Hedge Funds 360

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Summary of the course

- **Hedge Funds 360** is meant as an introduction to Hedge Funds, the new and not-so-new investment product which has flourished and gained media attention over the last 20 years

- HF AUM is approximately USD 2.5 Tn. In comparison, US debt is 14 Tn and investable assets are approximately USD 50 Tn.

- We will discuss

1. The point of view of investors
2. The point of view of managers
3. Main strategies & themes
4. A systemic view of HFs

Hedge Funds from the point of view of investors

Review: Mutual Funds

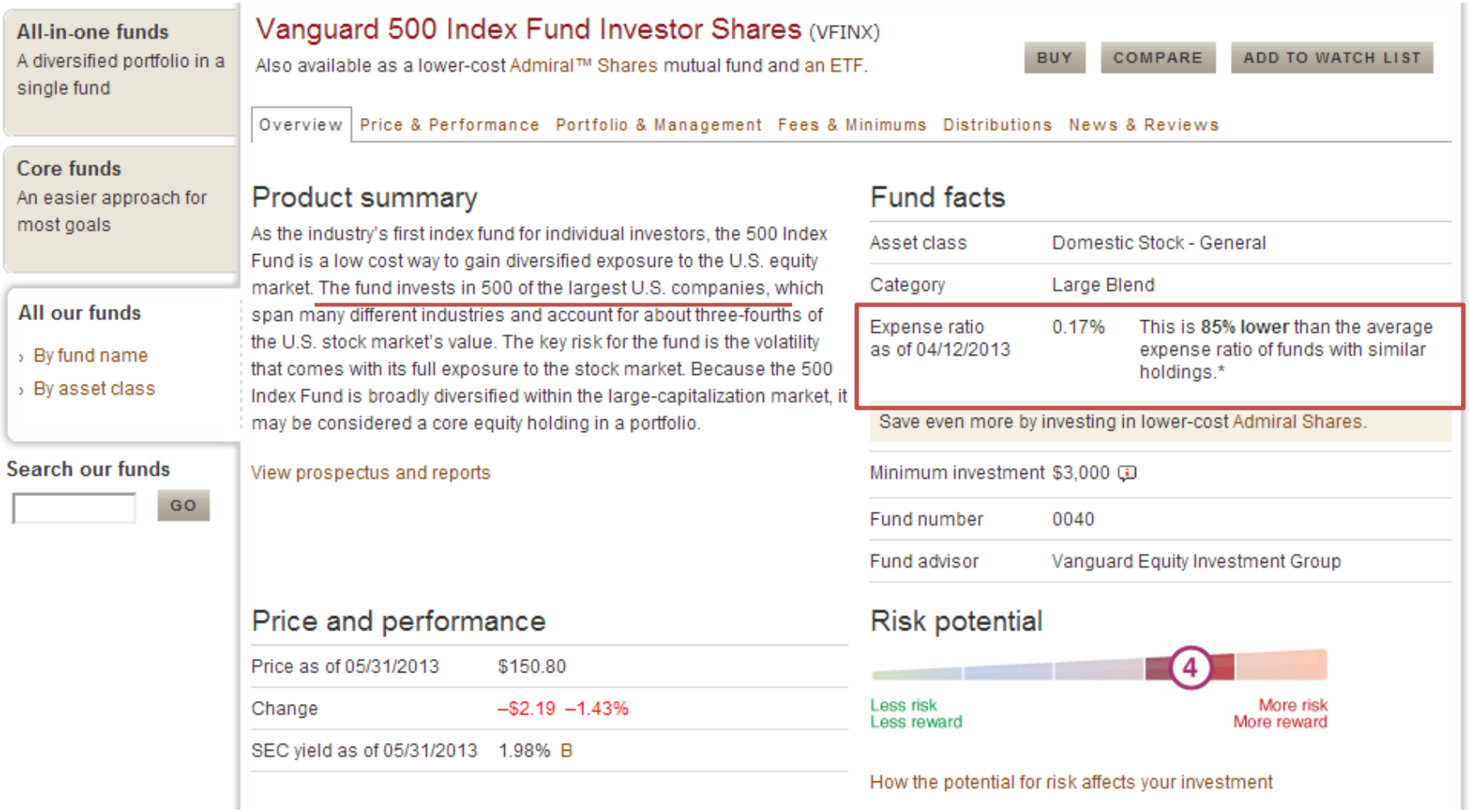
- In the US, mutual funds are regulated by the Investment Company Act of 1940

- Law designed to protect the public against unscrupulous managers
- Fees, diversification, concentration, transparency, are all regulated by IA 1940
- Begins the modern era of equity fund investment in the US.
- Mutual Funds allow for cheap access to stock portfolio trading by the public, encouraging saving in the stock market
- Defined by benchmarking in relation to a particular index or sector, e.g. S&P 500, Russell 2000.

Main Characteristics of MF

- Long only (no short selling, no leverage)
- Tracking benchmarks or indexes
- Daily liquidity
- Low fees (<10 basis points for passive funds)
- Tradeoff: in order to advertise MFs and sell them to the public,
  the company has to be regulated and satisfy considerable legal requirement
- What is a good MF? A fund that can track well an index with low cost OR
  a fund that can outperform the index but that has similar characteristics.

Example: Vanguard S&P500 Investor Shares (VFINX)



All-in-one funds
A diversified portfolio in a single fund

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Vanguard 500 Index Fund Investor Shares (VFINX)

Also available as a lower-cost Admiral™ Shares mutual fund and an ETF.

BUY COMPARE ADD TO WATCH LIST

Overview | Price & Performance | Portfolio & Management | Fees & Minimums | Distributions | News & Reviews

Product summary

As the industry's first index fund for individual investors, the 500 Index Fund is a low cost way to gain diversified exposure to the U.S. equity market. The fund invests in 500 of the largest U.S. companies, which span many different industries and account for about three-fourths of the U.S. stock market's value. The key risk for the fund is the volatility that comes with its full exposure to the stock market. Because the 500 Index Fund is broadly diversified within the large-capitalization market, it may be considered a core equity holding in a portfolio.

View prospectus and reports

Fund facts

Asset class	Domestic Stock - General	
Category	Large Blend	
Expense ratio as of 04/12/2013	0.17%	This is **85% lower** than the average expense ratio of funds with similar holdings.*

Save even more by investing in lower-cost Admiral Shares.

Minimum investment	$3,000
Fund number	0040
Fund advisor	Vanguard Equity Investment Group

Price and performance

Price as of 05/31/2013	$150.80
Change	–$2.19 –1.43%
SEC yield as of 05/31/2013	1.98% B

Risk potential

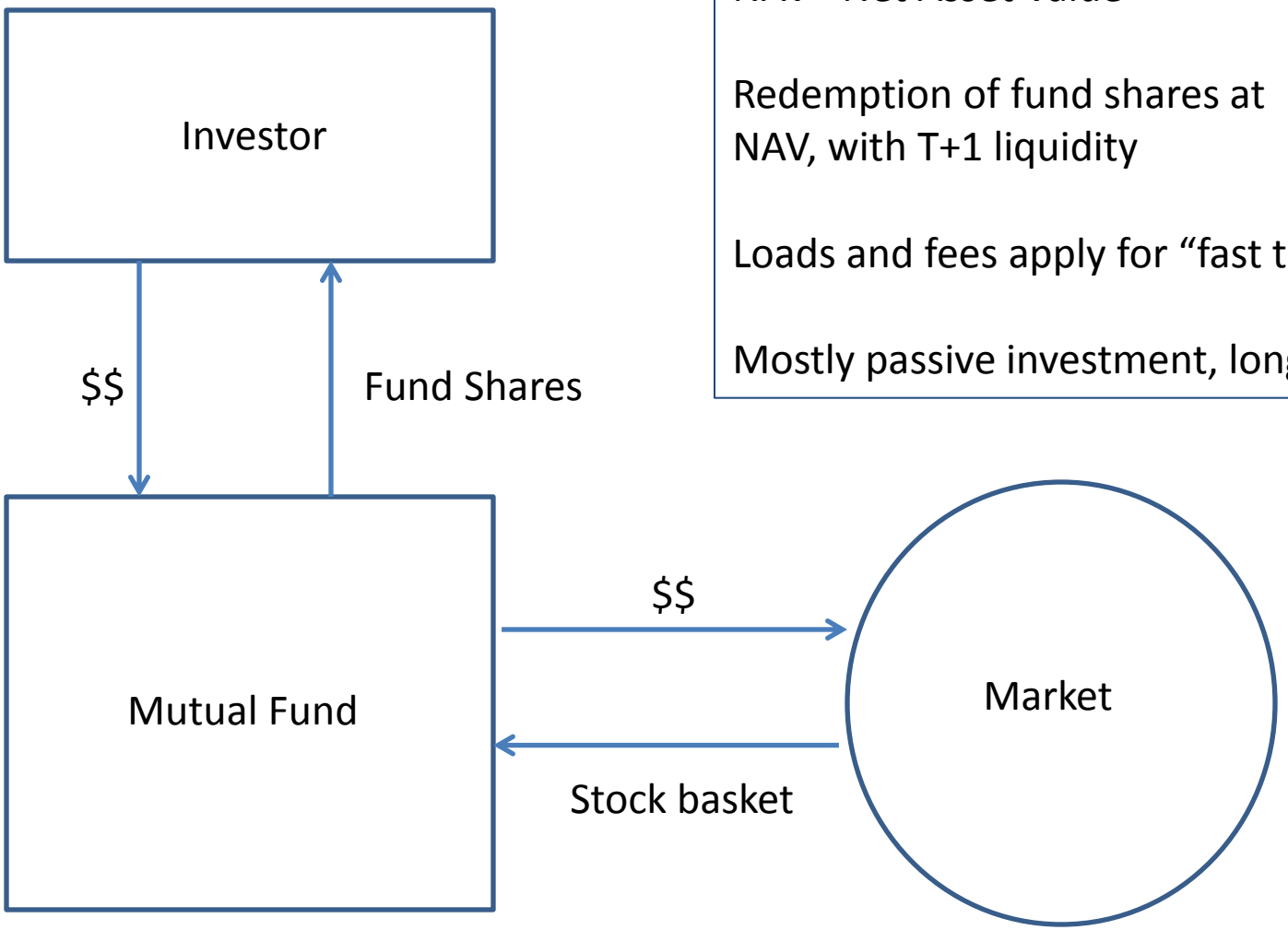
4

Less risk
Less reward

More risk
More reward

How the potential for risk affects your investment

How Mutual Funds Work



NAV= Net Asset Value

Redemption of fund shares at NAV, with T+1 liquidity

Loads and fees apply for “fast trading”

Mostly passive investment, long only

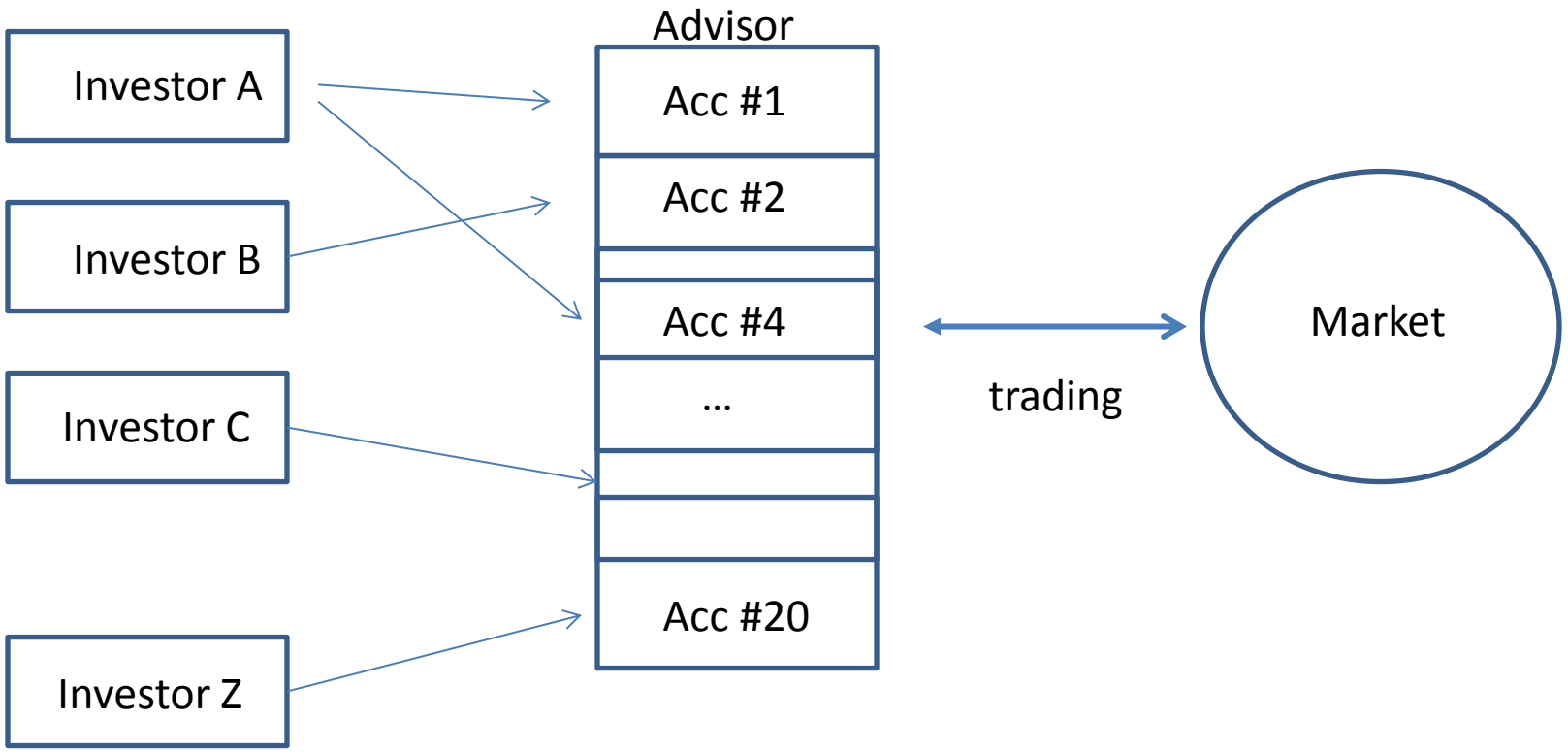
Hedge Funds

- Much less structured and regulated that MFs.
- Usually marketed as a Limited Partnerships or Trusts to Qualified Investors
- Fund does not track a benchmark: absolute returns versus indexing
- Said to be invented by A.W. Jones in the later 1940's, as a fund that would both buy AND sell shares
- Known as alternative investments, as in ``alternative to stocks and bonds''.
- In theory, HFs are uncorrelated with the stock market, because they are not benchmarked to equity indexes, but rather to cash.

