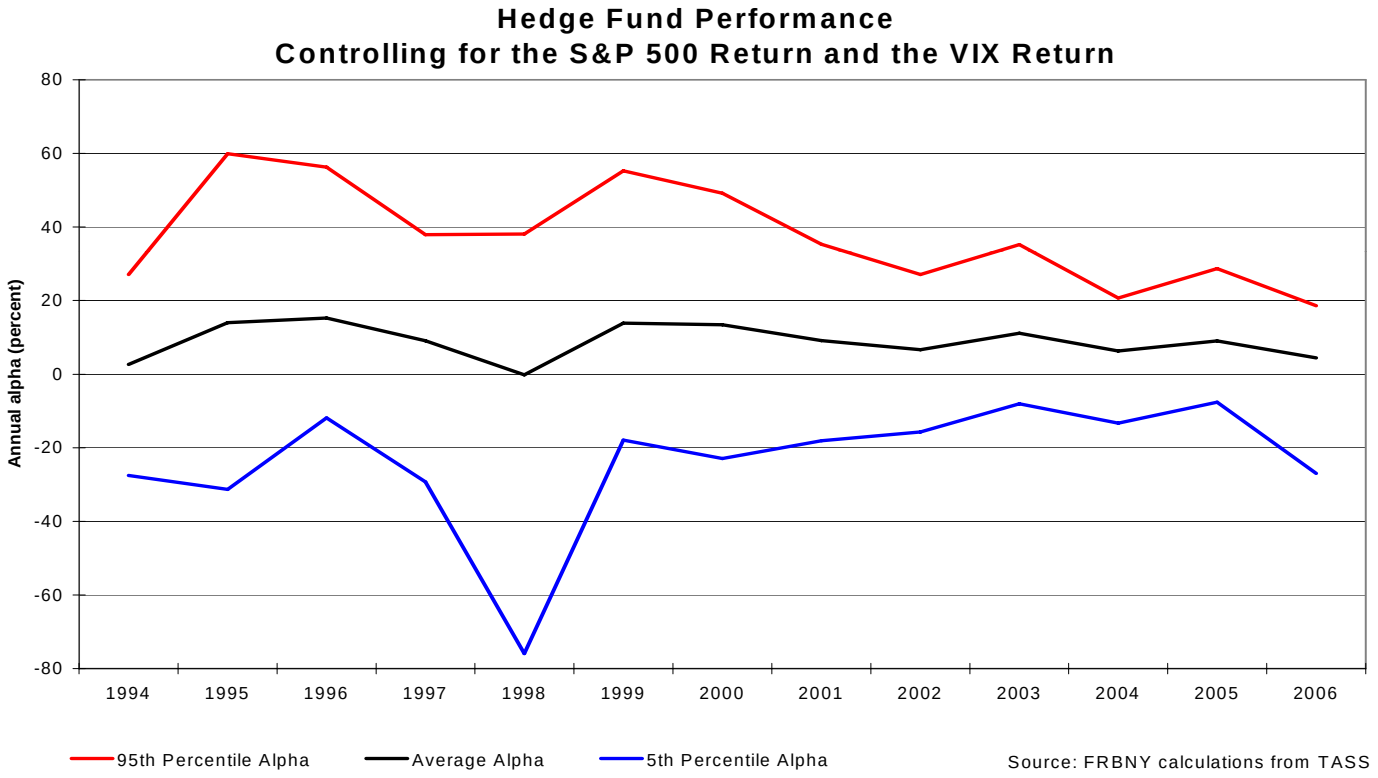
$$E[r_P] = \alpha_P + \beta_P E[r_M]$$

    - β_P: tendency of return to rise if market rises
    - $\beta_P r_{M,t}$: can get simply be investing in index ("style")
    - α_P: return in excess – selection/timing
    - $\varepsilon_{P,t}$: extra risk beyond index fund
  - For multi-factor model
- Appraisal (information) $\alpha_P/\sigma_\varepsilon$ (takes leverage into account)

PERFORMANCE MEASURES

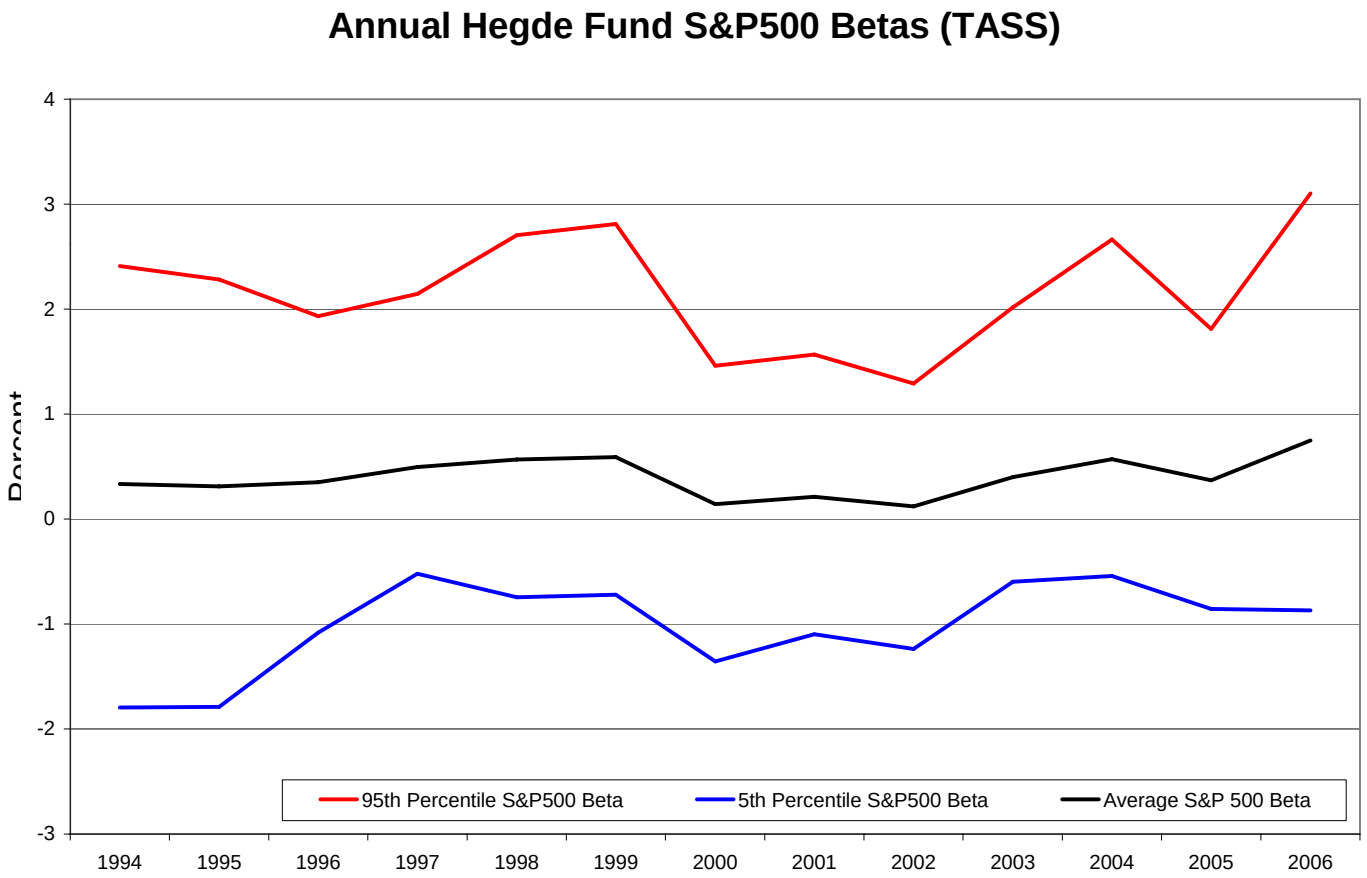
- Jensen's α
- Appraisal Ratio
- Sharpe Ratio $\frac{E[r_P]-E[r_f]}{\sigma_P}$
  - earned average risk premium of portfolio/fund P per unit of total risk
- Treynor Index $\frac{E[r_P]-E[r_f]}{\beta_P}$
  - earned average risk premium of portfolio/fund P per unit of systematic risk (measured by beta)

ALPHAS OVER TIME



- Alpha for two factor model with S&P500 and VIX
- Note cross-section alpha is getting compressed over time

MARKET-BETA OVER TIME



VIX-beta looks similar

PORTABLE ALPHA – FROM FUNG-HSIEH 2004

Regression Of HFR Equity Hedge Index on 4-Factor Model
1994-2002

	2-Factor	3-Factor	4-Factor	Nonlinear
Intercept	**0.0102**	**0.0103**	**0.0091**	**0.0076**
	0.0011	*0.0012*	*0.0011*	*0.0022*
Mkt-RF	**0.4383**	**0.4385**	**0.4721**	**0.4426**
	0.0270	*0.0300*	*0.0273*	*0.0307*
SMB	**0.2646**	**0.2648**	**0.2496**	**0.2545**
	0.0412	*0.0399*	*0.0373*	*0.0350*
HML		0.0006	0.0232	
		0.0458	*0.0389*	
MOM			**0.0851**	
			0.0236	
|Mkt-Rf|				0.0191
				0.0519
|SMB|				0.0602
				0.0488
R^2	0.8109	0.8109	0.8374	0.8156
Adjusted R^2	0.8073	0.8055	0.8312	0.8084

(Heteroskedasticity-consistent standard errors in italics. Coefficients in bold are statistically significant at the 1% level)
Two-factor model: Rm-Rf and SMB from Fama-French (1992).
Three-factor model: Rm-Rf, SMB, and HML from Fama-French (1992).
Four-factor model: Rm-Rf, SMB, and HML from Fama-French (1992), and MOM from Carhart (1997).

- More than 80% is explained by FF-factors
- α-Intercept is still significant
- But volatility is much lower

STALE PRICES – RETURN SMOOTHING

- Investing in illiquid assets with stale prices makes
  - Correlation with factor (e.g. market) appear to be low
    - Wrongly lowers β-estimate, increase α-estimate
  - Returns appear less volatile
    - Information ratio increases

USING LAGS TO IDENTIFY STALE PRICES

Style	ER (%/mo)	a	b	a3	b3
Index	0.64	**0.46**	**0.28**	**0.36**	**0.44**
Std. errors	0.20	0.17	0.04		
Short	-0.53	0.10	-0.94	0.13	-0.99
Emerg mkts	0.39	**0.00**	**0.58**	**-0.07**	**0.69**
Event	0.61	0.46	0.22	0.38	0.37
Global Macro	0.93	0.82	0.17	0.74	0.31
Long/Short Equity	0.73	0.42	0.47	0.32	**0.65**

Not zero!

Bigger with lags

Smaller with lags

Really not zero.
"Alternative asset?"

Long-short doesn't mean zero beta!

$$r_t^i = a + b r_t^{s\&p500} + \varepsilon_t^i$$

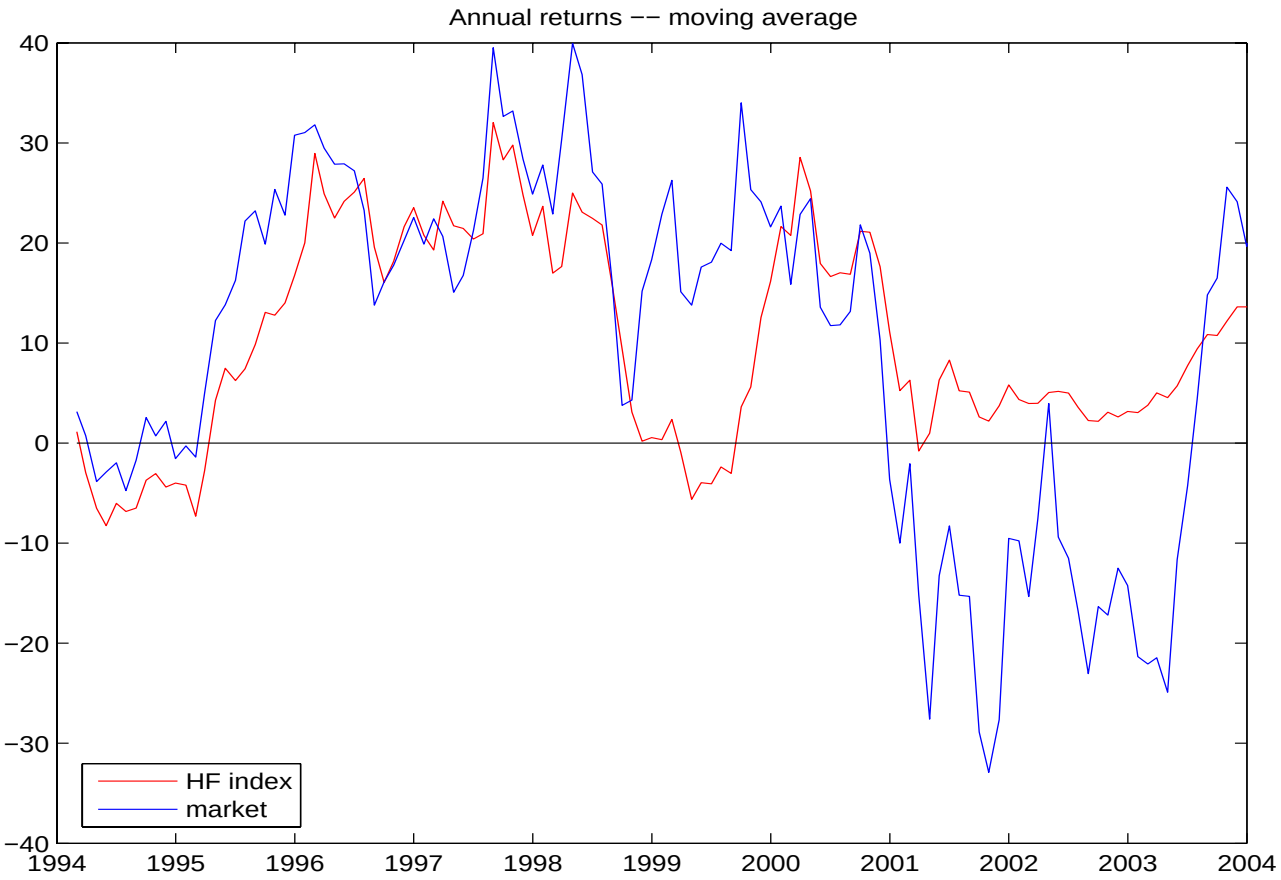
$$r_t^i = a3 + b_1 r_t^{sp} + b_2 r_{t-1}^{sp} + b_3 r_{t-2}^{sp} + b_4 r_{t-3}^{sp} + \varepsilon_t^i$$

$$b3 = b_1 + b_2 + b_3 + b_4$$

Lags are important – stale prices or lookback option
Betas are big!

Source for following slides: John Cochrane's website, idea from Asness et al JPM

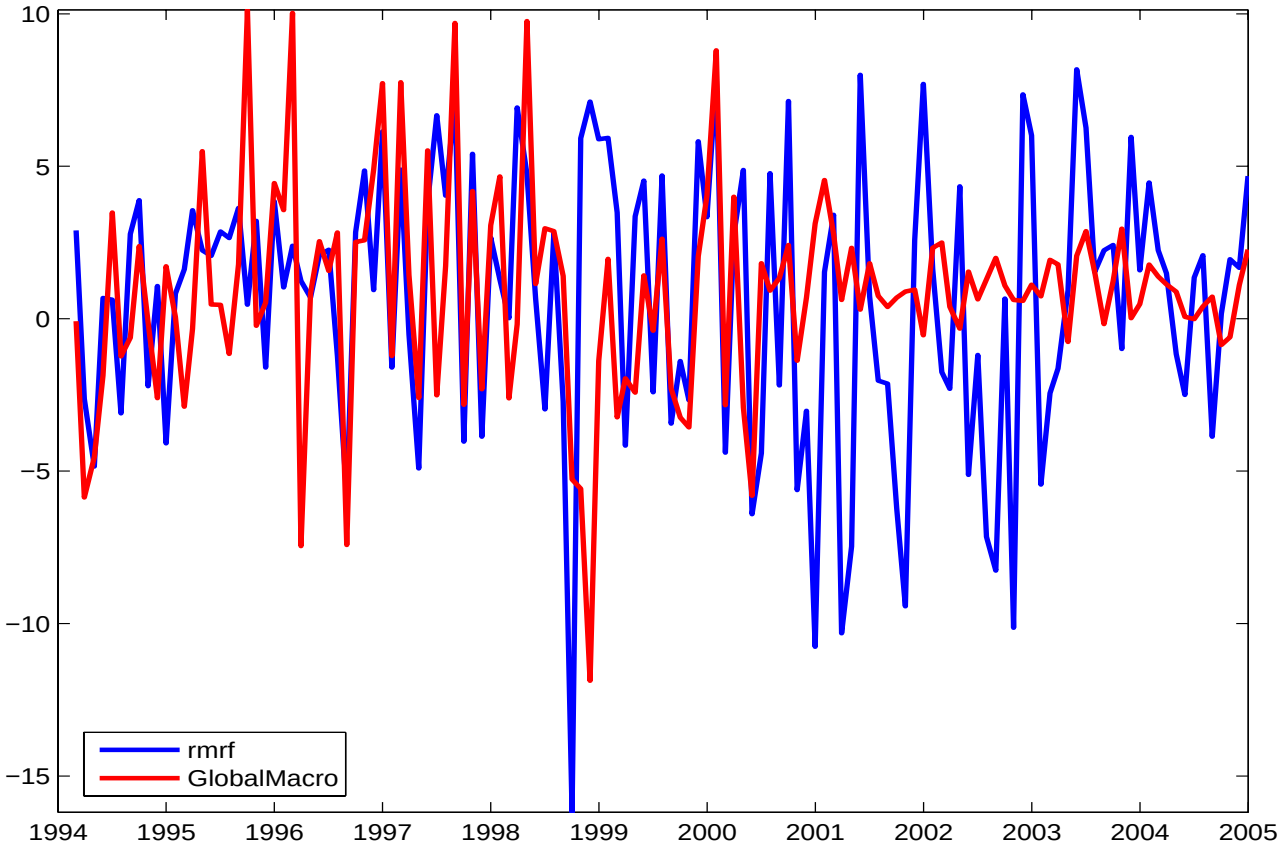
USING LAGS TO IDENTIFY STALE PRICES



Correlation with the market is obvious.
Getting out in 2000-2003 was smart! (Mostly due to Global/Macro group)