HF Management, Liquidity & Fees

- HFs can be seen as active management vehicles.
- Manager has considerably more discretion about the kinds of investments he or she makes
- Liquidity is limited. Can be monthly, quarterly or even annually.
- Fees are not standardized and can vary according to the investor. (Usually a management fee of the order of 1% to 2% and an incentive fee which is a percentage of profits (e.g. 10% or 20%)
- A hedge fund is an institutional form of an Investment Advisor (a figure also contemplated by the IA 1940.) Investment Advisors typically work with Managed Accounts

Investment Advisor with several Managed Accounts

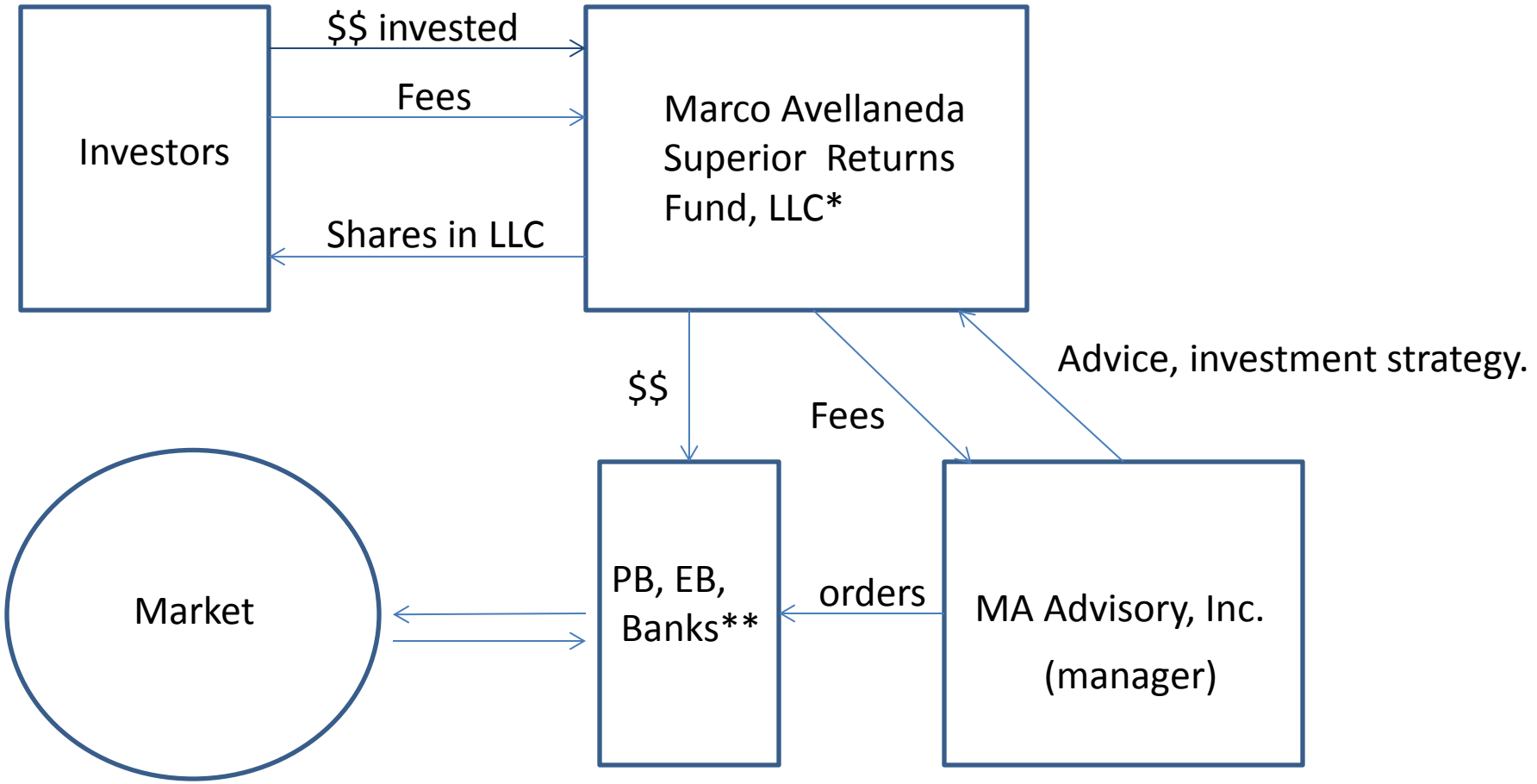


- Investment advisors manage accounts on behalf of their clients.
- Omnibus account
- IAs must register if they have more than a certain number of clients. Restrictions on fees apply, according to ICA 1940.

Commodity Trading Advisors

- Commodities is (was?) an asset class perceived by investors to deliver uncorrelated returns to the stock market.
- Commodity trading is done via futures markets.
- Natural framework for managed accounts.
- Commodity Trading Advisors (CTAs) provide futures trading strategies which seek to benefit from trends (periods of increase, periods of decrease) of commodities and currencies. (MAN is the biggest CTA in the world)
- I believe that CTAs and ``commodity pool operators// originated in the 1970's with the rise of inflation in the US following the Vietnam War and bear market
- CTA's are offered by intermediaries (brokers) to qualified investors.

Hedge Funds: ``commingled'' active management



* Single advisee

**Prime broker, Execution Broker, Custodian, Administrator

How is the HF market accessed?

- Banks acting as brokers (traditionally for MFs)
- Wealth-management advisors (private banking)
- Family offices
- Fund of Hedge Funds
- Direct contact via Internet site
- Managed-account platforms (e.g. Lyxor)
- Performances and NAVs are published in Bloomberg pages for Listed Funds. Often listing in Dublin Stock Exchange, or Malta Stock Exchange , or other exchanges.
- HF information is restricted (particularly in the US) due to the Investment Company Act of 1940, which regulates advertisement of alternative investments and funds

1. Private Banks and Wealth Managers

- Provide due diligence and keep track of a list of managers that the recommend to clients (e.g. Lombard Odier, GSAM, MSAM)
- Due diligence is very different from Mutual Funds and ETFs due to the differences in regulation. Much more delicate.
- Manager may not reveal the details of the strategy; only the general investment theme and/or asset class.
- Hedge fund analysts select the best managers and charge an advisory fee.
- These agents may or may not be remunerated by the HF manager.

2. Family Offices and Fund of Hedge Funds

- Family Offices typically manage the assets of on or more wealthy families. Fos have traditionally invested in alternatives via managed accounts or HFs.

- FO s employ investment professionals for fund selection and to construct a portfolio of investments.

- Fund of Hedge Funds are wealth management companies how issue shares and invest $ in HF. They also perform due diligence on behalf of clients and risk-manage the portfolio of HFs.

- FoHFs can re-allocate among HFs and also leverage.

- *Caveat emptor.*

Largest Hedge Funds (Top 20)

FUND	COUNTRY	AUM		FUND	COUNTRY	AUM
Bridgewater Associates	US	77.6		Cerberus Capital	US	23
MAN	**UK**	64.5		D.E. Shaw & Co.	US	23
JP Asset Management	US	46.6		Angelo Gordon Co.	US	22
Brevan Howard	**UK**	36.6		AQR Capital Management	US	20.5
Och-Ziff Capital	US	28.5		Farallon Capital Mgt.	US	20
Paulson & Co.	US	28		Goldman Sachs Asset Mgt.	US	19.5
Black Rock Advisors	US	27.7		Elliott Management	US	19
Winton Capital	**UK**	27		King Street Capital	US	18.5
Highbridge Capital	US	26.1		Canyon Partners	US	18.1
BlueCrest Capital	**UK**	25		Scenic Stone Capital	US	12.3
Baupost Group	US	23		**TOTAL**		**606.5**

- Total Assets in HF: approximately 2500 billion USD
- Top 20 HFs concentrate 25% of all investment assets
- Probably the top 100 have 90% of AUM.

Some broad HF Categories

- Distressed Debt/Restructuring
- Merger Arbitrage
- Equity Market Neutral
- Quantitative Equities (Factor based, stat arb)
- CTAs Trend Following
- Macro
- Emerging Markets
- Sectors: Heath Care, Technology

The manager’s perspective

Starting a Hedge Fund

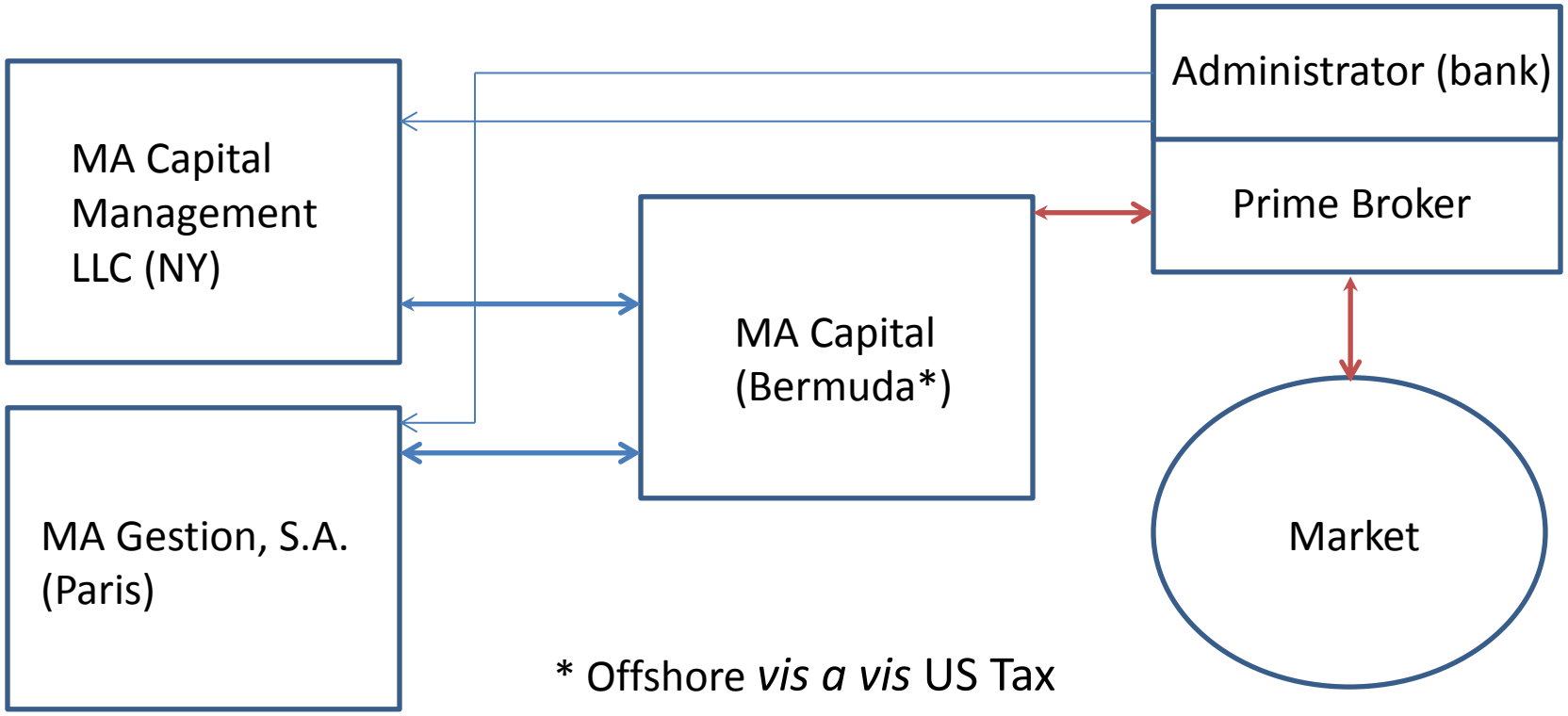
- Raising initial capital
- Choosing the business structure
- Prime broker
- Execution broker
- Computer and office equipment
- ``Soft-dollar'' funding
- HF Incubators
- Hiring traders, marketers and back-office
- Offering memorandum and marketing

Raising Initial Assets

- Initial assets should come from personal funds or first investors
- Skin in the game
- First investors typically want equity
- Later investors want good deals too…
- Reduced fees
- Capacity
- Starting with Managed Account?
- Track record
- Manager’s pedigree

Business structure

- Managed accounts or co-mingled funds?
- Onshore managers
- Master-feeder structure (onshore/offshore)



* Offshore *vis a vis* US Tax

UCITS (European Union)

- European Union has UCITS legislation, which harmonizes Mutual Fund, ETFs, FoHFs and Hedge Fund offerings for all member countries
- It is important to know the rules to be able to market the fund
- Malta, Luxemburg, Jersey, Guernsey, Isle of Man are the most common domiciles for HFs due to light taxation of the Master Fund
- Legal fees for registration in an offshore venue plus offering memorandum can run easily above 100K Euros.

Hedge Funds in LATAM

- In Brazil, there are three kinds of investment funds

  -- *Renda Fixa* (fixed income)

  -- *Renda Variavel* *(*equity mutual fund)

  -- *Multi-mercado* (allowed to short, more leeway for manager)

- Each country in LATAM has its own legal framework for investment management and its own investor culture.

- It is important to set up the correct business structure, which most likely will have the management company domiciled offshore and a local entity for investors. Fiscal matters and qualified investor requirements are VERY important everywhere.

- Many HFs in LATAM are sponsored by a bank (e.g. *Credit Suisse Hedging Griffo* (Brazil)) who is the first investor, provides the infrastructure and takes an equity interest

Prime Broker

- Prime brokers provide the connection between the HF and the markets and perform key functions.

  -- Execution

  -- Clearing

  -- Financing

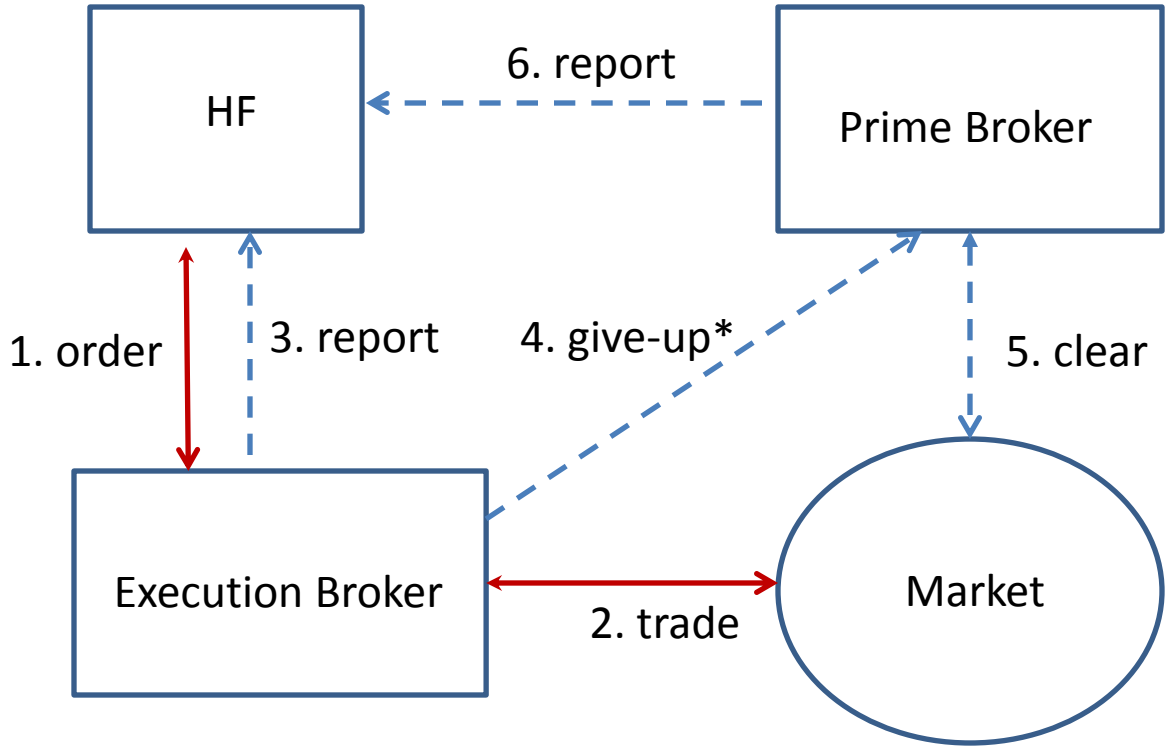
  -- Stock loan

  -- Custody

  -- Capital Introduction

- The prime broker is the way the fund accesses the market and registers trades. It also acts as a bank, lending money to the fund. Some funds have multiple PBs for reasons of confidentiality of traders.

Example of a fund executing a trade in the listed equities market



* If EB is not PB, a ``give up'' is made to transfer the trade from the EB to the PB

Financing

- PB provides financing for Fund's positions

  Example: long equities at Fed Funds + 30 bps
  short equities at Fed Funds – 30 bps (GC)

- PB arranges for stock-loan arrangements for short positions
  - maintains inventory of stock for lending
  - stock loan desk can locate stock for borrowing

- PB can also replace stock transactions by swaps (CFDs)

- PB gives access to OTC trading in Credit swaps, IR swaps, MBS, bonds, etc., and provides financing via repo markets.

Infrastructure, Office Equipment, Fees

- Hedge fund ``hotels''
- Soft-dollar agreements
  - -- data
  - -- research
  - -- office equipment
- Conflicts of interest with SD agreements
- Fees: Full Service versus Cost Plus
- Relationship with PB and other investors plays an important role in start-up funds and funding operations before fund is profitable
- Back of the envelope ``fee mathematics''
- Fiduciary obligation of manager vis a vis HF partners/investors

Capital Introduction

- PB s offer their clients Capital Introduction events
- Typically billed as ``startup fairs''
- Attended by big multi-manager funds, FoHFs.
- Usually held in major HF cities (e.g. London, New York, Geneva)
- HF conferences (GAIM, etc).

Meeting investor requirements

- Track record or solid backtesting idea
- Minimum AUM
- Risk-management
- Compliance
- Key persons
- Administrator, Custodian, PB
- Well-defined style

Case Study #1: Quantitative Fund (Europe)

- Originally a ``trend following'' futures fund (CTA) , founded early 1990's
- Early to mid-2000's expands from < 1Bn AUM to 5 Bn. AUM
- Adds a quantitative, market-neutral equity fund
- Adds a quantitative options fund
- Completely systematic (no human trading, no fundamental info)
- Strict real-time risk-management
- Position turnover: few minutes for few hours
- Personnel: mostly researchers in equities and futures strategies and a few administrative staff.