USING LAGS TO IDENTIFY STALE PRICES

Monthly returns on Global Macro HF and US market



"Global macro" yet you see the correlation with US market

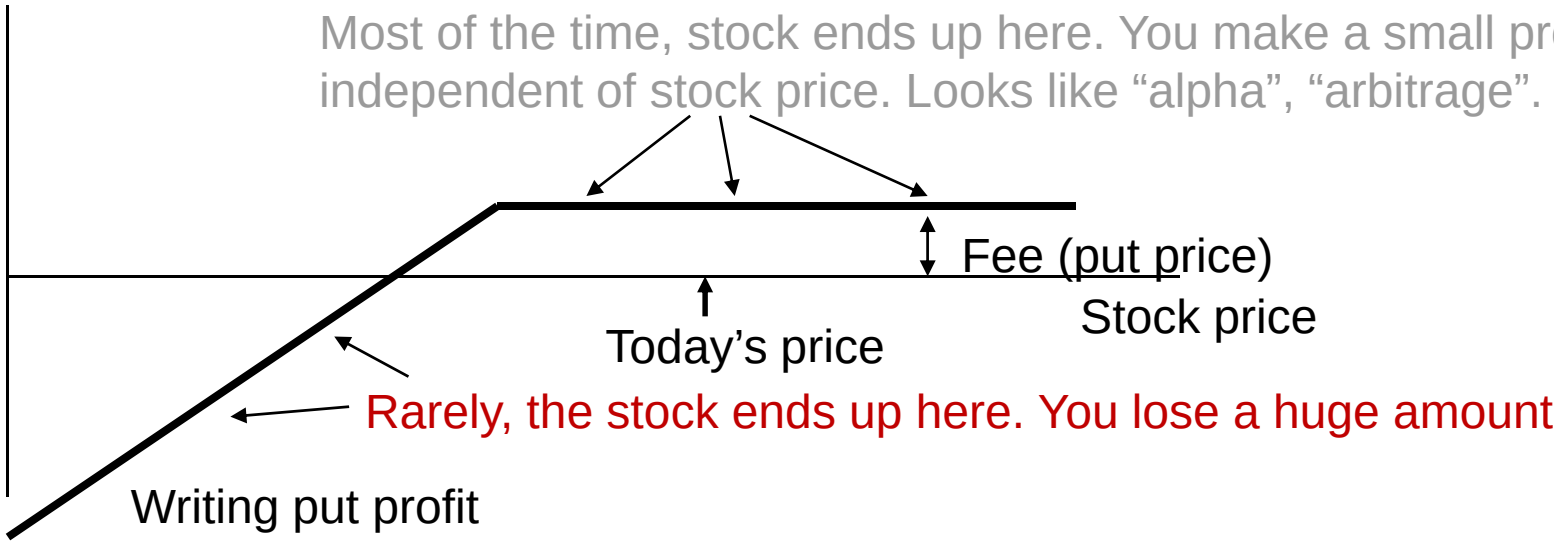
Lagged market effect is clear in 1998. Is Nov/Dec 1998 unrelated to Oct?

Dramatic stabilization / change of strategy in mid 2000

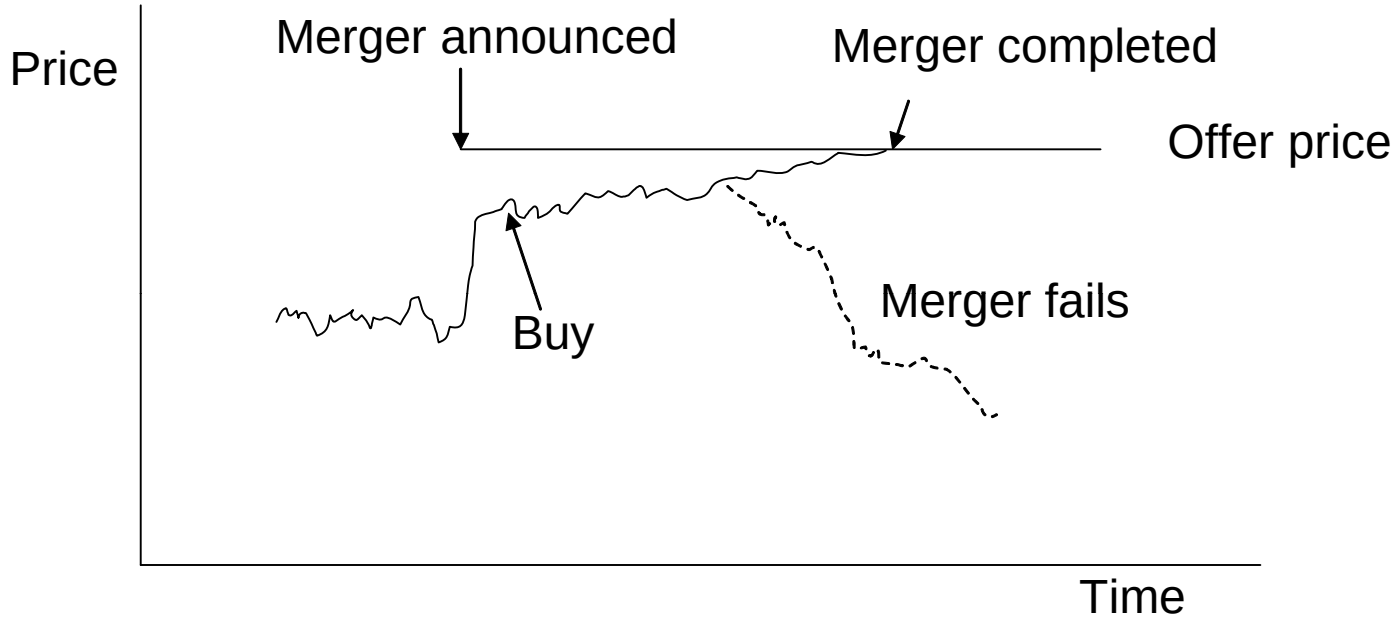
NON-LINEAR PAYOFFS

- Linear CAPM regression cannot capture non-linear payoff structures that arise
  - From trading options
  - Replicating options with dynamic trading strategies
- Popular HF-strategy – writing put options

You collect a fee, only pay off if the market goes down a lot.
Providing "disaster insurance"



MERGER ARBITRAGE – OPTION LIKE RETURN



- Cash offer. Borrow, buy target – short acquirer.
- Large chance of a small return if successful. (Leverage up)
- Small chance of a large loss if unsuccessful.
- But…offer is more likely to fail if the market falls!
- Payoff is like an index put!

ARBITRAGE SPREAD

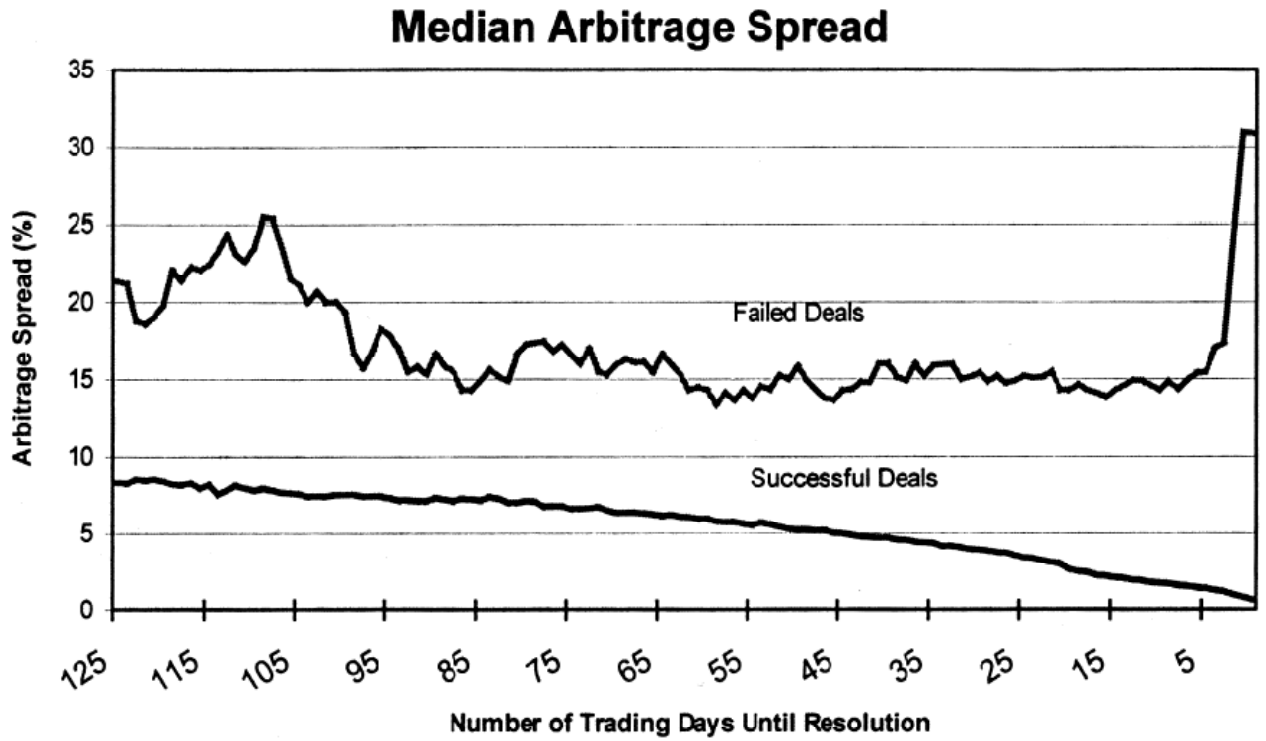
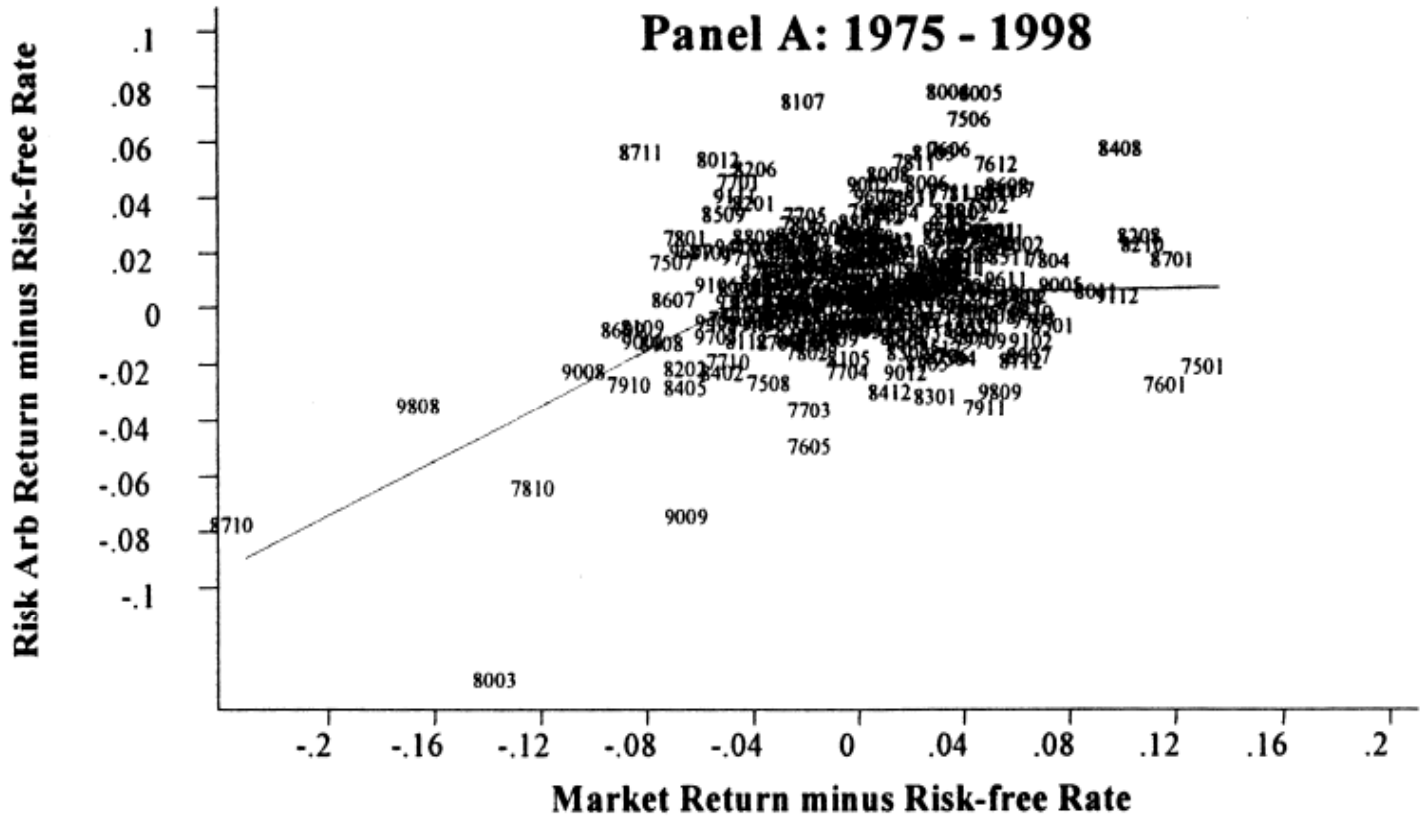