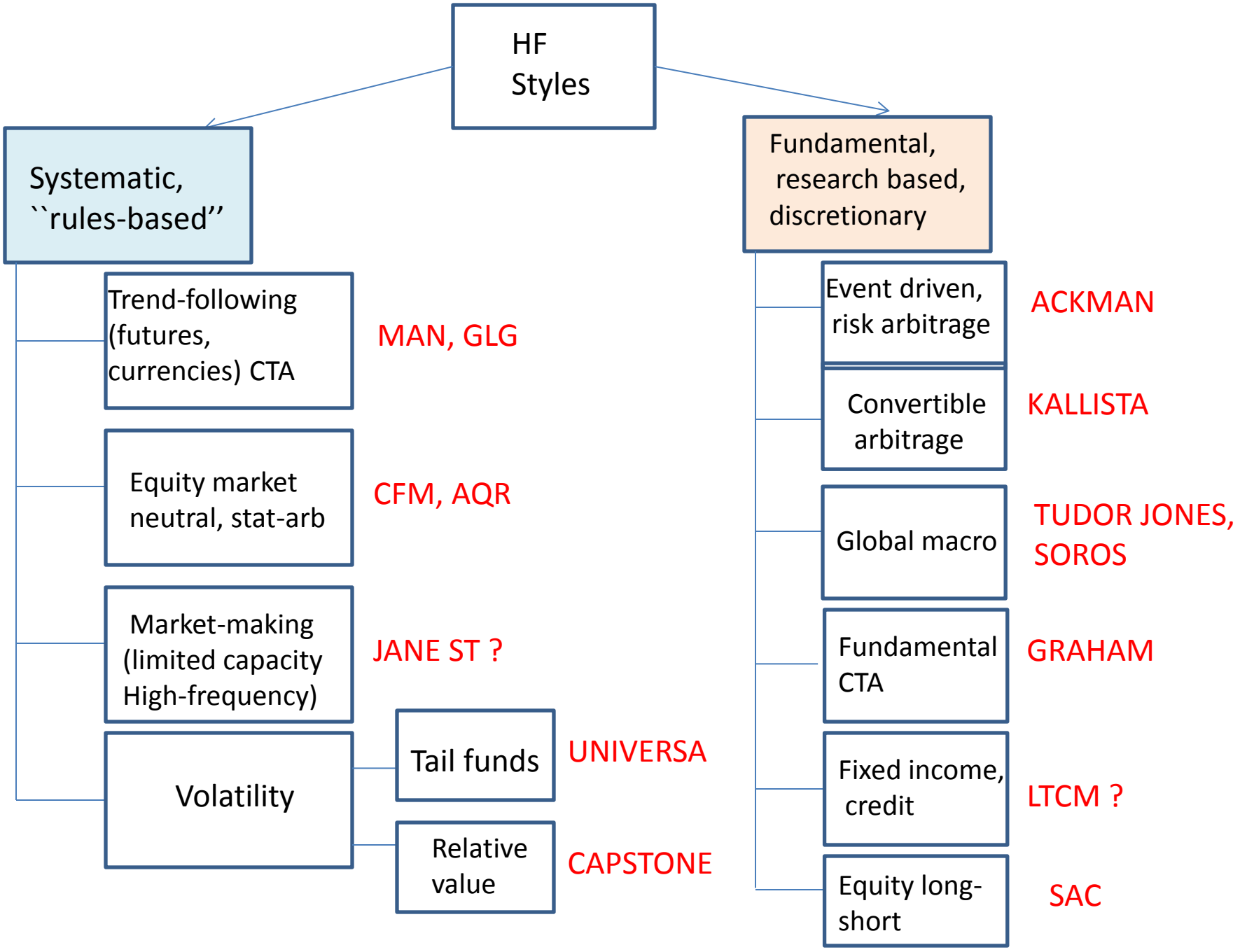
Case study #2: Long-short equity fund (NY, fundamental)

- Created after Internet Bubble
- Core funds: Technology, Health Care
- Staff: Equity research, trading, back-office
- Investment process: trades suggested by research staff that goes over company reports and gets research from sell-side. (``Mosaic theory'')
- Traders (Portfolio Managers) use the ideas to construct active trading
- Hedging with options and ETFs (limited exposure, either to long or short side).
- Turnover: weeks, months

Success of HF business: a few thoughts for managers

- Market for *managers* and *investment/trading talent*
- Past 10 years: entrance of pensions and endowments; more attention to administration
- Importance of returns vs. risk management
- Importance of risk-management versus returns
- Liquidity
- Transparency
- Multi-strategy is necessary to survive in the post 2008 period
- Talent for business administration & marketing

Hedge Funds Strategies and Styles


HF Styles
Systematic, ``rules-based''
Fundamental, research based, discretionary
Trend-following (futures, currencies) CTA
MAN, GLG
Equity market neutral, stat-arb
CFM, AQR
Market-making (limited capacity High-frequency)
JANE ST ?
Volatility
Tail funds
UNIVERSA
Relative value
CAPSTONE
Event driven, risk arbitrage
ACKMAN
Convertible arbitrage
KALLISTA
Global macro
TUDOR JONES, SOROS
Fundamental CTA
GRAHAM
Fixed income, credit
LTCM ?
Equity long-short
SAC

Trend Following CTA

- Trend following is an investment or trading strategy which tries to take advantage of long, medium or short-term moves that seem to play out in various markets.

- Traders who employ a trend following strategy do not aim to forecast or predict specific price levels; they simply jump on the trend (when they perceived that a trend has established with their own peculiar reasons or rules) and ride it.

- Traders normally enter in the market after the trend "properly" establishes itself, betting that the trend will persist for a long time, and, for this reason, they ignore the initial turning point profit.

- A market "trend" is a tendency of a financial market price to move in a particular direction over time. If there is a turn contrary to the trend, they exit and wait until the turn establishes itself as a trend in the opposite direction. In case their rules signals an exit, the trader exits but re-enters when the trend re-establishes.

Statistical Arbitrage

- StatArb evolved out of the simpler pairs trade strategy, in which stocks are put into pairs by fundamental or market-based similarities.

- StatArb considers not pairs of stocks but a portfolio of a hundred or more stocks—some long, some short—that are carefully matched by sector and region to eliminate exposure to beta and other risk factors.

- Portfolio construction consists of two phases. In the first or "scoring" phase, each stock in the market is assigned a numeric score or rank that reflects its desirability.

- The details of the scoring formula vary, but, generally (as in pairs trading), they involve a short term **mean reversion** principle so that, e.g., stocks that have done unusually well in the past week receive low scores and stocks that have underperformed receive high scores.

HFT, Market-making

- **High-frequency trading** (HFT) is the use of sophisticated technological tools and computer algorithms to trade securities on a rapid basis.[HFT usually uses proprietary trading strategies that are carried out by computers.

- Unlike regular investing, an investment position in HFT may be held for only seconds, or fractions of a second (though sometimes it may extend to longer), with the computer trading in and out of positions thousands or tens of thousands of times a day. At the end of a day of HFT, there is no open position in the market.

- Firms engaged in HFT rely heavily on the **processing speed of their trades**, and on their access to the market. Many high-frequency traders provide liquidity and price discovery to the markets through **market-making** and **arbitrage trading**; and high-frequency traders also take liquidity to manage risk or lock in profits.

- As of 2009, studies suggested HFT firms accounted for 60-73% of all US equity trading volume, with that number falling to approximately 50% in 2012.

Long Volatility Funds

- In the aftermath of the (i) Internet bubble and (ii) 2007-2008, funds that systematically bought options and delta hedged, made a lot of money
- Following that development, the concept of **long volatility fund,** or **tail risk fund** was established
- Such funds maintain an inventory of long premium (rolling long positions in options). The thinking is that the cost of the premium will be less than the gains from vega/gamma if the market crashes.
- In general, these vehicles lose money except when there is a large crisis like 2008
- Long volatility funds still elicit interest from investors, to some extent.

AllianceBernstein launches tail risk protection strategy

Friday, 24 May 2013 11:30am
By Mark Smith | In Investment

Tail risk, or the risk of suffering losses greater than statistically normal ranges, is a much greater threat to portfolios than volatility, global asset manager AllianceBernstein warns.

Tail risk takes its name from the shape of the bell curve, in which statistically normal outcomes fall along the "dome" of the bell and extreme outcomes tail off at either end, with negative outcomes on the left and positive ones on the right.

"The problem with the concept of volatility as it is typically understood by risk-aware investment strategies is that it assumes a normal pattern of returns, such as that described by the bell curve diagram of probable outcomes commonly used in statistics," said Michael DePalma, AllianceBernstein's New York-based chief investment officer for quantitative investment strategies, during a visit to Australia this week.

"But we know from experience-particularly since the 2008 financial crisis-that extreme outcomes are likelier in reality than the probability implied by a normal distribution."

According to AllianceBernstein research, negative tail events have occurred more frequently in global financial markets in recent years than would historically be expected - a total of nine tail events have occurred since 1988 instead of the anticipated six.

Harcourt Quarterly Hedge Fund Presentation
Paris, November 2004

Trading Market Volatility

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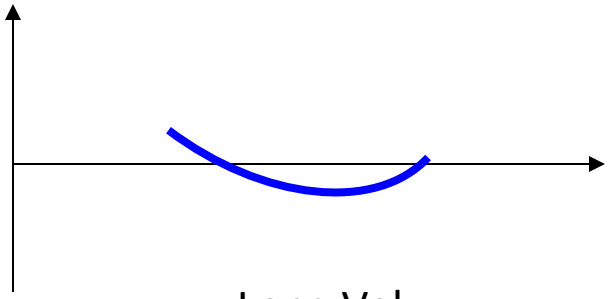
CAPITAL FUND MANAGEMENT

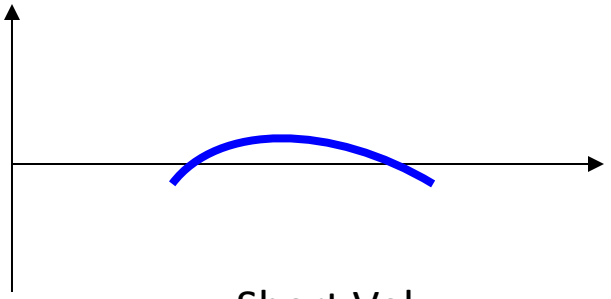
Volatility Trading in a Nutshell

- Long volatility: buy call option, sell shares
  buy put option, buy shares

- Short volatility: sell call option, buy shares
  sell put option, sell shares



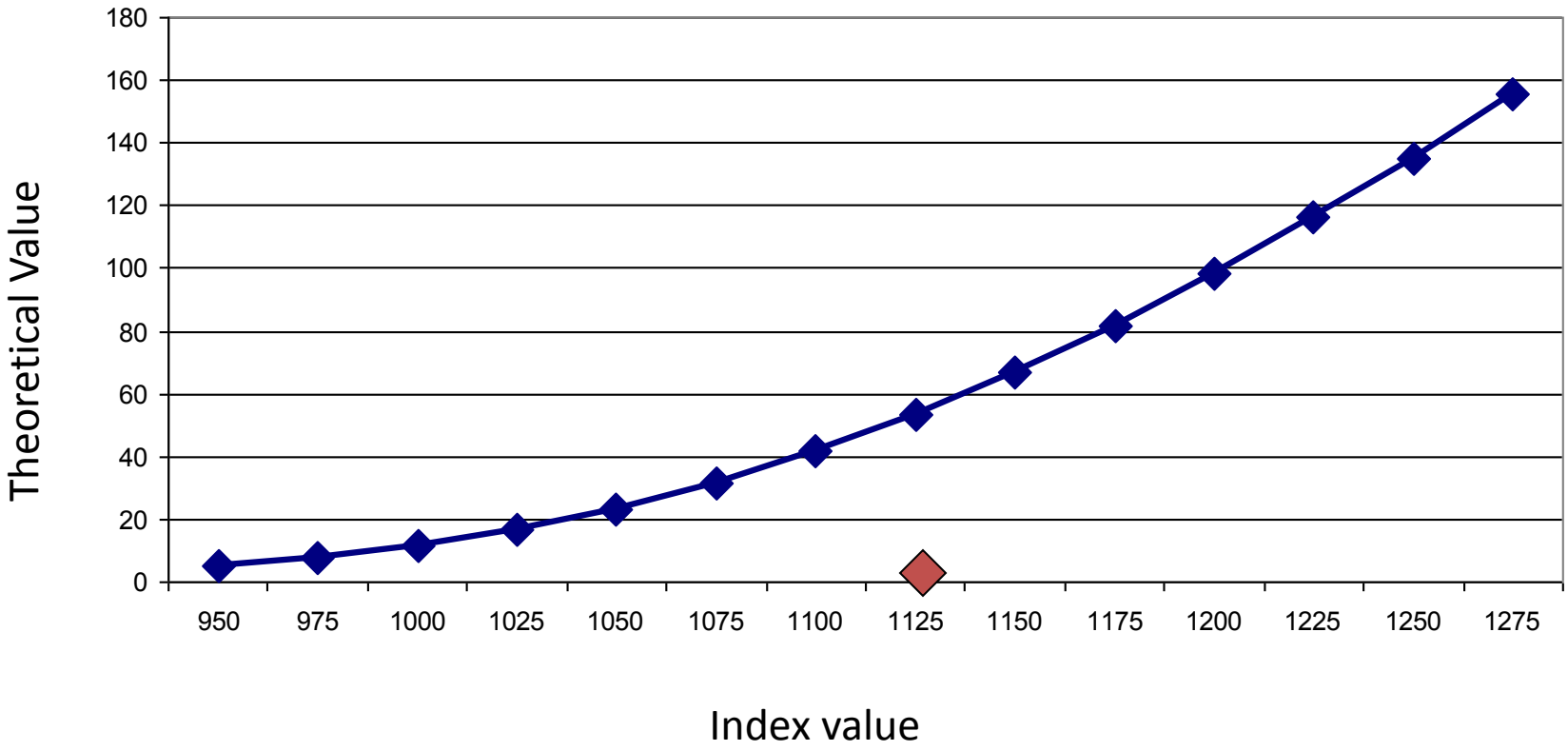
Long Vol



Short Vol

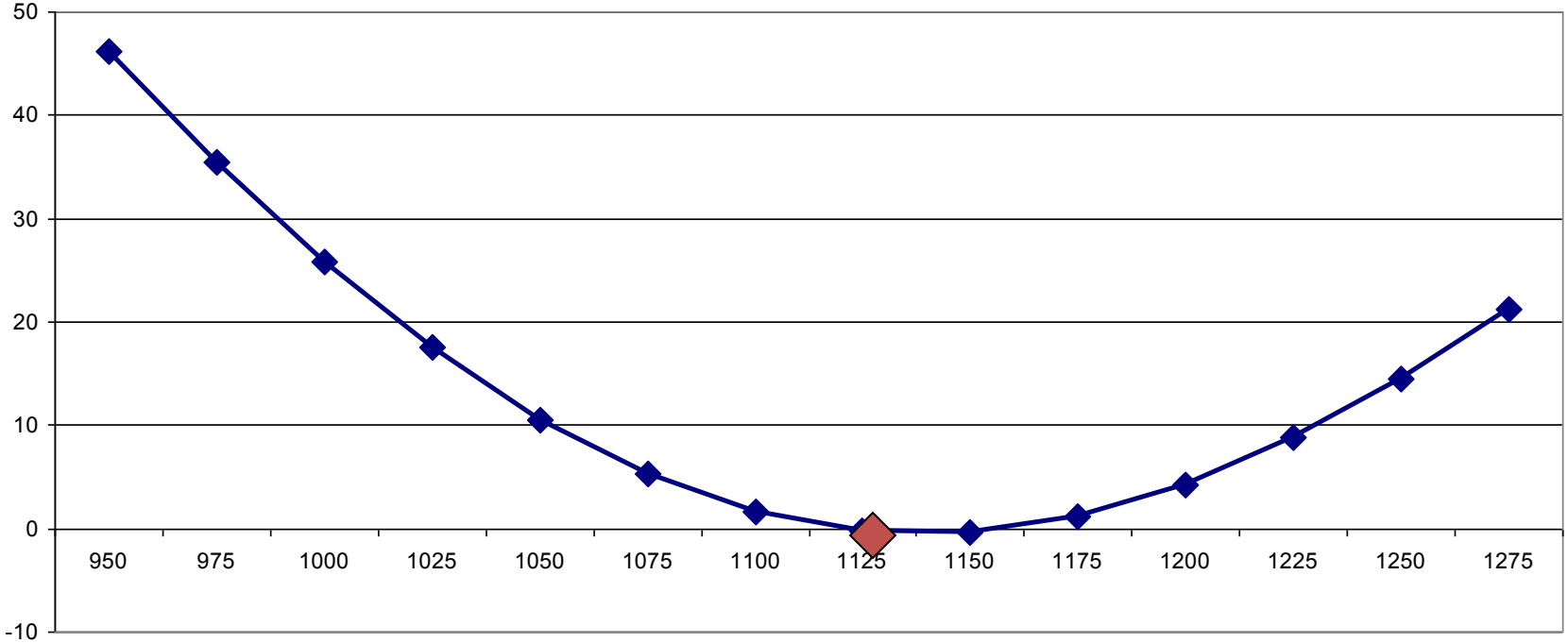
SP 500 June05 1125 Call

Vol=16%



1-day P/L for Long Call/Short Stock

(Constant volatility=16%)

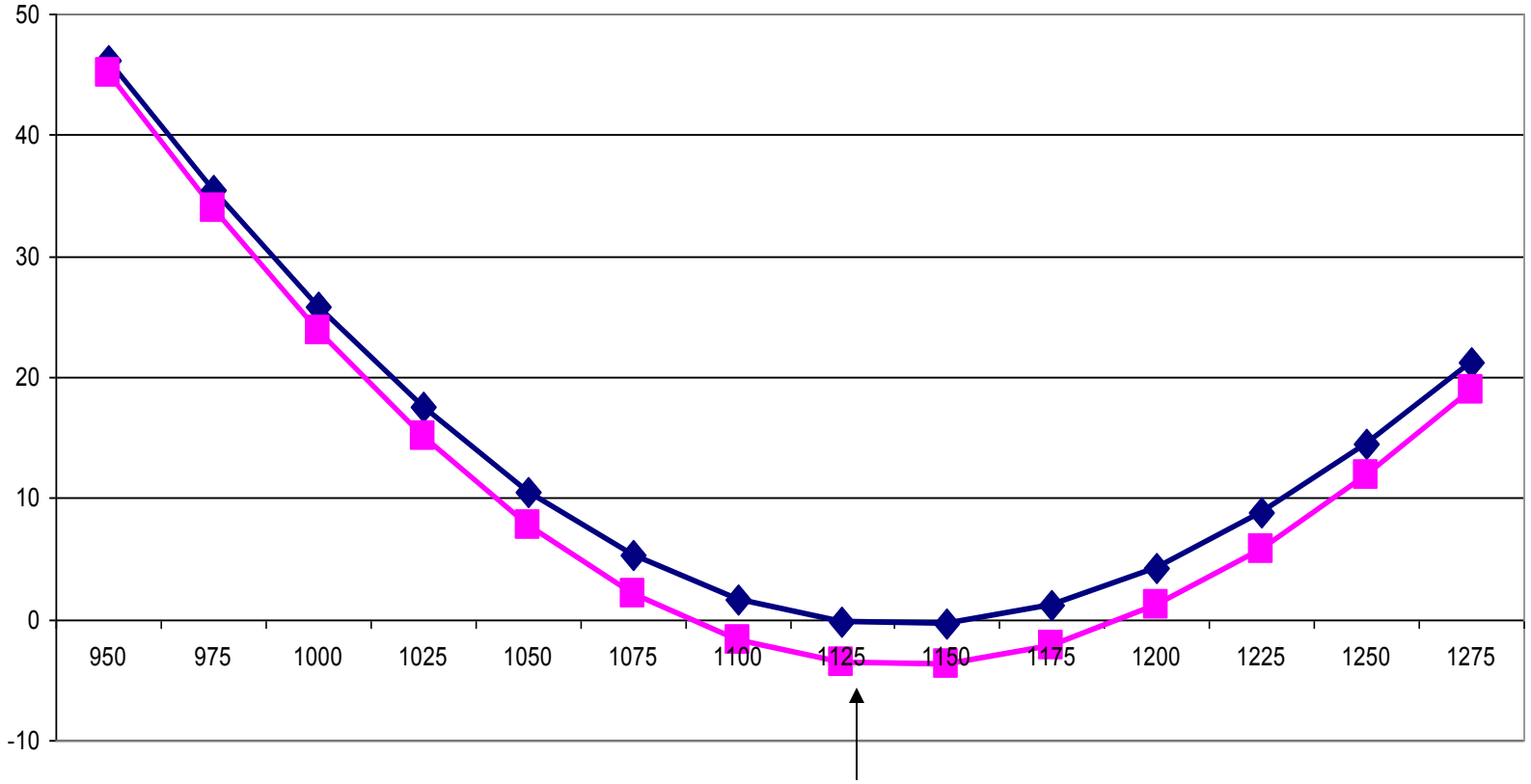


$$\text{P/L} \approx \theta \cdot \left(n^2 - 1\right)$$

$$\theta = \text{daily time-decay}, \quad n = \frac{\text{percent index change}}{\text{expected daily volatility}}$$

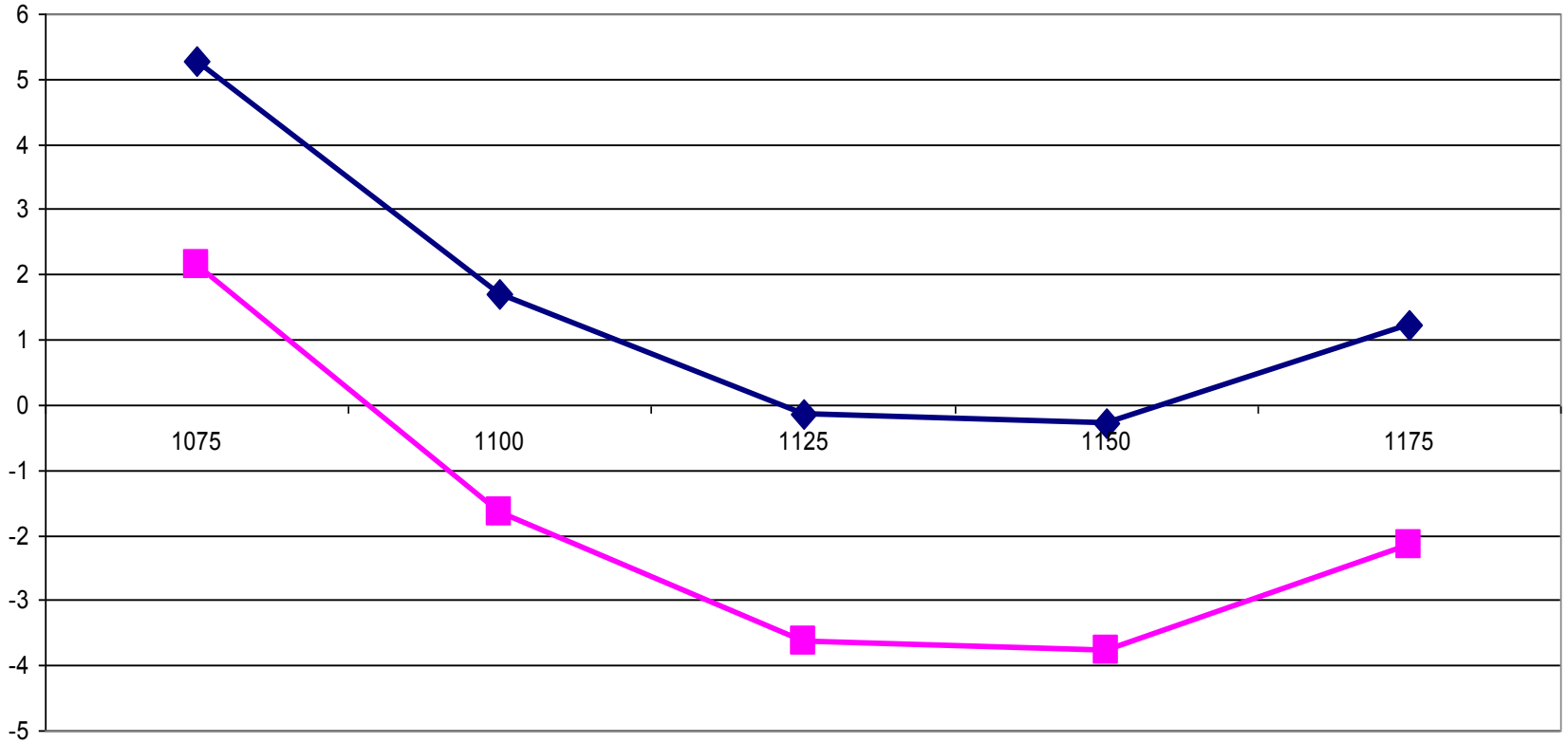
Assuming an implied volatility drop of 1%

Vol=15%



3.80 loss if stock does not move and volatility drops 1%

A closer look at the profit-loss due to a change in volatility



1% move in vol => 8% move in premium for a 6m ATM option

Book-keeping: profit/loss from a delta-hedged option position

$$\mathrm{P/L} = \theta \cdot \left(n^2 - 1\right) + V \cdot d\sigma$$

or

$$\mathrm{P/L} = \frac{1}{2}\Gamma \cdot \left(\frac{(dI)^2}{I^2} - \sigma^2 dt \right) + V \cdot d\sigma$$

Return Characteristics

- Implied volatility is a market forecast of the future volatility of the underlying stock (level-dependent)

- Long volatility positions gain when realized volatility (over the lifetime of the option) is higher than implied volatility at inception

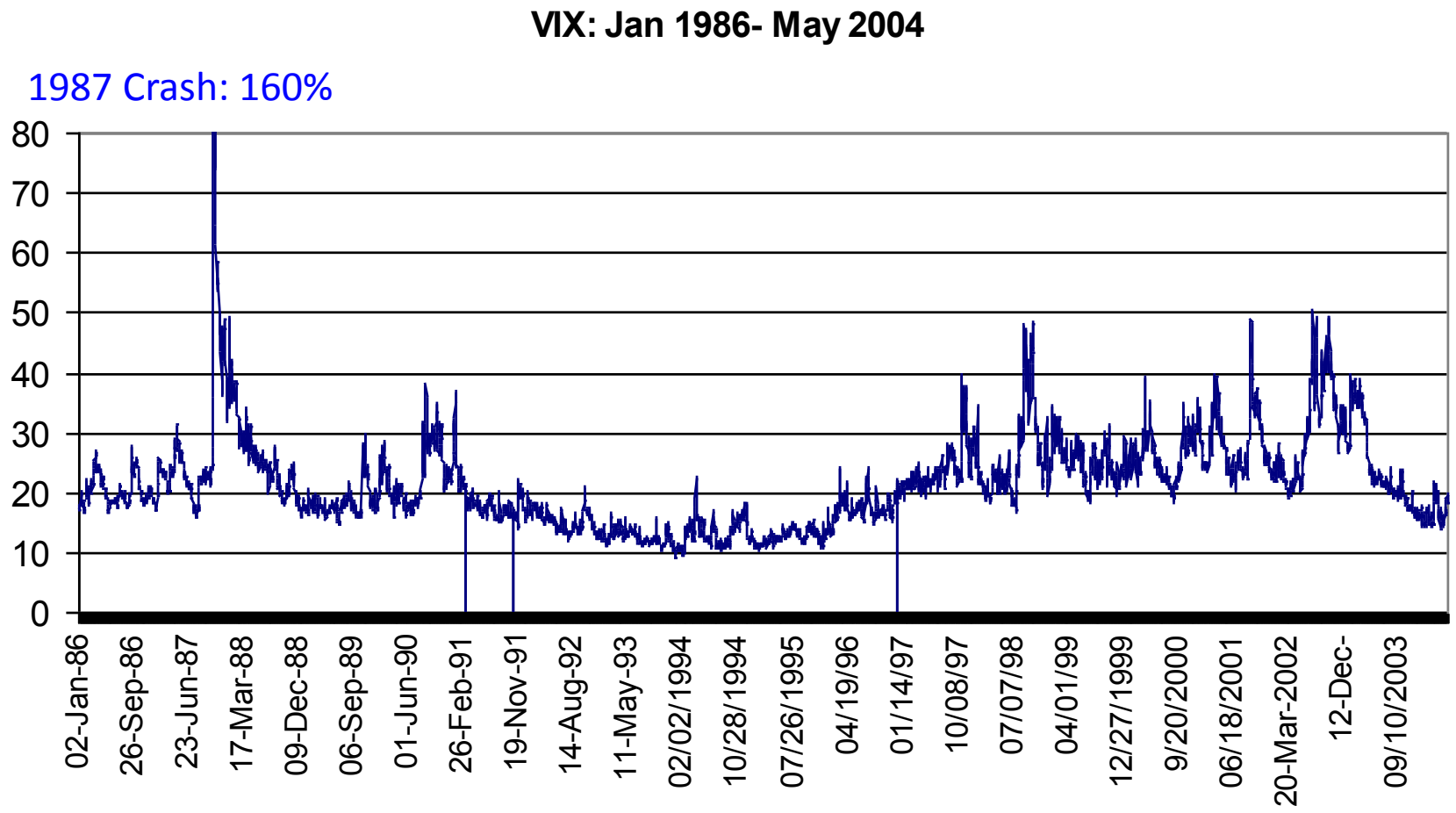
- Changes in implied volatility affect the MTM of the position

S&P500 Implied and Realized Volatilities

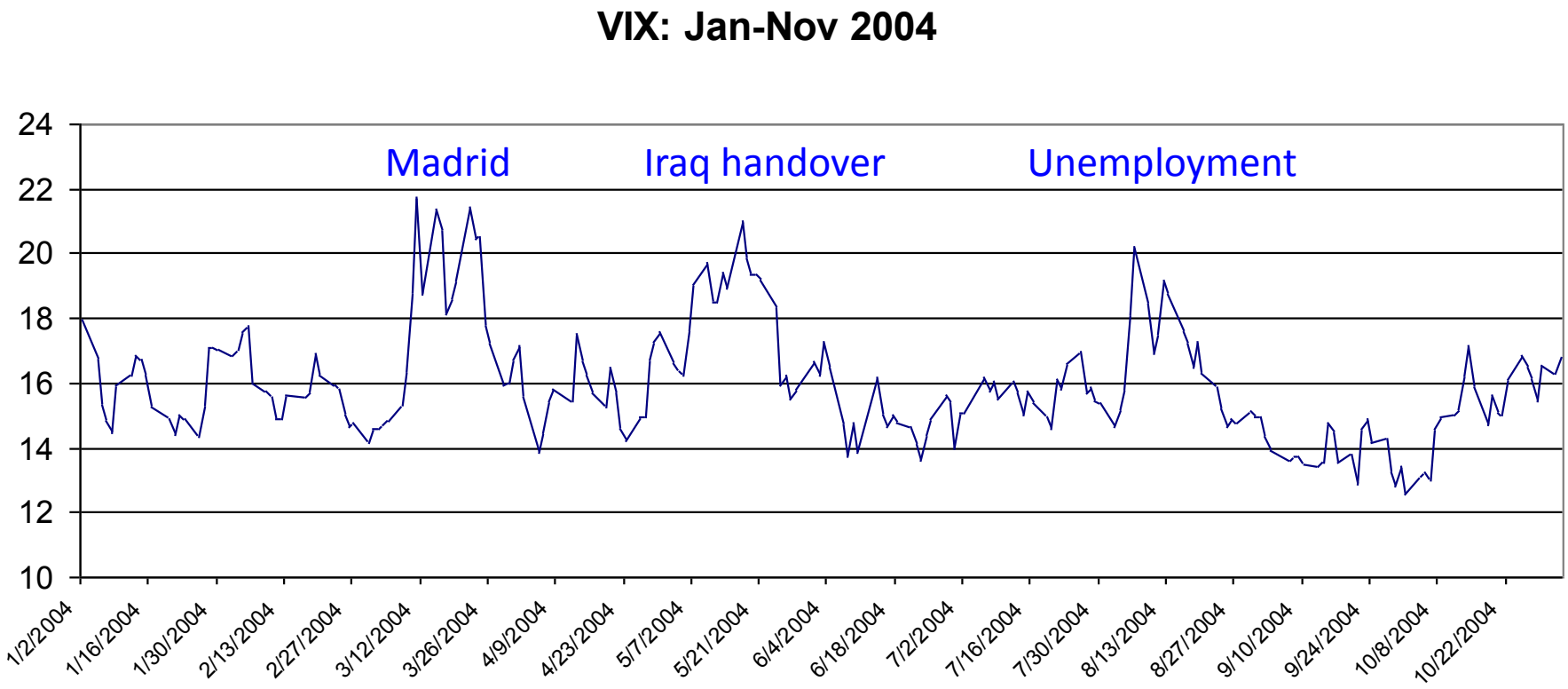
Are current levels of volatility justified?