Figure 1. This figure plots the median arbitrage spread versus time until deal resolution. The arbitrage spread is defined to be the offer price minus the target price divided by the target price. For failed deals, the deal resolution date is defined as the date of the merger termination announcement. For successful deals, the resolution date is the consummation date.

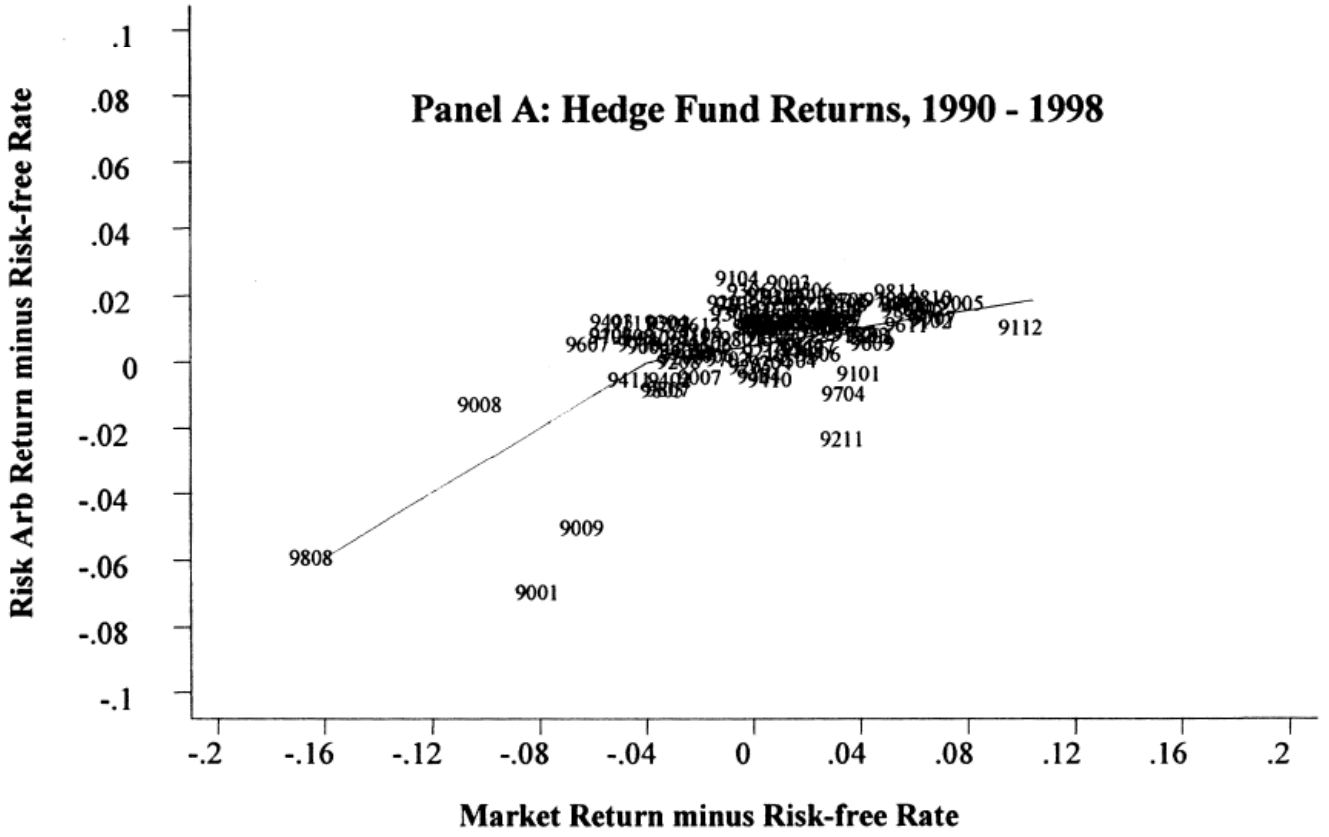
MERGER ARBITRAGE – OPTION LIKE RETURN



Mitchell and Pulvino, JF

- Line indicates similarity to writing index puts

MERGER ARBITRAGE – OPTION LIKE RETURN



Mitchell and Pulvino, JF

- Occasional catastrophes
- Catastrophes are more likely when market declines

UP/DOWN BETA – OPTION PAYOFF

Style	b3	b up	b down
Index	0.44	**0.08**	**0.77**
Short	-0.99	**-0.22**	**-1.82**
Emerg mkts	0.69	**0.08**	**1.16**
Event	0.37	**0.18**	**0.47**
Global Macro	0.31	**-0.08**	**0.66**
Long/Short Eqty	0.65	**0.19**	**1.18**

Example: if the market goes up 10%, the HF index goes up 0.8%. But if the market goes down 10%, the HF index goes down 7.7%!

$$r_t^i = a3 + b_1 r_t^{sp} + b_2 r_{t-1}^{sp} + b_3 r_{t-2}^{sp} + b_4 r_{t-3}^{sp} + \varepsilon_t^i$$

$$b3 = b_1 + b_2 + b_3 + b_4$$

$$r_t^i = a + b_{up}(r_t^{sp} > 0) + b_{down}(r_t^{sp} < 0) + \varepsilon_t^i$$

(Includes 3 lags)

- Betas are close to one
- Hence, need option-return benchmarks

INCLUDE OPTION FACTORS

$$r_t^i = \alpha_i + \beta_i^{sp} r_t^{sp} + \beta_i^{SPPo} SPPo_t + s_i\, SMB_t + h_i\, HML_t + \varepsilon_t^i$$

	ER (%/mo)	alpha	SPPo (puts)	SMB (size)	HML (value)
Event Arb	1.03	0.04	-0.92	0.15	0.08
Restructure	1.29	0.43	-0.63	0.24	0.12
Event driven	1.33	0.20	-0.94	0.31	0.12
Rel. value arb	1.15	0.38	-0.64	0.17	0.08

SPPo = return from rolling over out-of-the-money puts
Source: Agarwal and Naik *RFS*, using HFR data