- Market volatility is at a historical low
- We believe that these levels of volatility are associated with the ``investment cycle'' in equities
- The crash of 2000-2002 diminished the public's appetite for equities
- The volatility environment resembles the early 1990's (somewhat)

VIX: 30-day Implied Volatility index of S&P 100



This year's VIX



Can we forecast volatility?

- Volatility cannot be predicted over long periods of time
- Option markets in stocks and indices provide ``market forecasts'' (market consensus) for periods ranging from 1 month to 1 year
- Statistical models may be used to forecast volatility over short periods of time
- Importance of taking into account ``exogenous news'' and events, macro news

Equity Volatility Markets

- 3000 optionable stocks in the U.S., 500 names have liquid options
- Index options (SPX, OEX) and ETF options (QQQ)
- In Europe, liquid markets in Eurostoxx50
  and DAX index options
- Moderate liquidity in single-name options in Europe
- Asia: Nikkei and Kospi200 are very active

Examples of trading strategies

- Think of volatility trading as trading in insurance premiums (against large moves in the underlying stock)
- Analyze market in options as an ``insurance'' market via normative models and build positions
- Long-only strategies: always buy volatility to capitalize on market dislocations. Typically proposed as an insurance overlay to other investments
- Long-short strategies: relative value approach. Capitalize on perceived mispricing of options. Originated from market-making activities in dealing rooms. Only recently adapted to asset-management
- Macro strategies: invest across asset classes (equity, fx, fixed income, currencies)

Long-Only Strategies

- Strategies are natural hedges/overlays
- Performed well before 2001
- Performed less well after 2001 due to drop in levels
- P/L profile: many small losses (time decay), occasional large windfalls

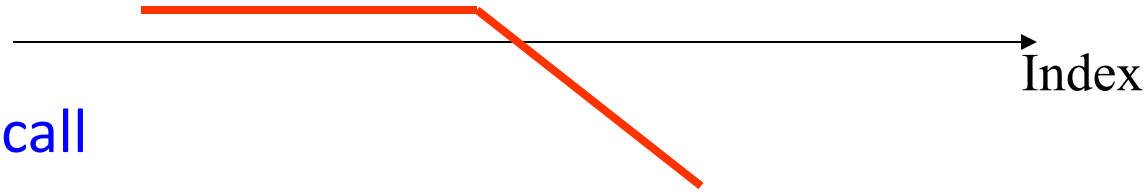
Long-Short Strategies

- Vega-neutrality to hedge changes in overall market volatility
- Sell AND buy volatility (like insurance/reinsurance)
- Adapted from dealing room (market-making) practice
- Use correlation models for the underlying assets and their volatilities
- Require strict control of exposure to single-name risk and market crash risk

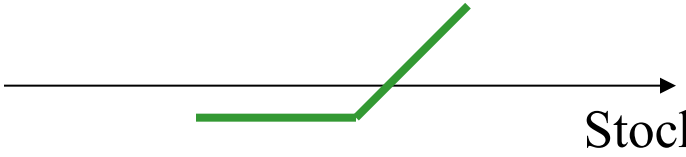
Index Option Arbitrage (Dispersion Trading)

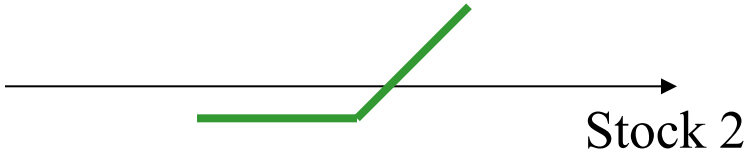
- Sell index volatility, buy the volatility of the index components
- Takes advantage of differences in implied volatilities of index options and implied volatilities of individual stock options
- Main source of arbitrage: correlations between asset prices vary with time due to corporate events, earnings, and ``macro'' shocks

Dispersion trading (graphical)



Sell index call





Buy calls on different stocks.

Also, buy index/sell stocks

Practical aspects of vol trading

- Market structure: specialist system in the US, OTC in Europe
- Electronic versus voice trading
- Reduction in trading costs and improved access allows hedge funds to compete with B&Ds
- Liquidity in single names and ETFs can be a problem
- Technical infrastructure for trade processing, risk-management, models, etc

Worst-case scenarios for volatility trading & remedies

- Short volatility positions are such that underlying stock moves considerably and implied volatility goes up
- Long volatility positions are such that stocks move moderately and volatility collapses
- Limit exposure by asset
- Limit sector exposure
- Limit correlation exposure (dispersion trading)

Links between volatility trading and other markets

- Issuers of structured products (guaranteed principal with equity upside) are sellers of long term equity volatility and correlation
- Convertible bond issuers are sellers of equity volatility
- Institutional investors tend to be long converts and banks are short structured notes
- Hedging these exposures creates flows in listed options (Eurostoxx50, Dow, S&P) and basket trades (dispersion) which connect long-term volatility markets with listed markets
- Estimated exposure by issuers of structured products is EUR 200 MM per correlation point *(RISK, May 2004)*

Risk Arbitrage

- If a company (A) is going to buy another one (B), it has to pay a premium above the pre-announcement value. The stock of B will go up during the time of the announcement until when the deal is done.

- There is a chance that the deal does not go through, in which case stock B drops in value.

- Risk Arb is, by definition, a strategy which attempts to capitalize from these effects on share prices caused by mergers.

Convertible arbitrage

- The premise of the strategy is that the convertible bonds are is sometimes priced inefficiently relative to the underlying stock, for reasons that range from illiquidity to market psychology,(to the fact that there are no bond buyers otherwise).

- In particular, the equity option embedded in the convertible bond (which is typically a 5 year option) may be a source of cheap volatility, which convertible arbitrageurs can then exploit by selling shares or selling listed options with shorter maturities.

- The number of shares sold short usually reflects a delta-neutral or market-neutral ratio. As a result, under normal market conditions, the arbitrageur expects the combined position to be relatively hedged.
- However, maintaining a market-neutral position may require rebalancing transactions, a process called dynamic delta hedging. This rebalancing adds to the return of convertible arbitrage strategies.

Global Macro

Global macro is the strategy of investing on a large scale around the world using economic theory to justify the decision making process. Usually with currencies, commodities equity Indexes or fixed income.

The strategy is typically based on forecasts and analysis about interest rates trends, the general flow of funds, political changes, government policies, inter-government relations, and other broad systemic factors.

Macro trader Yra Harris claims that "global macro" is really a new term, which used to be called geopolitics. George Soros famously employed a global macro strategy when he sold pound sterling in 1992 at the time of the European Rate Mechanism debacle.

In an discussion on global macro, hedge fund manager John Burbank discussed the increasing importance and shift of private and institutional investors toward more global macro strategies. Burbank defined global macro as "having a reason to be long or short something that is bigger than a fundamental or quantitative stock view."

CTA, fundamental or systematic

- A **Commodity trading advisor** (**CTA**) is an individual or organization who is retained by a fund or individual client to provide advice and services related to trading in futures contracts commodity options and/or swaps.
- They are usually responsible for the trading within managed futures accounts. The definition of CTA may also apply to investment advisors for hedge funds and private funds including mutual funds and exchange-traded funds in certain cases[1]
- A CTA generally acts as an asset manager, following a set of investment strategies utilizing futures contracts and options on futures contracts on a wide variety of physical goods such as agricultural products, forest products, metals, and energy, plus derivative contracts on financial instruments such as indices, bonds, and currencies.[
- The trading programs employed by CTAs can be characterized by their market strategy, whether trend following or market neutral, and the market segment, such as financial, agricultural or currency.
- There are two major styles of investment employed by CTAs: technical and fundamental.

Fixed-income/credit arbitrage

- **Fixed-income arbitrage** consists of the discovery and exploitation of inefficiencies in the pricing of bonds, i.e. debt instruments from either public or private issuers, yielding a contractually fixed stream of income.

- In pursuit of their goal of both steady returns and low volatility, managers can focus upon interest rate swaps, US non-US government bond arbitrage, see US Treasury securities, forward yield curves, and/or mortgage-backed securities.

- Synthetic instruments such as Credit Default Swaps (CDS) and indexes of CDS, can be used in fixed-income/credit arbitrage.

Long-short equity funds

- Typically, equity long/short investing is based on "bottom up" fundamental analysis of the individual companies in which investments are made. There may also be "top down" analysis of the risks and opportunities offered by industries, sectors, countries, and the macroeconomic situation.

- Long/short covers a wide variety of strategies. There are generalists, and managers who focus on certain industries and sectors or certain regions. Managers may specialize in a category — for example, large cap or small cap, value or growth. There are many trading styles, with frequent or dynamic traders and some longer-term investors.

- A fund manager typically attempts to reduce volatility by either diversifying or hedging positions across individual regions, industries, sectors and market capitalization bands and hedging against un-diversifiable risk such as market risk.

- There is wide variation in the degree to which managers prioritize seeking high returns, which may involve concentrated and leveraged portfolios, and seeking low volatility, which involves more diversification and hedging.

Statistical Arbitrage, Enhanced Indexing and 130/30

Summary

-- Overview of Statistical Arbitrage

-- Using ETFs as relative-value indicators

-- Mean-reversion & the Ornstein-Uhlenbeck process

-- Examples of trades

-- Portfolio construction: a hypothetical fund (PLATA)

-- Synthetic 130/30 funds constructed from PLATA and Indices

-- Comparison of PLATA+SP with 130/30 Mutual Funds and a 130/30 ETF

-- Conclusions

Statistical Arbitrage

Trading strategy consisting of investing in stocks, both long and short, with a mean-reversion theme

-- Pairs trading: practiced since the 1990s, invented by Morgan Stanley's prop team, the precursor of stat-arb

-- Factor neutral trading: generalizes pairs trading using APT-like factors

-- ETF relative-value trading: the ultimate subject of this presentation (ETFs as factors)

Idea: measure statistically a time-series of spread between two or more correlated stocks or indices and invest in overbought/undersold spreads.

Trading Universe:
Stocks of more than 1BB cap

Sector	ETF	Num of Stocks	Market Cap unit: 1M/usd		
			Average	Max	Min
Internet	**HHH**	22	10,350	104,500	1,047
Real Estate	**IYR**	87	4,789	47,030	1,059
Transportation	**IYT**	46	4,575	49,910	1,089
Oil Exploration	**OIH**	42	7,059	71,660	1,010
Regional Banks	**RKH**	69	23,080	271,500	1,037
Retail	**RTH**	60	13,290	198,200	1,022
Semiconductors	**SMH**	55	7,303	117,300	1,033
Utilities	**UTH**	75	7,320	41,890	1,049
Energy	**XLE**	75	17,800	432,200	1,035
Financial	**XLF**	210	9,960	187,600	1,000
Industrial	**XLI**	141	10,770	391,400	1,034
Technology	**XLK**	158	12,750	293,500	1,008
Consumer Staples	**XLP**	61	17,730	204,500	1,016
Healthcare	**XLV**	109	14,390	192,500	1,025
Consumer discretionary	**XLY**	207	8,204	104,500	1,007
Total		**1417**	**11,291**	**432,200**	**1,000**

January, 2007

Investing: a quant perspective

Separate the **systematic** components of stock returns from the company-specific, or **idiosyncratic** components

$$R_i = \beta_i R_{Mkt} + \varepsilon_i$$

Project returns on single Market Factor (CAPM)

$$R_i = \sum_{j=1}^{m} \beta_{ij} F_j + \varepsilon_i$$

Project returns on Multiple (sector, size) Factors (APT)

In principle, market-neutral portfolios should have no exposure to market factors ("defactoring")

Defactoring: the Correlation Matrix Approach

$$R_{it} = \text{daily stock returns in panel form}$$

$$i = 1,\ldots,N,\ t = 1,\ldots,T$$

$$\overline{R_i} = \frac{1}{T}\sum_{i=1}^{T} R_{it}, \qquad \overline{\sigma_i}^{2} = \frac{1}{T-1}\sum_{i}\left(R_{it} - \overline{R_i}\right)^2$$

$$\overline{\rho_{ij}} = \frac{1}{T-1}\sum_{i}\frac{\left(R_{it} - \overline{R_i}\right)\left(R_{jt} - \overline{R_j}\right)}{\overline{\sigma_i}\,\overline{\sigma_j}}$$

Principal Component Analysis

$$\lambda_1 > \lambda_2 \geq \lambda_3 \geq \ldots \geq \lambda_N$$

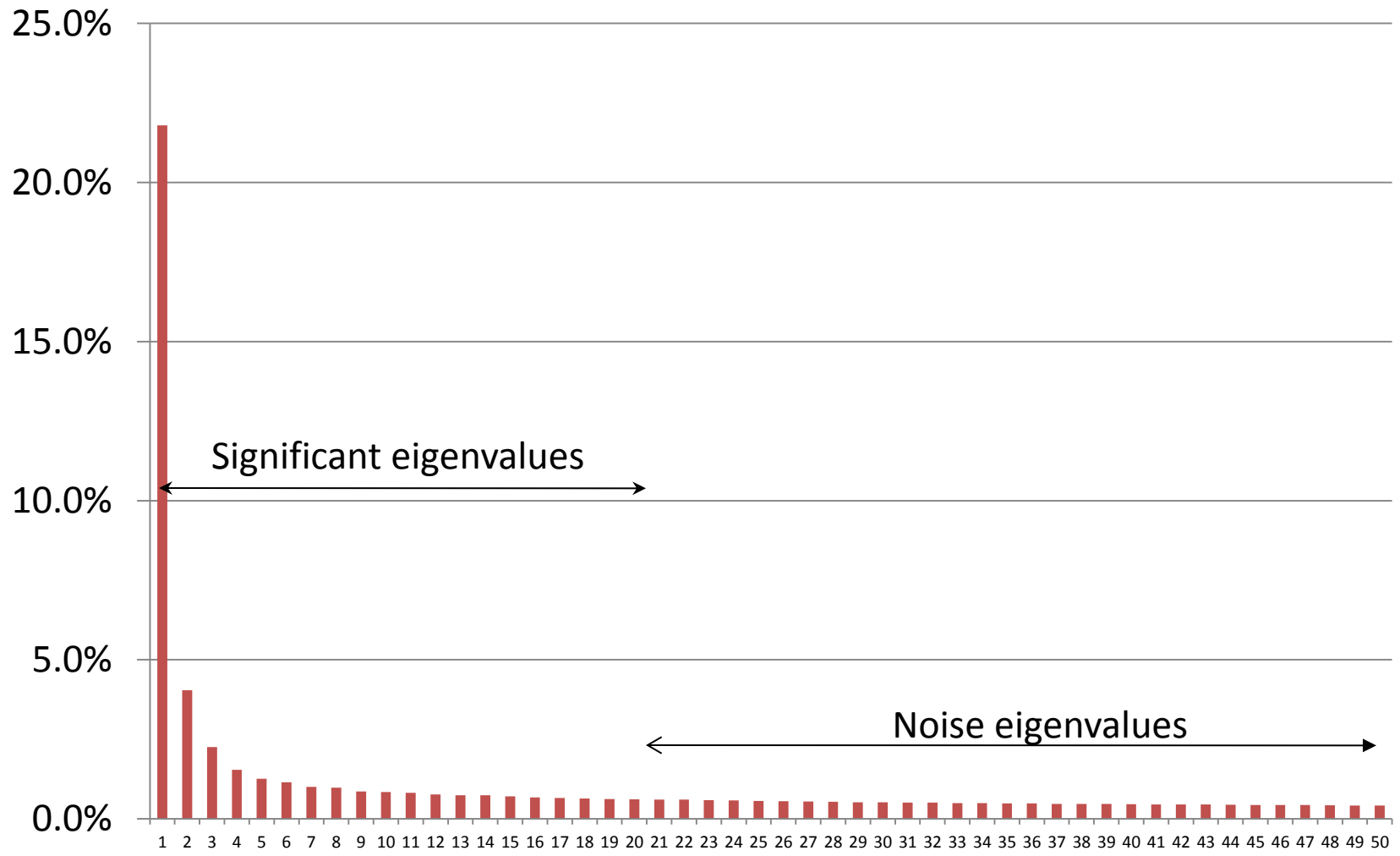
Eigenvalues are all non-negative

$$V^{(j)} = \left(v_1^{(j)}, v_2^{(j)}, \ldots, v_N^{(j)} \right)$$

Orthogonal eigenvectors

Stock market fluctuations can be characterized as moves along the eigenvector directions. We seek to extract mathematical factors from the PCA analysis.

PCA: Explained variance from the viewpoint of eigenvalues



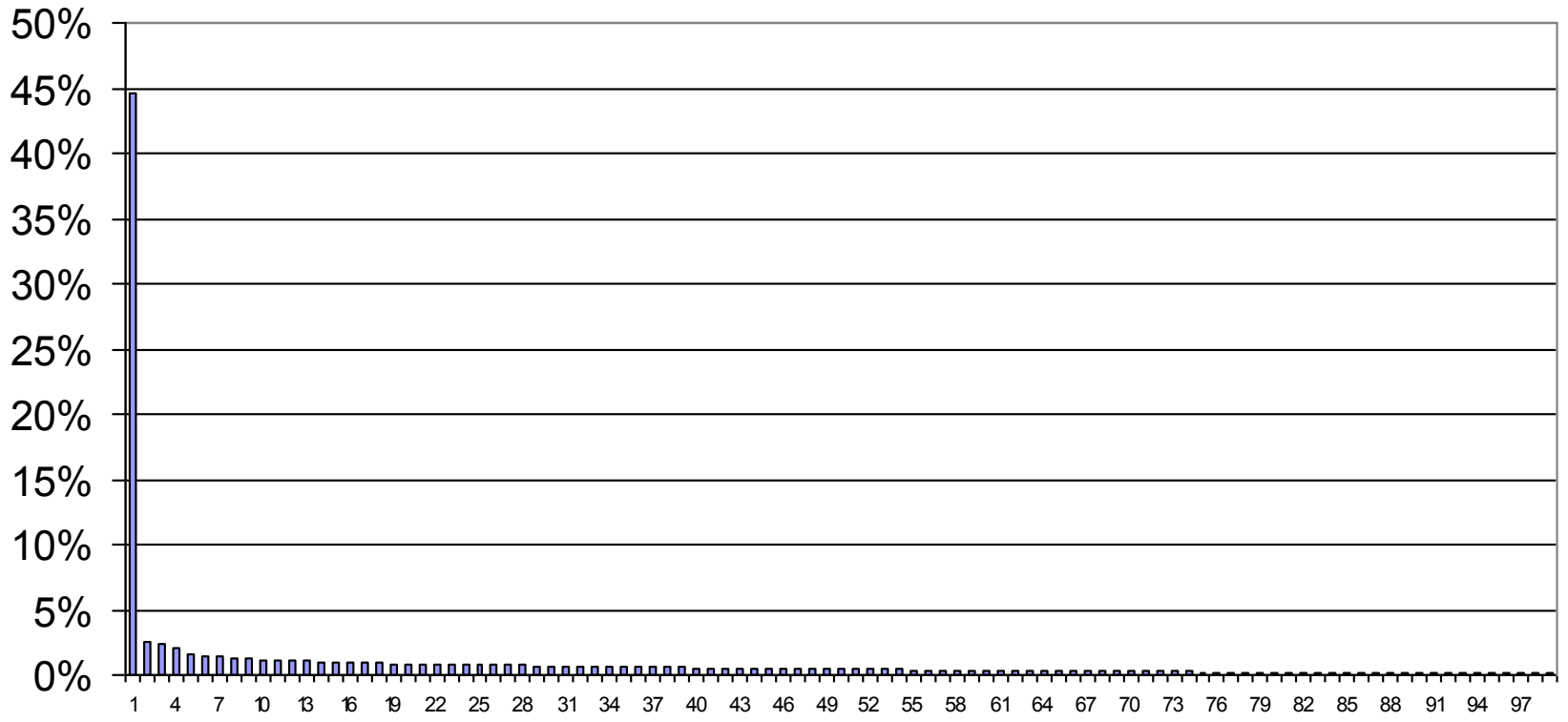
Big universe: Jan 2007-Dec 2007

Nasdaq-100
Components of NDX/QQQQ

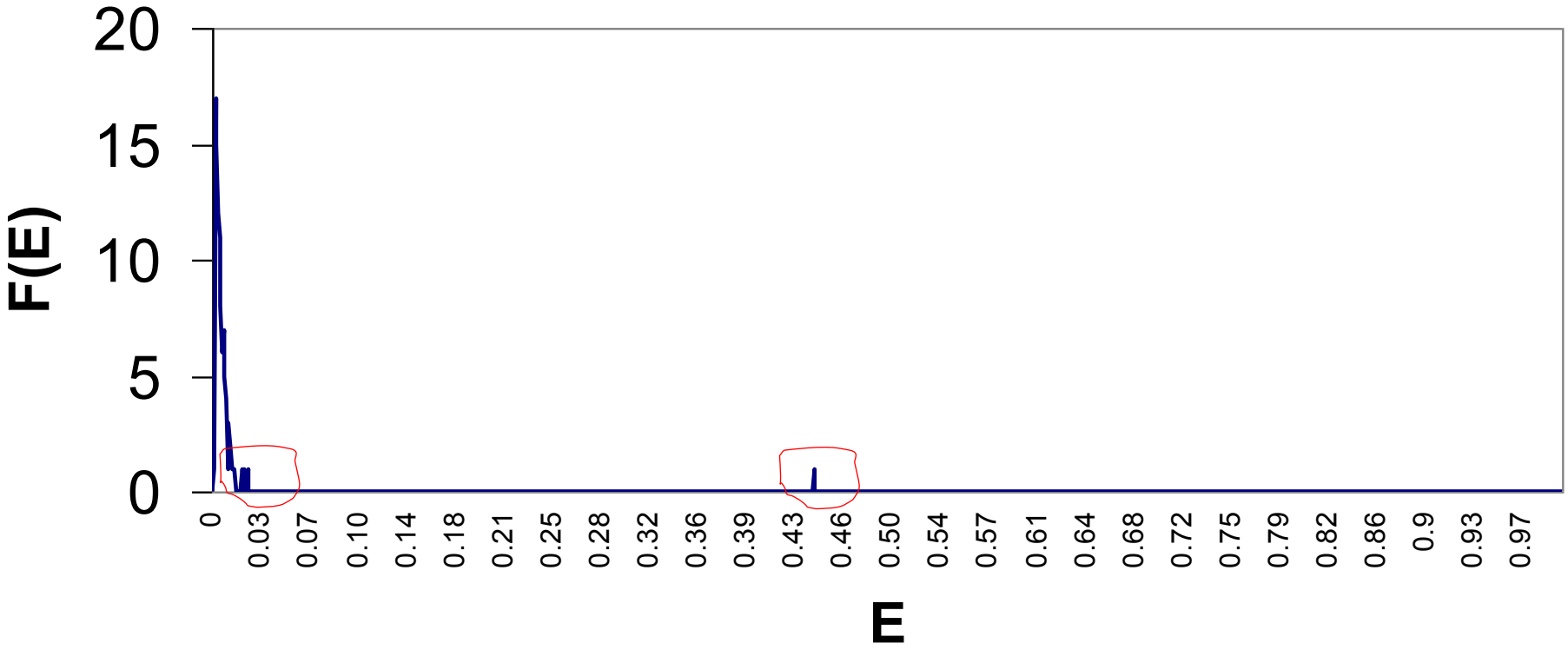
Data: Jan 30, 2007 to Jan 23, 2009

502 dates, 501 periods

99 Stocks (1 removed) MNST (Monster.com), now listed in NYSE

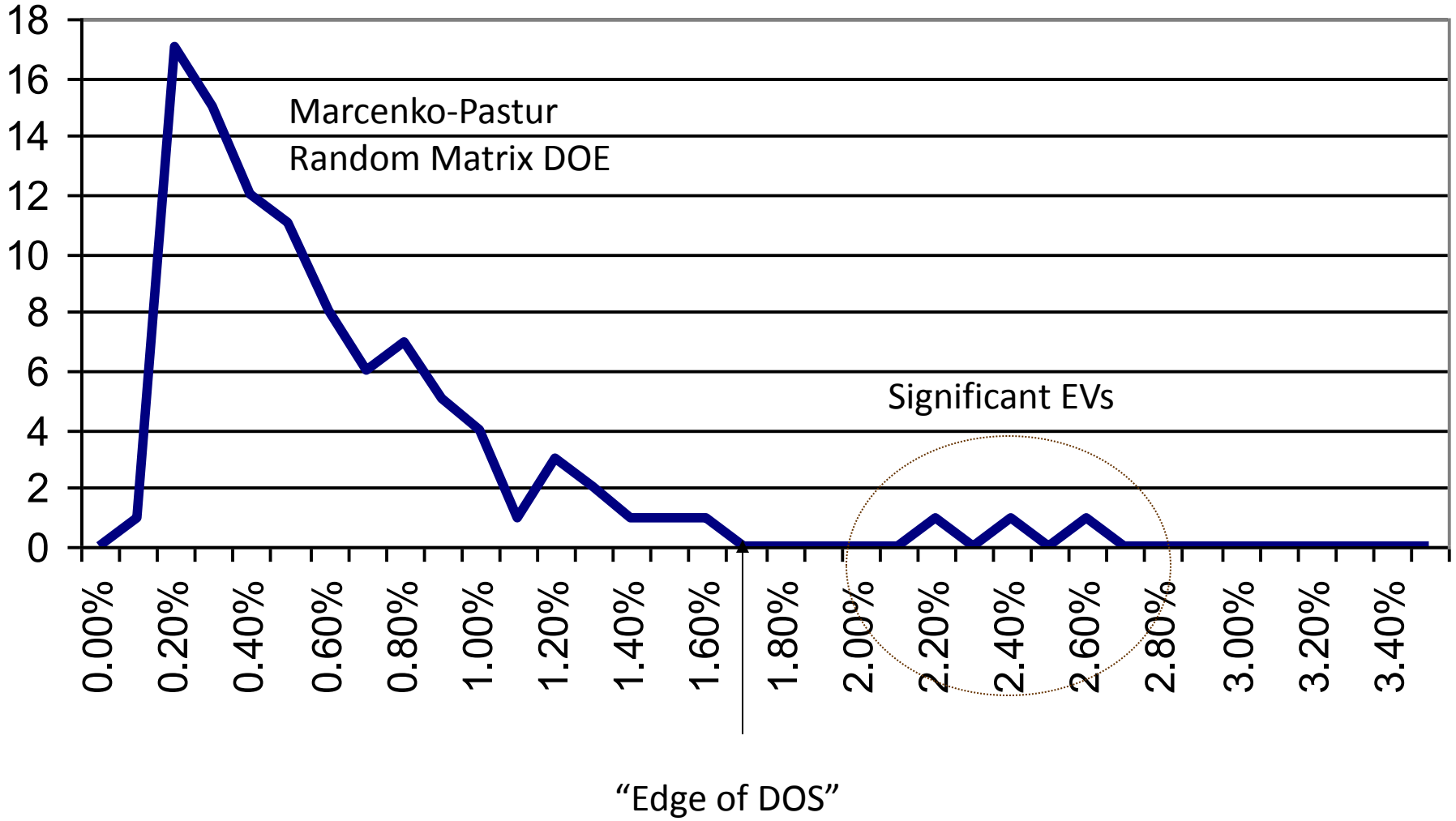


Density of States (from previous data)



One large mass at 0.44,
Some masses near 0.025
Nearly continuous density for lower levels

Zoom of the DOS for low eigenvalues



Factors & Eigenportfolios

For each eigenvector, build a portfolio which is weighted proportionally to the coefficient of each stock and inversely proportionally to its volatility

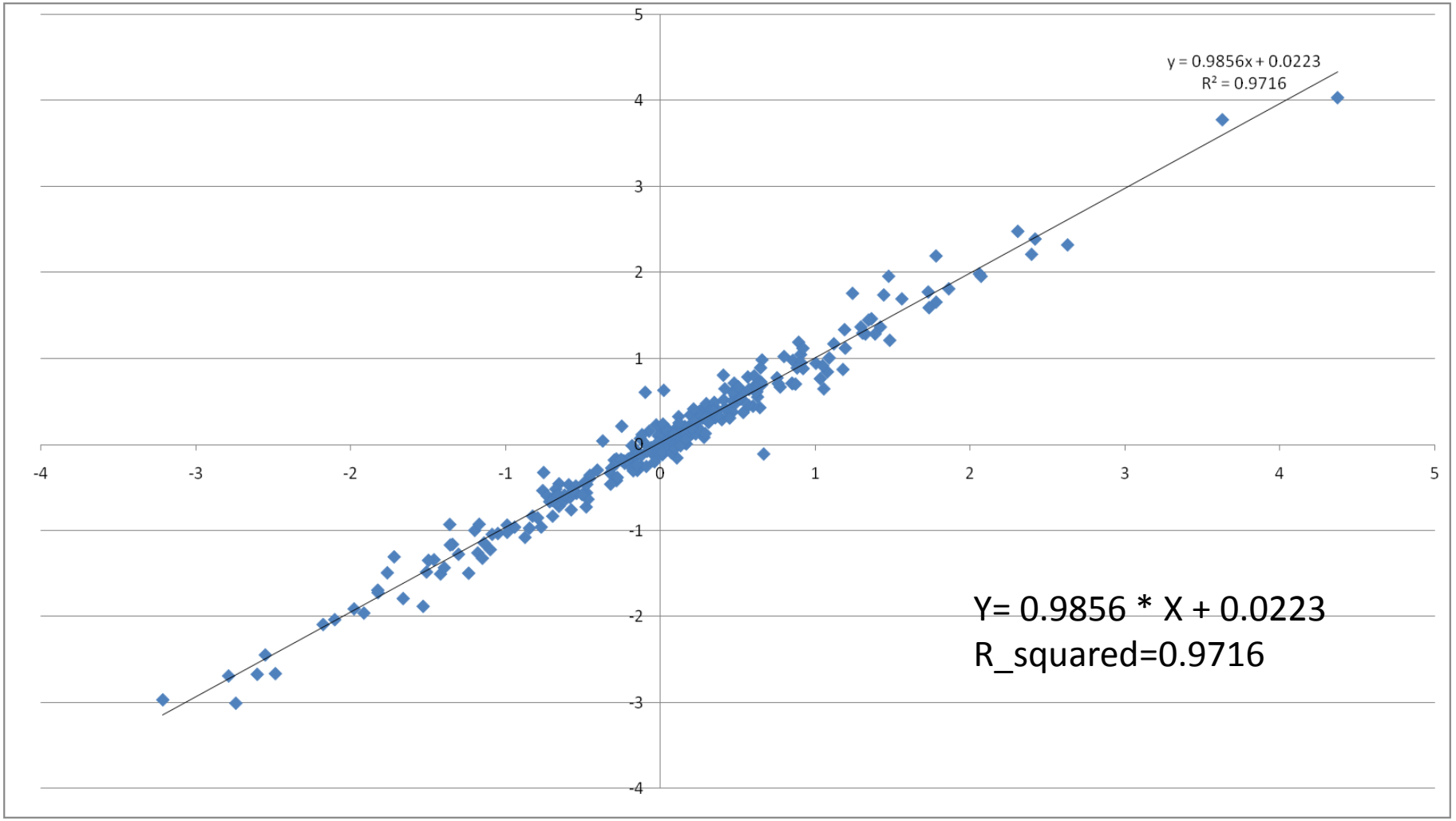
$$Q_i^{(j)} = \frac{v_i^{(j)}}{\sigma_i}$$

Portfolio weight of j-th eigenportfolio

$$F_j = \sum_{i=1}^{N} Q_i^{(j)} R_i = \sum_{i=1}^{N} \left(\frac{v_i^{(j)}}{\sigma_i} \right) R_i$$

J-th factor is the return of the j-th eigenportfolio

First eigenportfolio returns compared with S&P 500 returns (1/5/2009 to 1/29/2010)



How many eigenportfolios are significant?