- Large market betas emerge
- Alphas are smaller

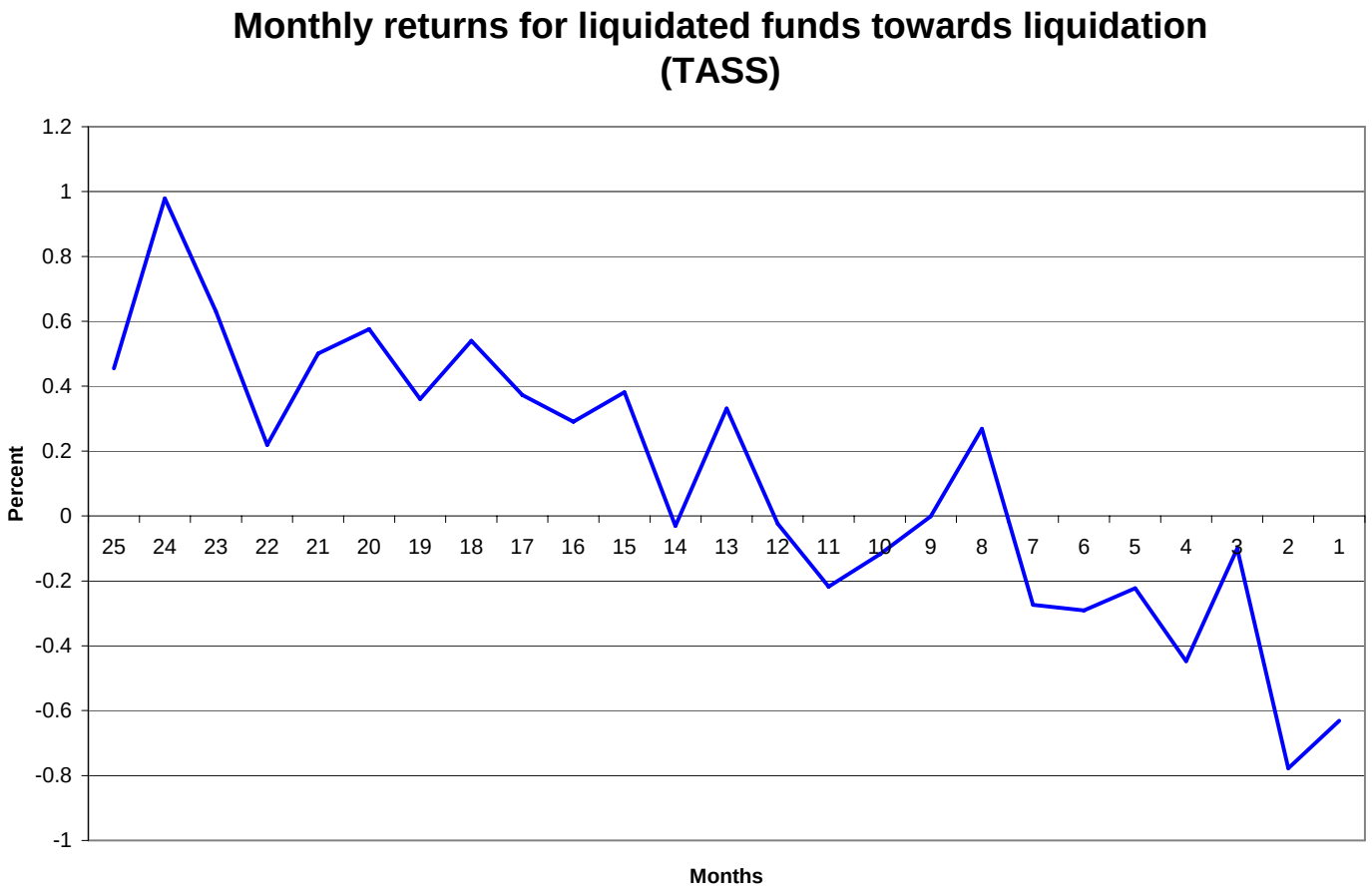
PROBLEM

- Lots more factors are needed
  - Market, value, size, momentum, term, default, currency
  - Options on all of these
  - Time-varying coefficients …
- Problems
  - More regressors than data points
  - …

OVERVIEW

- A Primer on Hedge Funds
  - History, Compensation,
  - Hedge Fund Strategies
- Performance
  - alpha versus beta
    - stale prices
    - non-linear payoffs
  - Focus I: Merger Arbitrage
    - Mitchell and Pulvino, 2001, Characteristics of Risk and Return in Risk Arbitrage, *J of Finance*
- Liquidity Risk and Risk Management
  - Risk spillovers
  - Focus II: 2007 Quant crisis

DISMAL RETURNS OF LIQUIDATED FUNDS



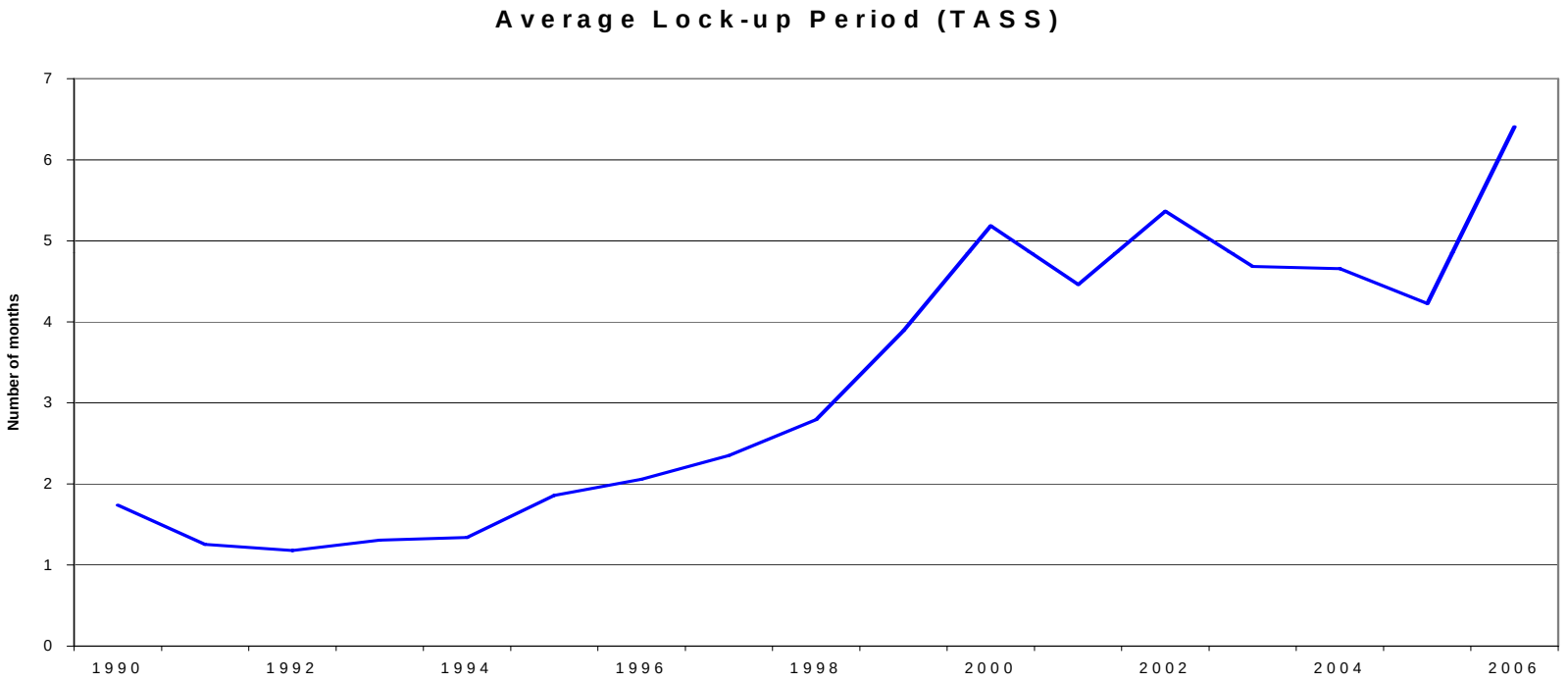
FLAVORS OF FUNDING LIQUIDITY

- Margin funding risk *Prime broker*
  - Margin has to be covered by HF's own capital
  - Margins increase at times of crisis
- Rollover risk *CP*
  - Inability to roll over short-term commercial paper
- Redemption risk *Depositors, HF-investors*
  - Outflow of funds for HFs and banks

- Essentially the same!
- Maturity mismatch:

  Long-term assets (with low market liquidity)
  Short-term borrowing

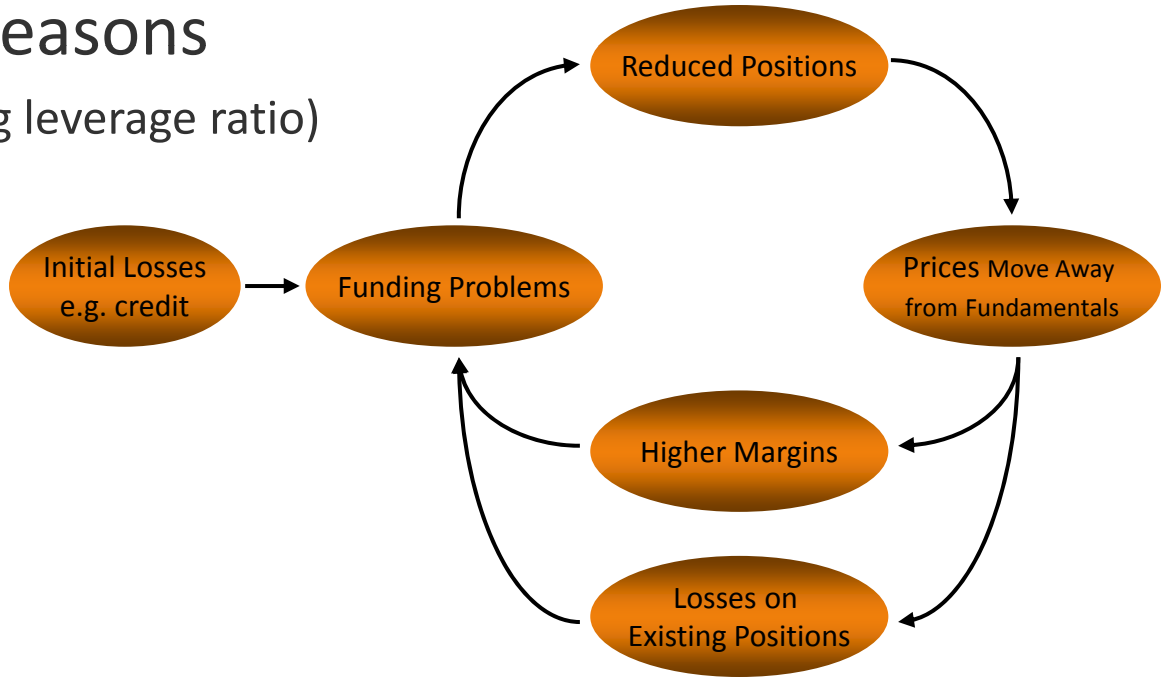
FUND OUTFLOWS FROM INVESTORS



- Lock up periods
- Gates
- Side pockets

FUND OUTFLOWS – MARGIN SPIRAL

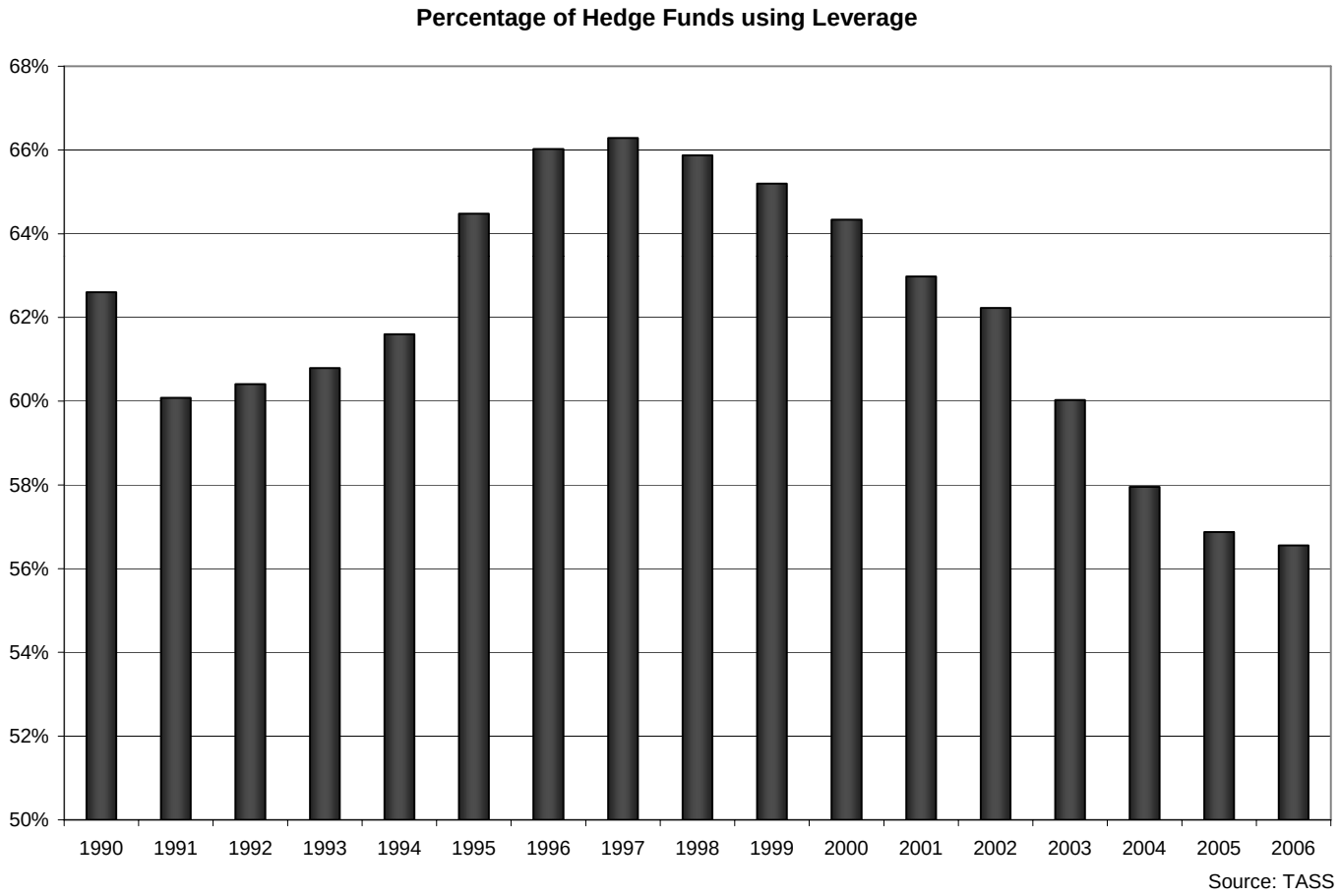
- Loss spiral
  - Net wealth > α x
    for asym. info reasons
  - (constant or increasing leverage ratio)
  - Bernanke-Gertler, …
- Margin spiral
  - (forces to delever)



Source: Brunnermeier & Pedersen (2007)

- Both spirals reinforce each other

FUND OUTFLOWS – MARGIN SPIRAL



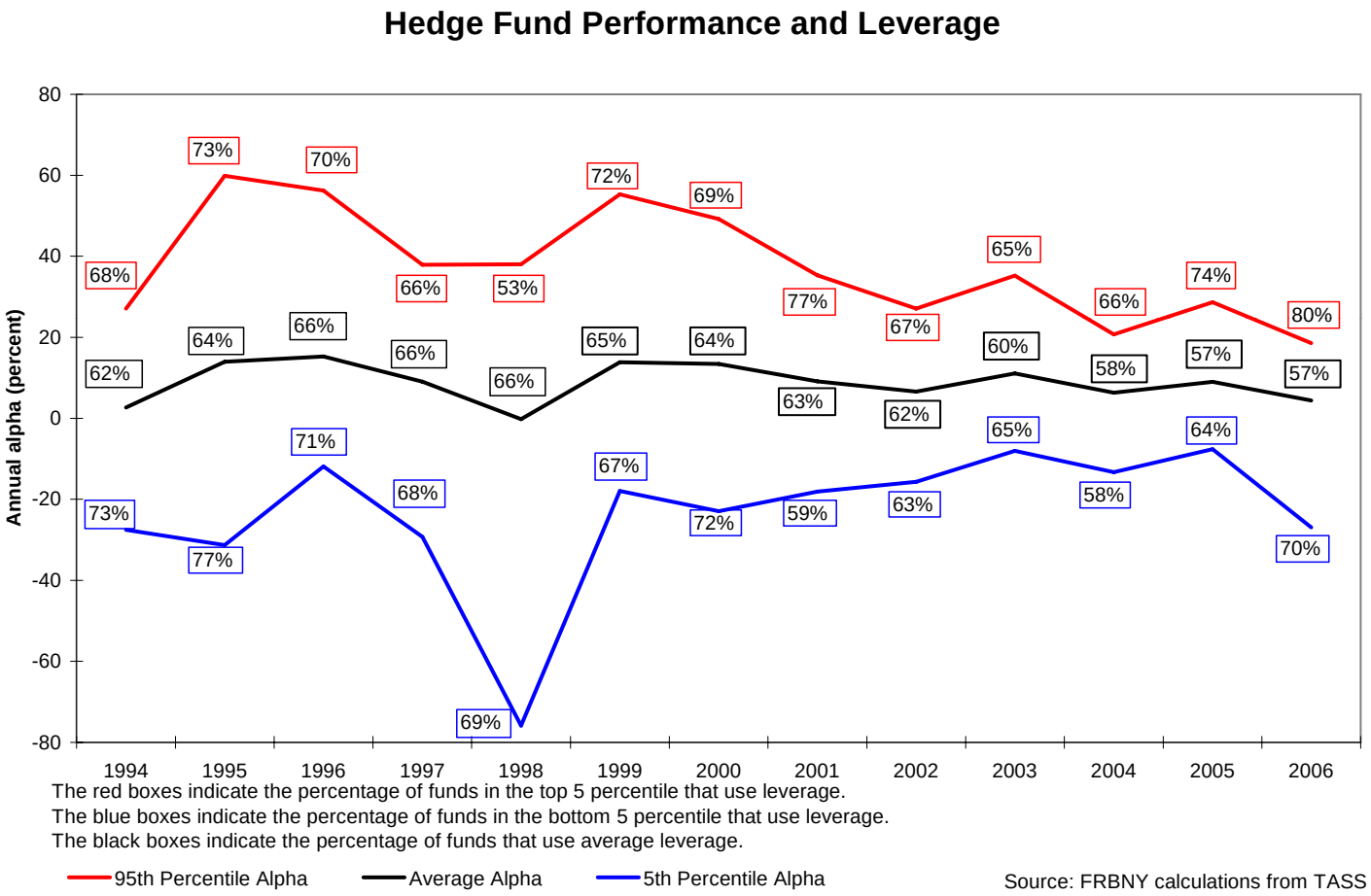
Somewhat surprising, fraction of funds using leverage is declining

MARGIN SPIRAL – SUMMER 2007

Margins/Haircuts:

Rating	Jan-May 2007	July-Aug 2007
	Bond	
Investment grade	0-3	3-7
High yield	0-5	10+
	Leveraged Loan	
Senior	10-12	15-20
2nd lien	15-20	20-30
Mezzanine	18-25	30+
	ABS and CDO	
AAA	2-4	8-10
AA	4-7	20
A	8-15	30
BBB	10-20	50
Equity	50	100
Source: Citigroup, IMF Stability report 2007		