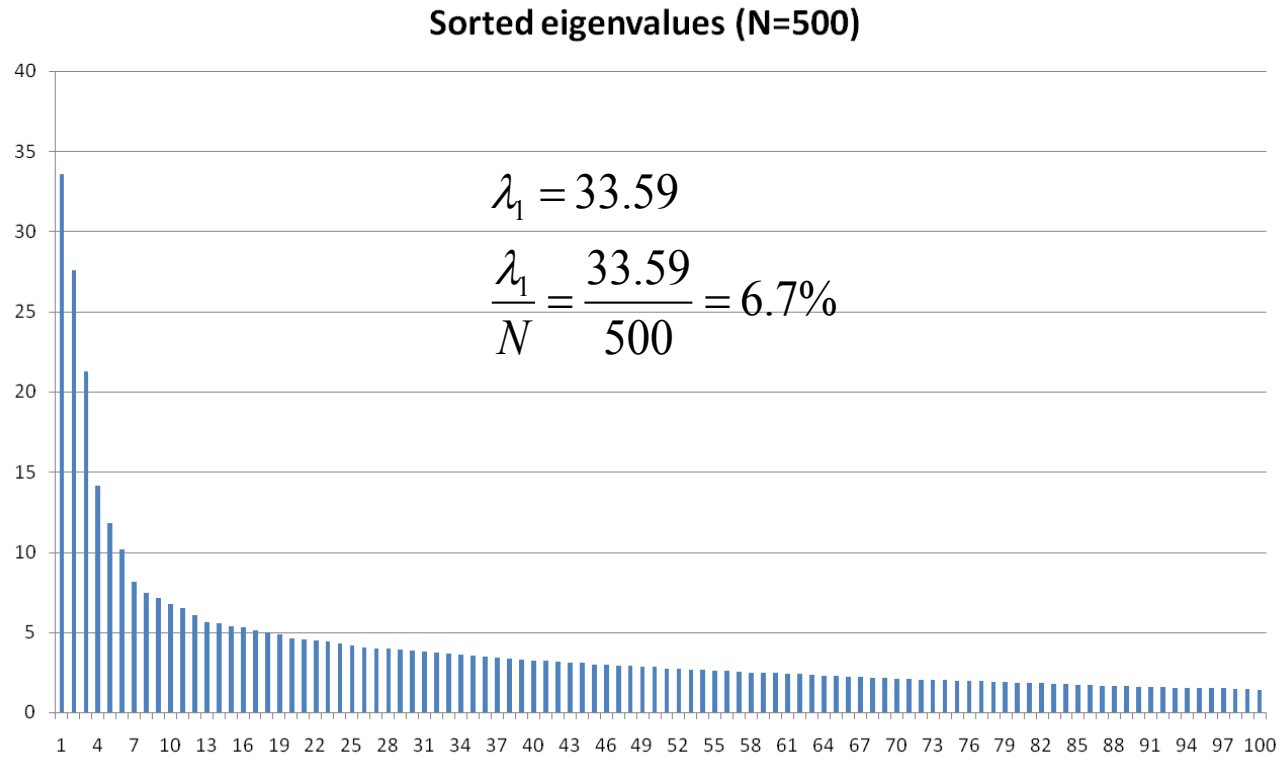
- Perform PCA on the empirical correlation matrix with 1 year moving window

- Consider the correlation matrix of the residuals after removing 1, 2 ,3… eigenportfolios

- Compare the DOS of the correlation of the residuals with the spectrum of the correlation matrix of pure noise (Marcenko-Pastur)

-The number of significant factors corresponds to the **first m for which the matrix of residuals is close to MP** (e.g. in the sense of hypothesis testing)

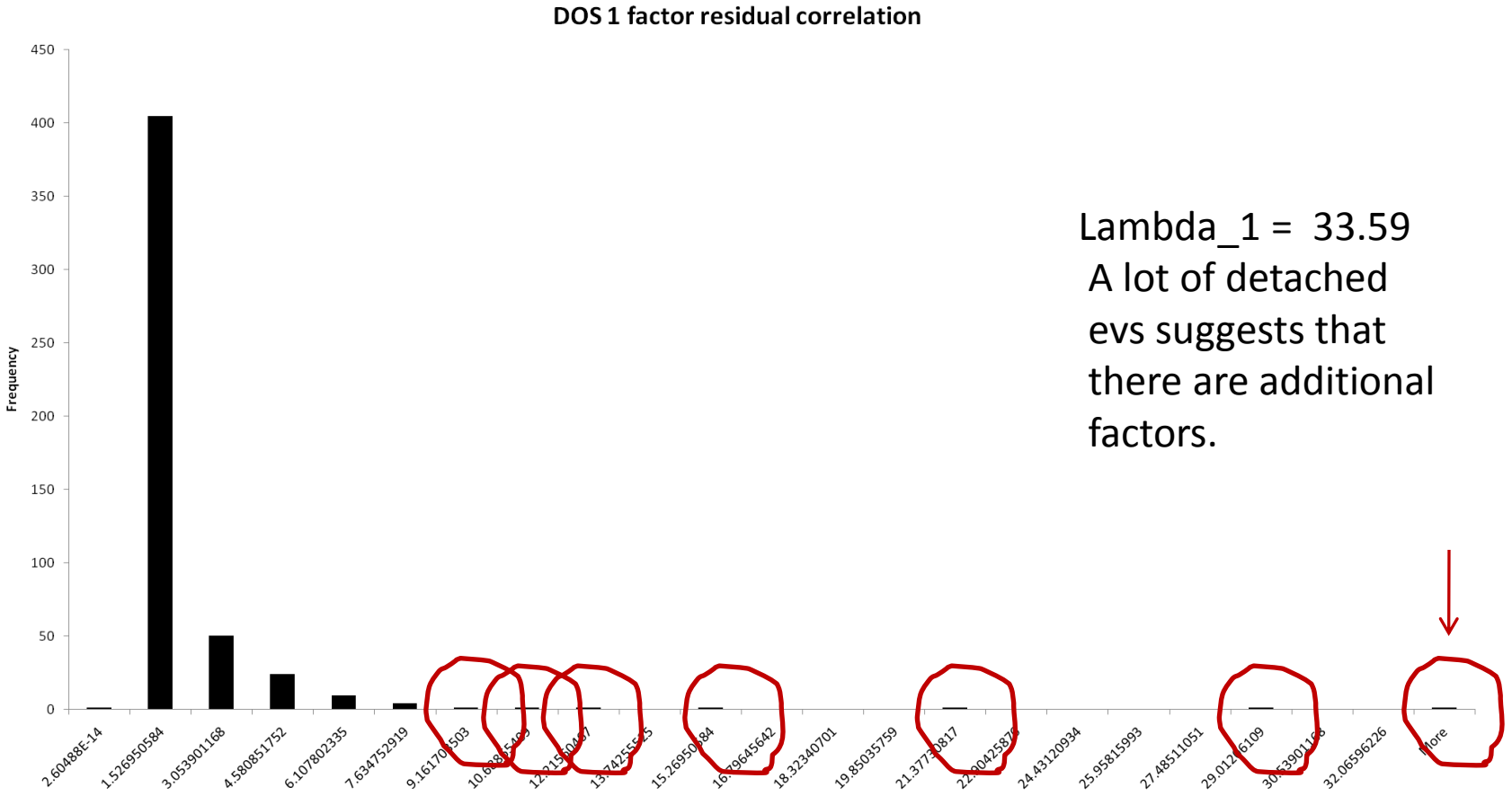
Eigenvalues of the correlation matrix of residuals (m=1)



Recall that lambda_1 for the original correlation matrix was ~ 220, so the residuals matrix has ``smaller'' correlations.

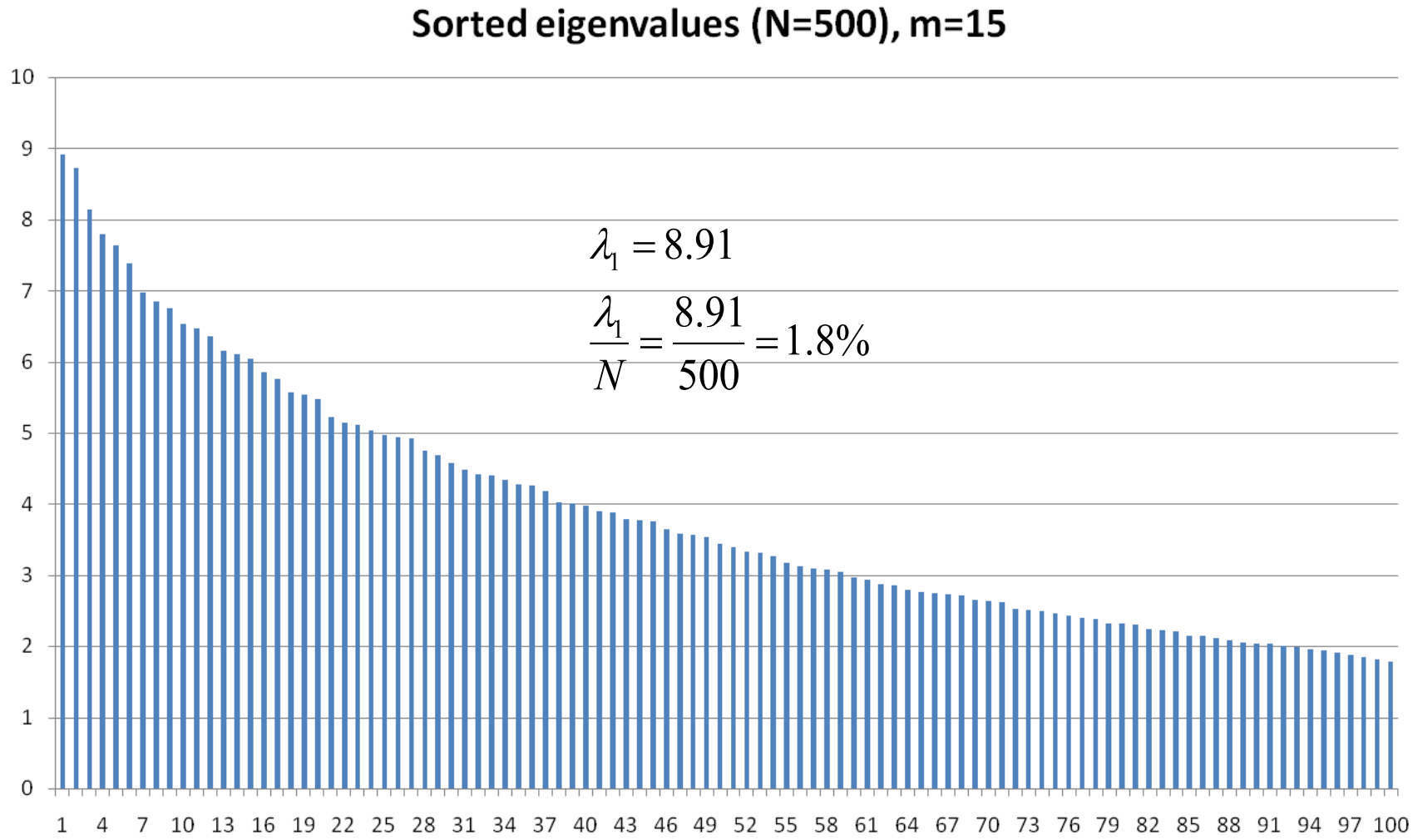
Ratio lambda/N is a proxy for the average correlation.

Density of States, or Histogram, of Eigenvalues for m=1 (correlation of returns with first factor removed)

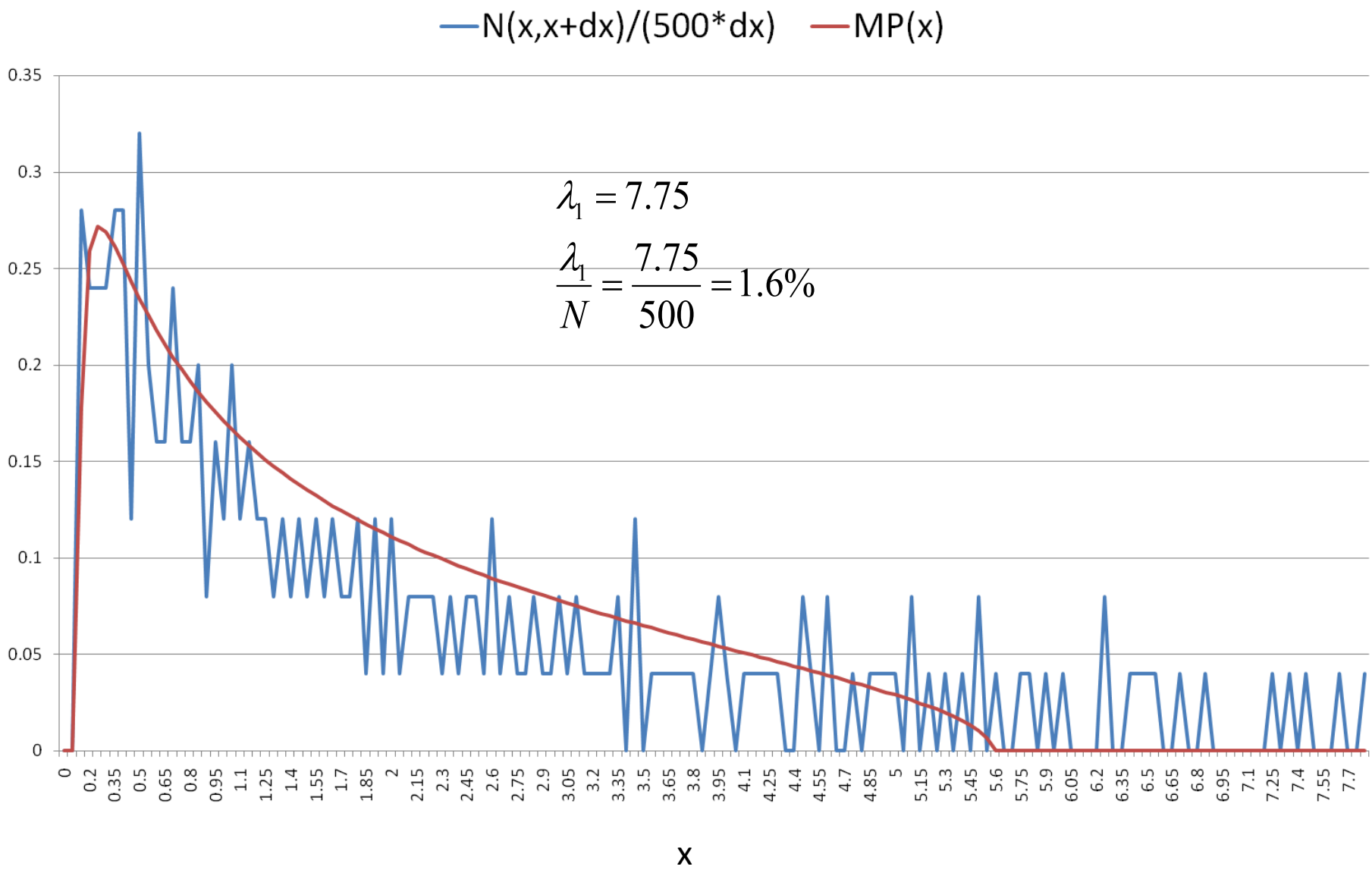


Lambda_1 = 33.59
A lot of detached evs suggests that there are additional factors.