LEVERAGE AND ALPHAS



Source: FRBNY calculations from TASS

- Top and bottom performers have higher leverage
- In 2005/06 leverage is high
- In 1998 leverage is low

MARGIN SPIRAL AND FAT TAILS

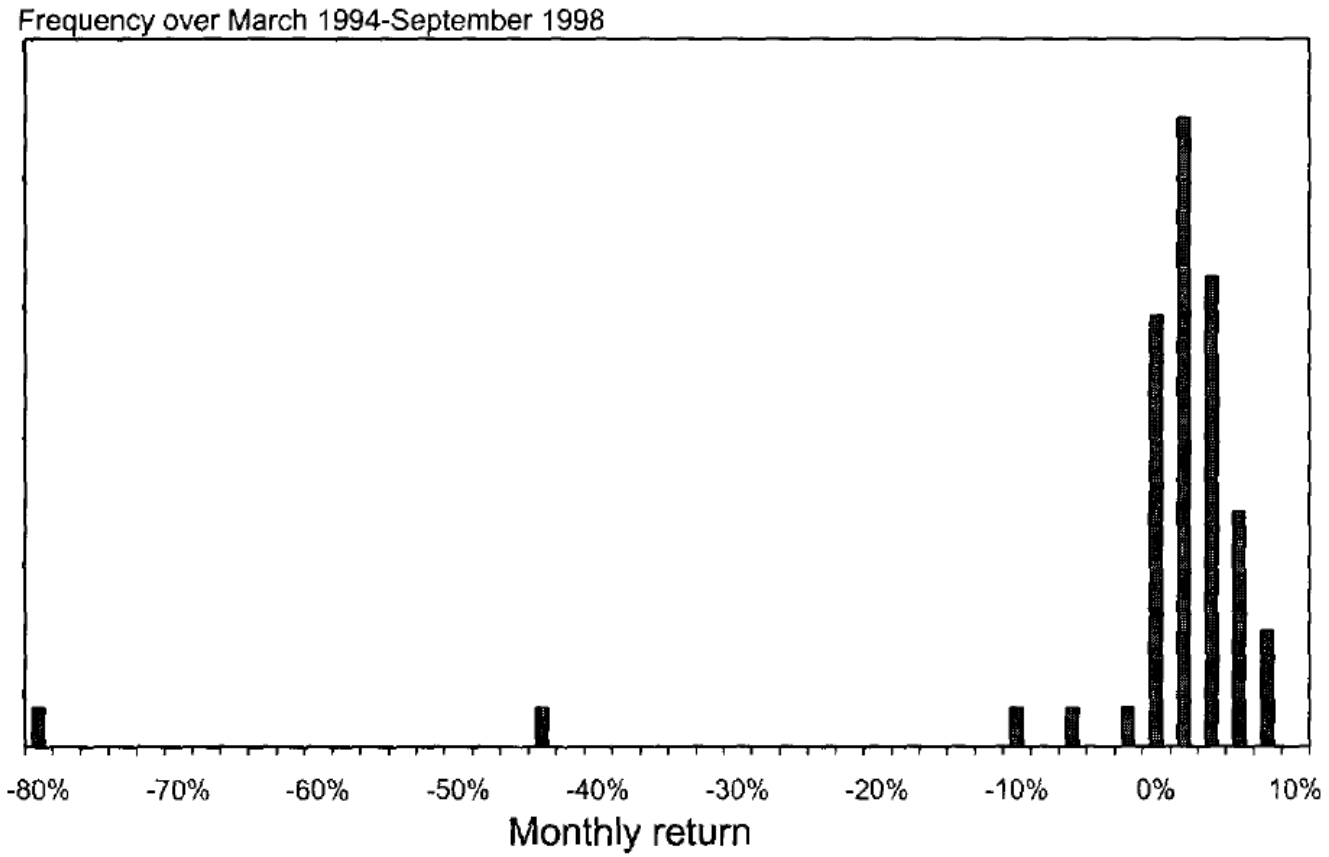
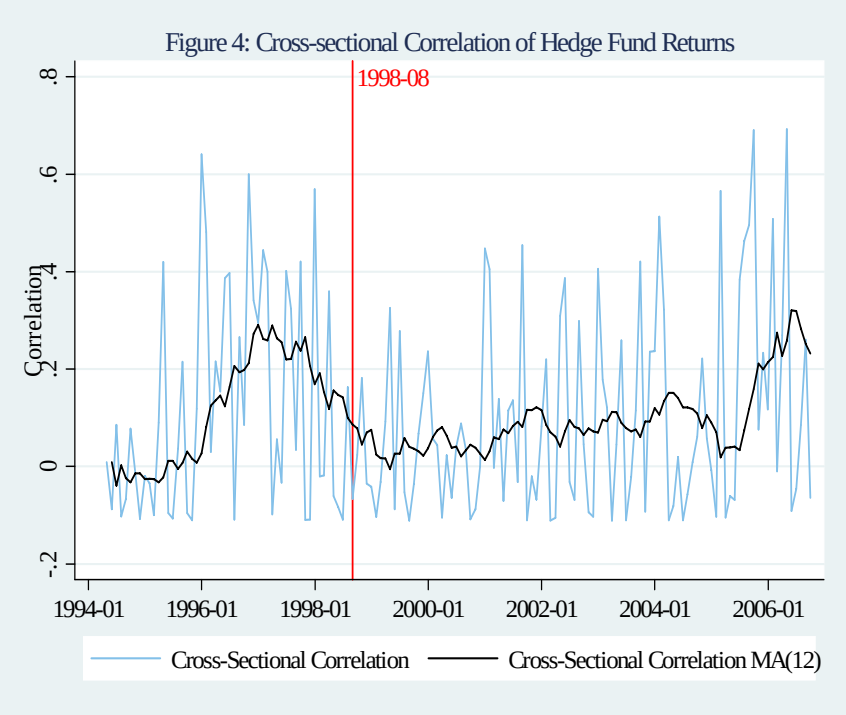


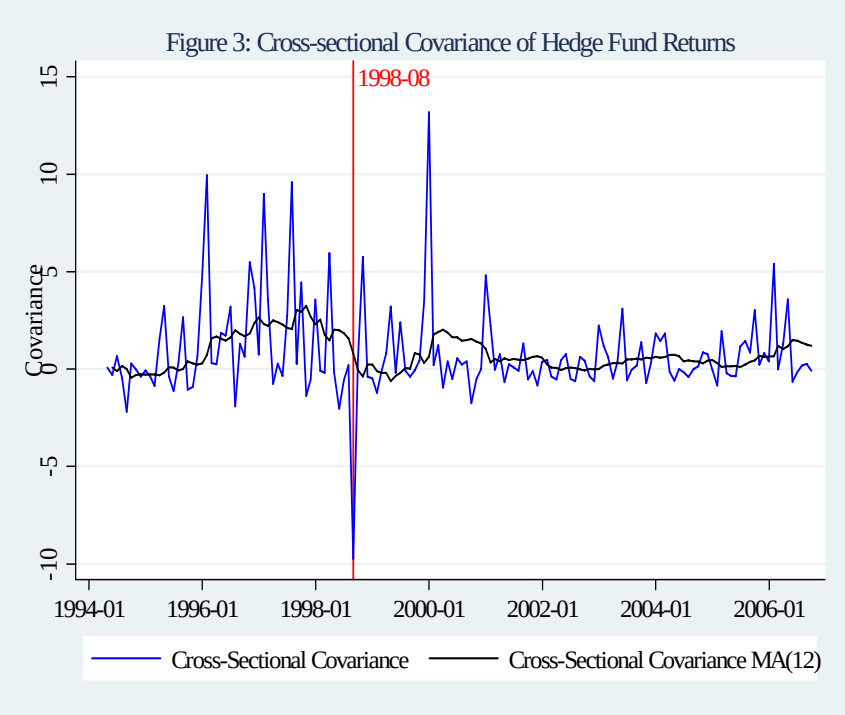
Fig. 12. Distribution of LTCM's monthly returns.

Source: Jorion (2000)

CORRELATION ACROSS HEDGE FUNDS

- Crowded trades?



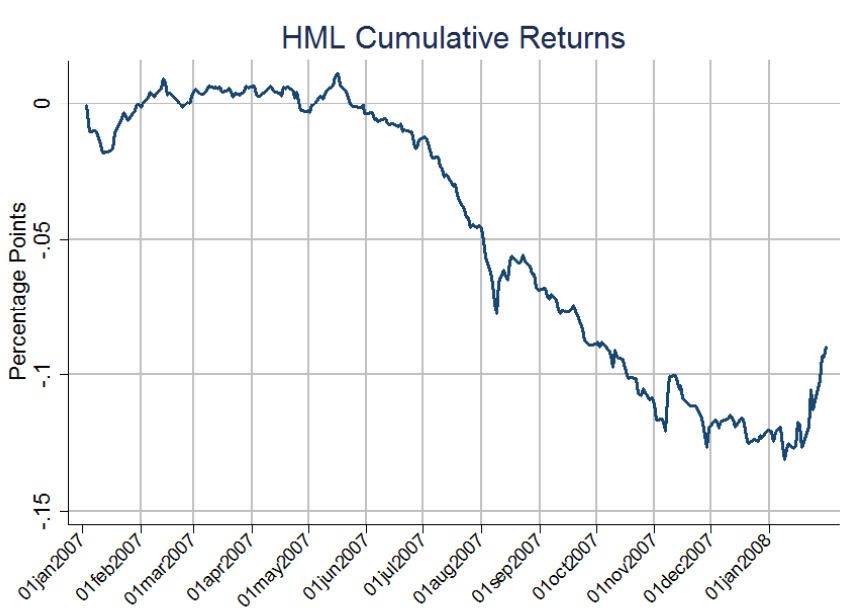


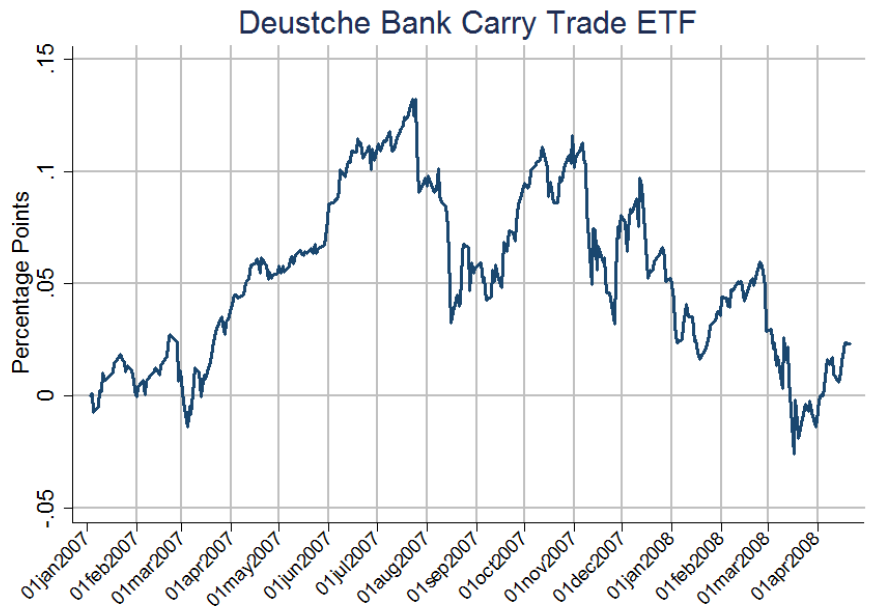
- Correlation can be misleading
  - Vol declined – great moderation

2007 HEDGE FUND QUANT CRISIS

- High frequency stat arbs
  - High frequency, IT driven, short-term reversal strategies
  - Aug 1st to Aug 9th - price declines seven days in a row
  - e.g. Renaissance's Medallion fund
- Low frequency quant funds
  - Value-growth (HML) strategy, momentum strategy, earning to sale-ratio, accruals-total assets ratio, …
    - Orthogonalize (diversification)
  - FX carry trades
  - e.g. Goldman Sachs' Global Alpha, AQR, …
  - $\Rightarrow$ became very popular/crowded

2007 HEDGE FUND QUANT CRISIS

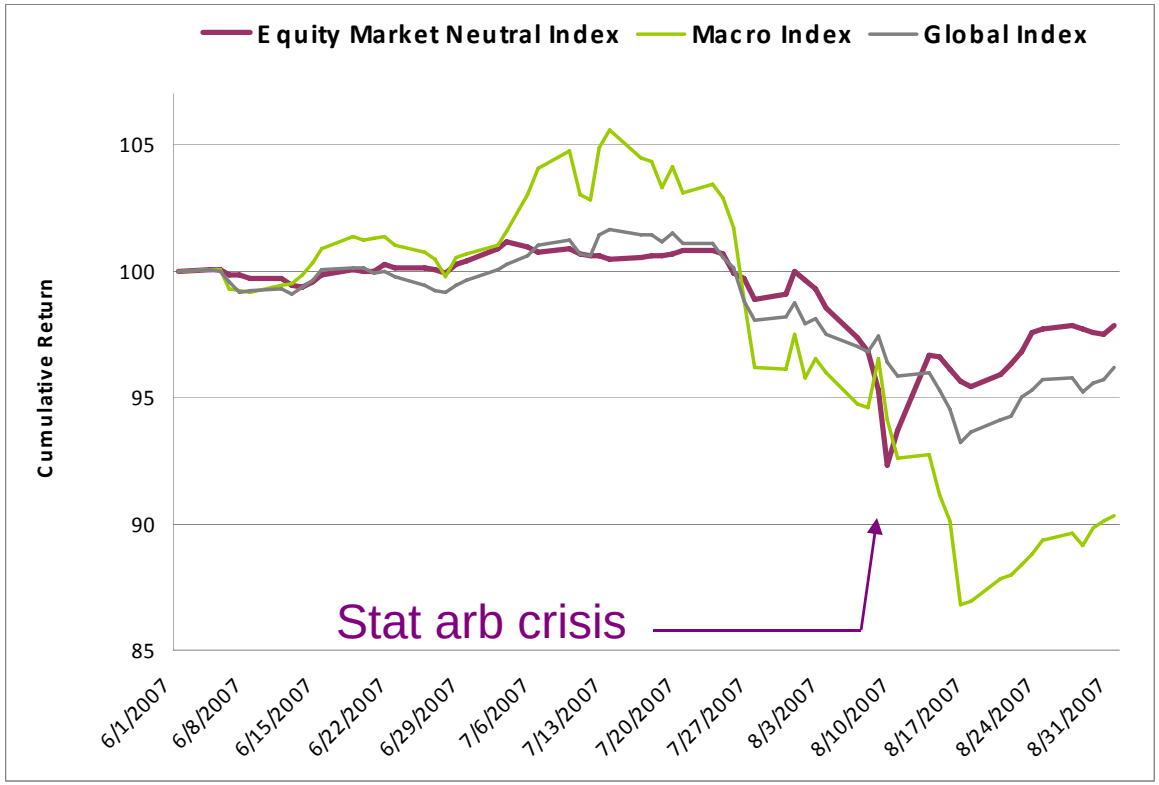




- Why? Many (not only quant) funds liquidate "relatively" liquid positions first – "liquid HML" suffered even more
- Quant funds focus on same few "quant strategies"
- Almost all quant strategies *comoved* – "crowded trades"
  - US from 08/05/07 + sharp (correlated) rebound on 08/10/07
  - Europe/Japan from 08/08/07 onwards

2007 HEDGE FUND QUANT CRISIS

- Daily HFR indexes



HFR indexes

"Quant googols" are needed to see it!

SUMMARY

- A Primer on Hedge Funds
  - History, Compensation,
  - Hedge Fund Strategies
- Performance
  - alpha versus beta
    - stale prices
    - non-linear payoffs
  - Focus I: Merger Arbitrage
    - Mitchell and Pulvino, 2001, Characteristics of Risk and Return in Risk Arbitrage, *J of Finance*
- Liquidity Risk and Risk Management
  - Fund Flows
  - Liquidity Spirals and Leverage
  - Correlation across Hedge Funds
  - Focus II: 2007 Quant crisis

EXTRA: SOVEREIGN WEALTH FUNDS

- Stephen Jen “Sovereign Wealth Funds”
- History
  - Established 3 decades ago to smooth disturbances from volatile oil price
  - Evolved from ‘stabilization funds’ to ‘wealth accumulation’
  - New: many Asian central banks
    - Manage reserves through SWFs
- Size: US$ 2.9 tr + 300bn a year

Table 1: Sovereign Wealth Funds

Country	Fund Name	Assets (Mlns US$s)	Inception year	Source of funds
UAE	ADIA[1]	875,000	1976	Oil
Norway	Government Pension Fund — Global	380,000	1996	Oil
Singapore	GIC[1]	330,000	1981	Other
Saudi Arabia	Saudi Arabian funds of various types[1]	300,000	n/a	Oil
Kuwait	Reserve Fund for Future Generation	250,000	1953	Oil
China	State FX Investment Corp. + Huijing Co.	200,000	2007	Other
Singapore	Temasek Holdings[1]	159,210	1974	Other
Libya	Oil Reserve Fund	50,000	2005	Oil
Algeria	Fond de régulation des recettes	50,000	2000	Oil
Qatar	Qatar Investment Authority	42,600	n/a	Oil, gas
US (Alaska)	Permanent Reserve Fund	38,000	1976	Oil
Brunei	Brunei Investment Authority	30,000	1983	Oil
Malaysia	Khazanah Nasional BHD	25,700	1993	Other
Russia	Stabilisation Fund[2]	24,000	2003	Oil
Korea	KIC (Korea Investment Corporation)	20,000	2006	Other
Kazakhstan	National Fund	17,600	2000	Oil, gas
Canada	Alberta Heritage TF	15,500	1976	Oil
ROC (Taiwan)	National Stabilisation Fund[3]	15,000	n/a	Other
Iran	Oil Stabilisation Fund	15,000	1999	Oil
Chile	A new SWF based on the Copper Fund	14,820	1985	Copper
Nigeria	Excess Crude Account	11,000	2003	Oil
Botswana	Pula Fund	6,800	1966	Diamonds
Oman	State General RF	2,000	1980	Oil, gas
Azerbaijan	State Oil Fund	1,500	1999	Oil
Venezuela	FIEM	756	1998	Oil
Canada	Fond des générations (Québec)	560	2006	Electricity
Trinidad & Tobago	Revenue SF	460	2000	Oil
Kiribati	Revenue Equliz. Fund	400	1956	Phosphates
Uganda	Poverty Action Fund	350	1998	Aid
Total		2,876,256		
Oil & gas-related funds		2,103,416		
Non-oil related funds		772,840		

FUTURE TRENDS

- Diversify across
  - Assets
    - sovereign bonds, agencies, corporate, equity, private equity, real estate
  - Countries
    - Large impact on US Treasuries
- Financial Protection – Next Risk
  - Economic or strategic investments
  - Geopolitical dimension
- Transparency
  - Objectives, activities, performance