Top 100 eigenvalues of the correlation matrix of residuals (m=15)



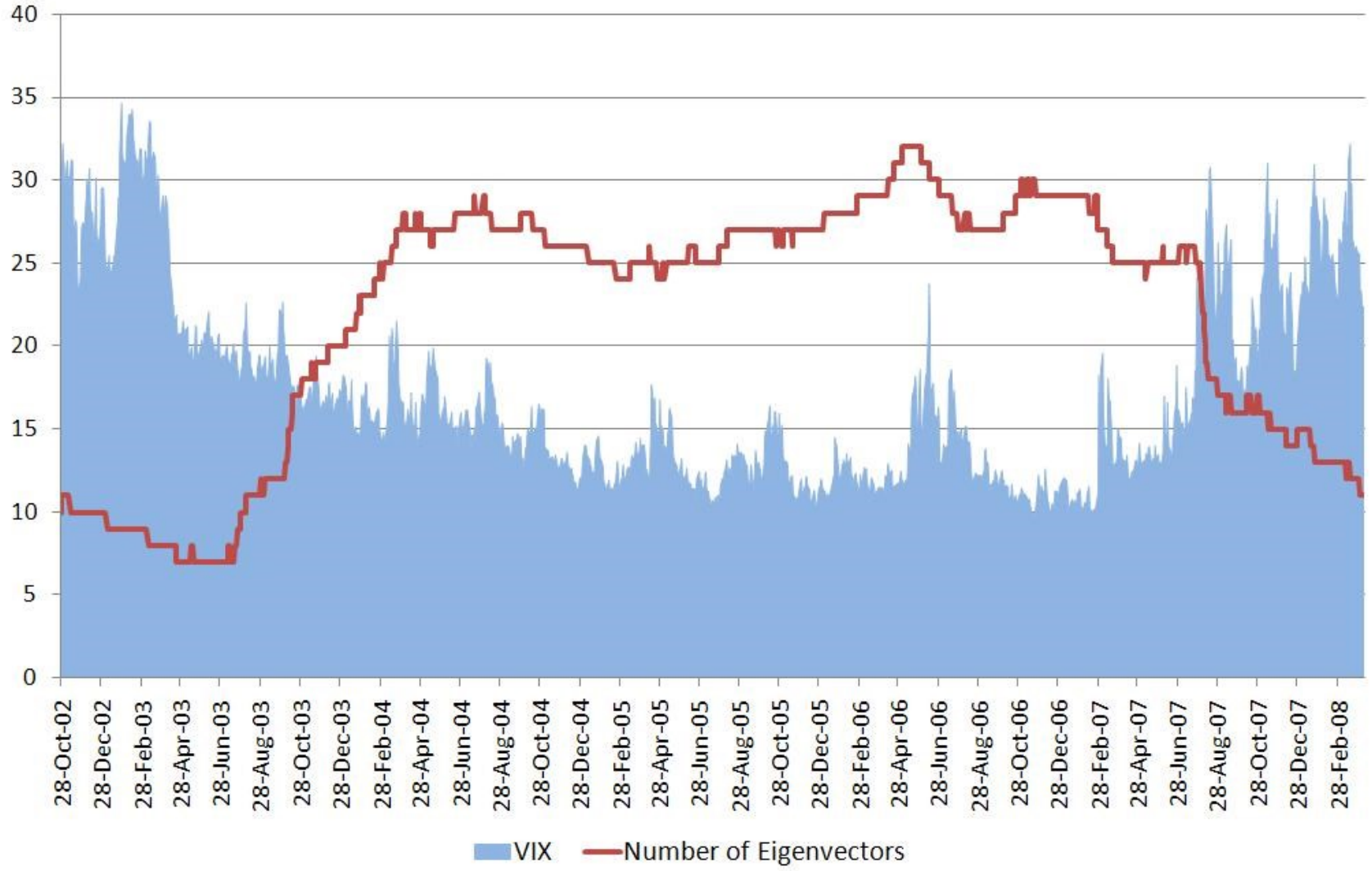
Marcenko Pastur compared to data with m=30



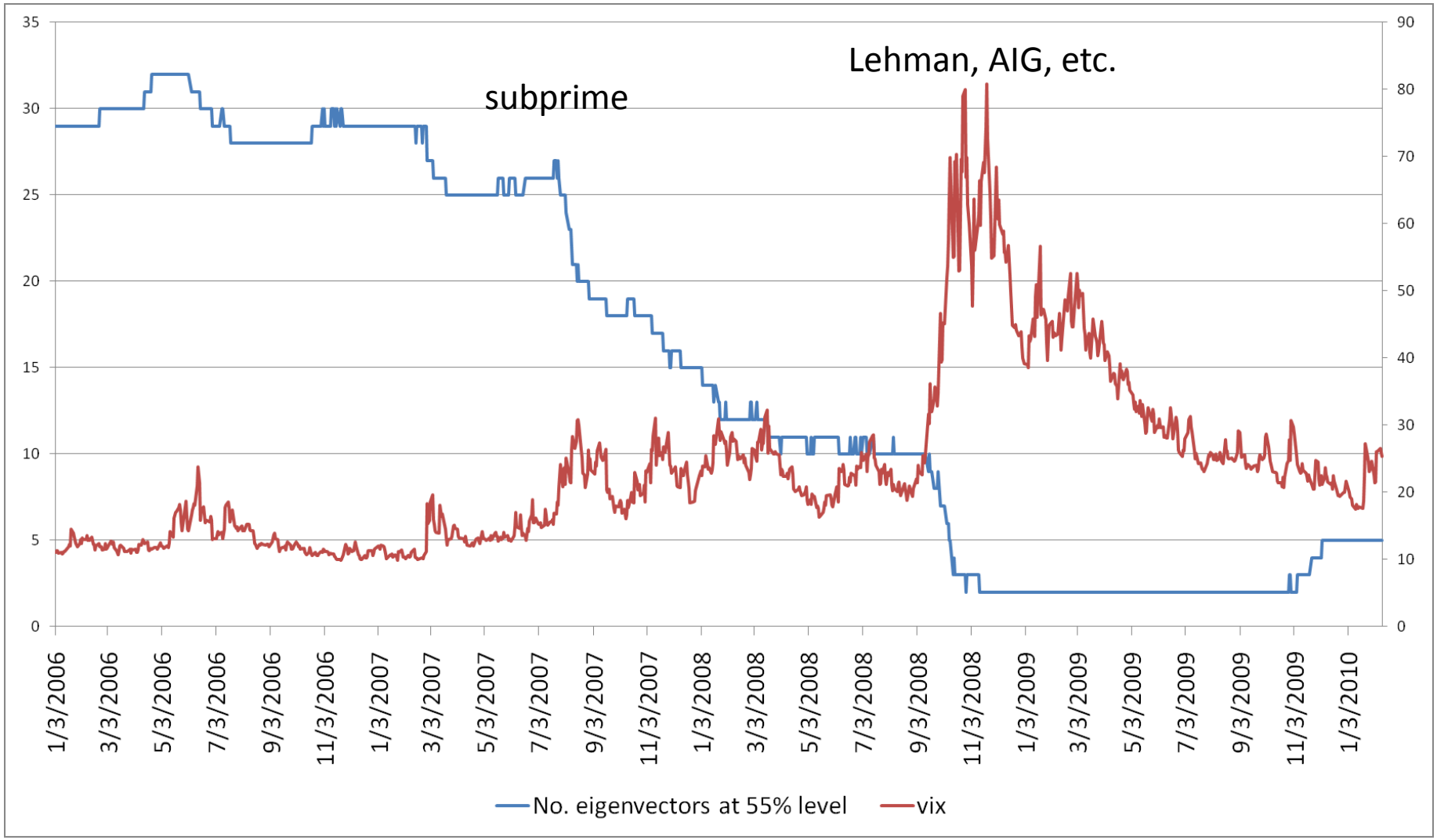
$$\lambda_1 = 7.75$$

$$\frac{\lambda_1}{N} = \frac{7.75}{500} = 1.6\%$$

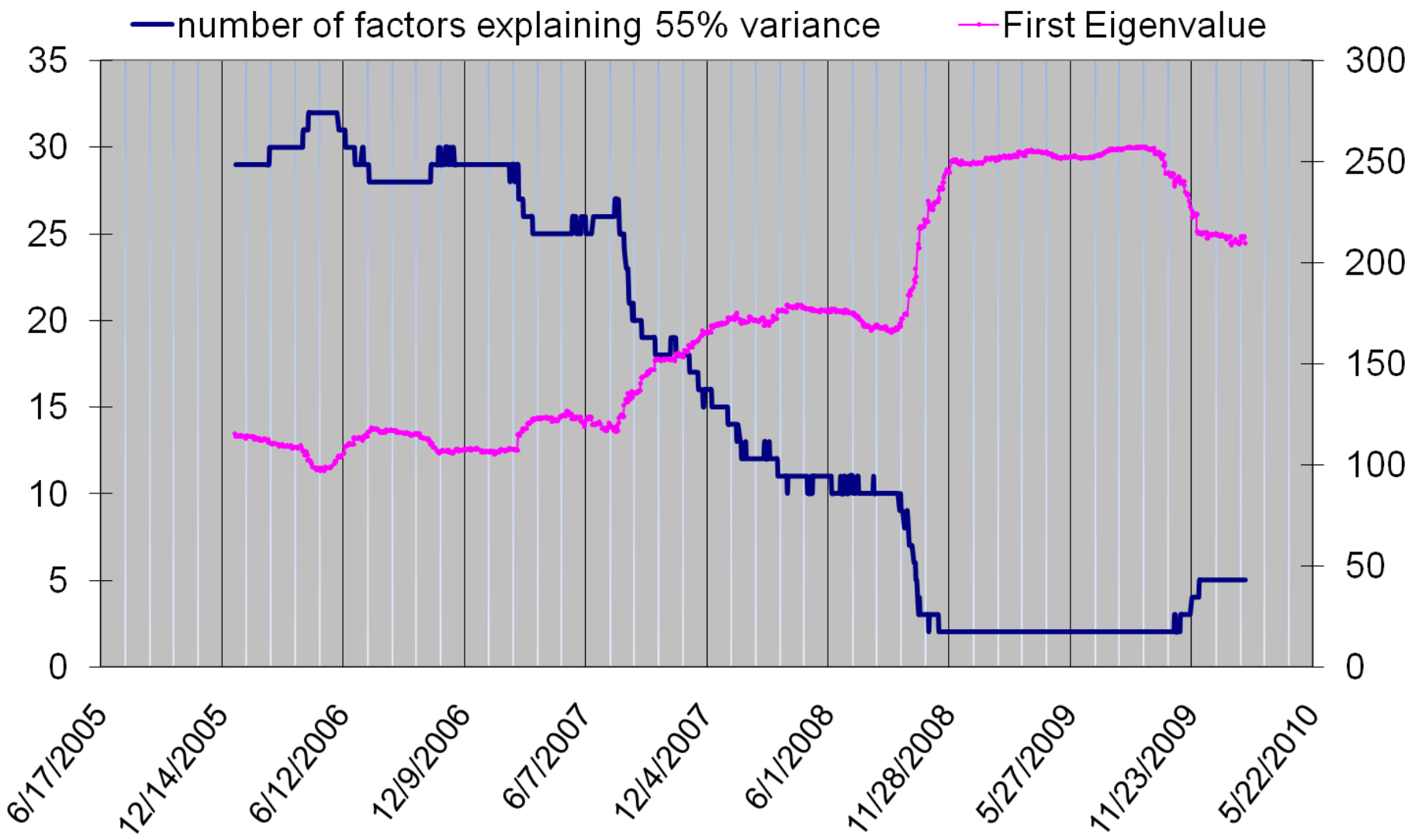
Number of factors explaining 55% variance vs. VIX (2002-2008)



Number of significant EVs versus VIX (1/2006-2/2010)



Number of significant factors vs. first eigenvalue of correlation matrix



Using ETFs as factors and relative value indicators (e.g. trade EBAY versus QQQQ)

Idea: rather than decomposing risk into abstract factors, consider a stock and the sector ETF corresponding to its industry

Pro: the relative analysis of a stock compared to its peers is done comparing with a tradable index. We deal with one stock-specific risk at a time, not 2 or more.

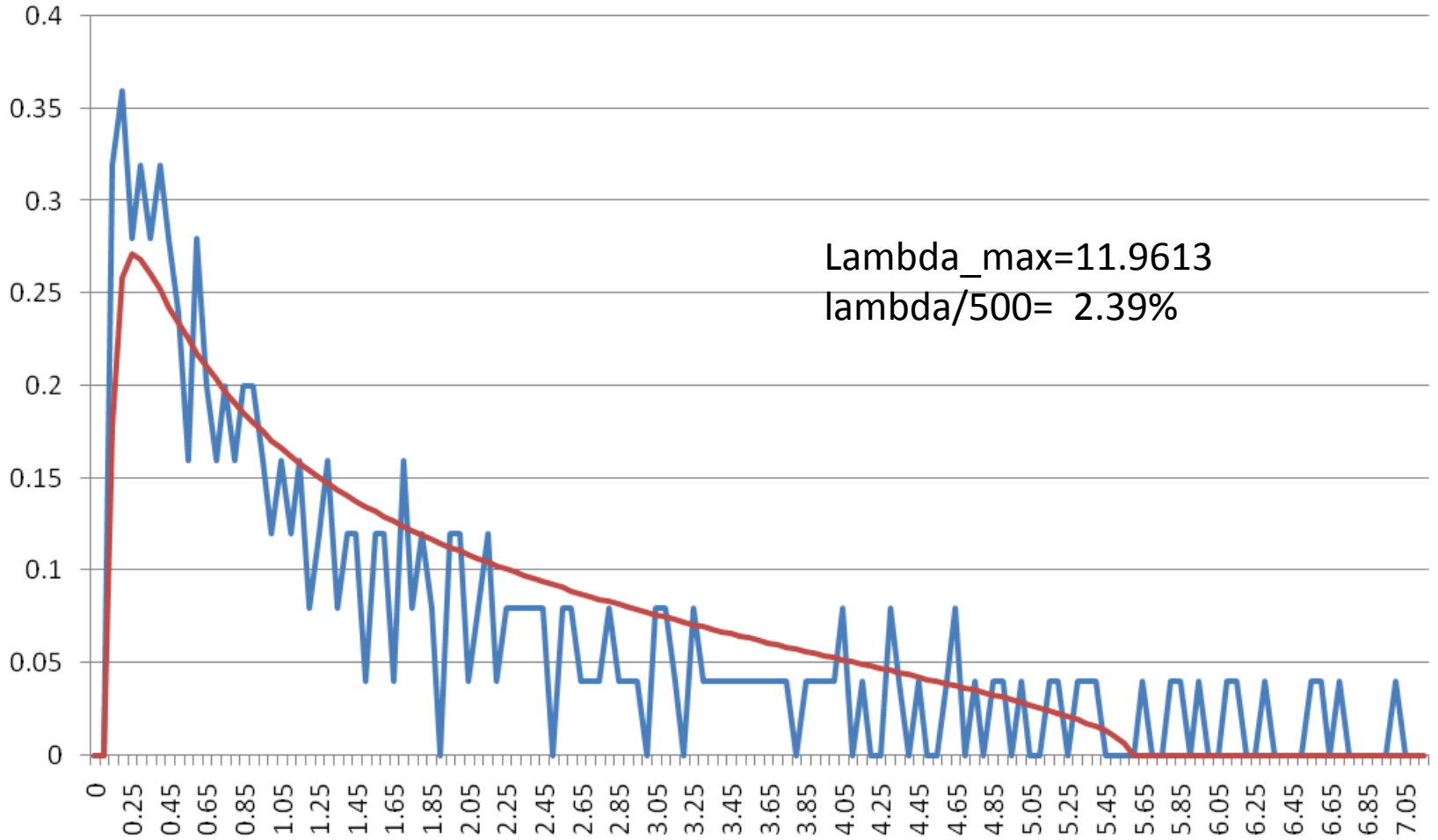
Pro: this is better than using an abstract factor from PCA because the latter are more likely to be unstable

Pro: the complexity of the signal generation is significantly reduced and the origin of excess returns is simple to explain

Con: some large cap stocks track too closely the industry, so no signals are available. Equivalently, the strategy can be viewed as somewhat biased to small caps

Con: Some stocks do not fit well the ETF identikit. We leave those to fundamental analysts.

Defactoring with ETFs as factors (19 ETFs) (Red line=Marcenko-Pastur, universe =S&P 500)



Modeling the Evolution of Stock Residuals

$$\frac{dS_i(t)}{S_i(t)} = \beta_i \frac{dI(t)}{I(t)} + \varepsilon_i(t)$$

Stock returns a sum of a multiple of an ETF return and a residual process

$$\varepsilon_i(t) = \alpha_i dt + dX_i(t)$$

Residual= drift component (expected excess return above mkt.) + increment of a stationary process

$$dX_i(t) = \kappa_i(m_i - X_i(t))dt + \sigma_i dW_i(t)$$

Ornstein-Ulembeck AR-1 process

Statistical Estimation Window=3 months (~ 60 business days) to include at least one earnings announcement

Statistics on the Estimated OU Parameters

ETF	Abs(Alpha)	Beta	Kappa	Reversion days	EquiVol	Abs(m)
HHH	0.20%	0.69	38	7	4%	3.3%
IYR	0.11%	0.90	39	6	2%	1.8%
IYT	0.18%	0.97	41	6	4%	3.0%
RKH	0.10%	0.98	39	6	2%	1.7%
RTH	0.17%	1.02	39	6	3%	2.7%
SMH	0.19%	1.01	40	6	4%	3.2%
UTH	0.09%	0.81	42	6	2%	1.4%
XLF	0.11%	0.83	42	6	2%	1.8%
XLI	0.15%	1.15	42	6	3%	2.4%
XLK	0.17%	1.03	42	6	3%	2.7%
XLP	0.12%	1.01	42	6	2%	2.0%
XLV	0.14%	1.05	38	7	3%	2.5%
XLY	0.16%	1.03	39	6	3%	2.5%
Total	0.15%	0.96	40	6	3%	2.4%

Average over 2006-2007

Trading Signals

We introduce an **s-score** for each stock:

$$s_i(t) = \frac{X_i(t) - m_i}{\sigma_{eq,i}}$$

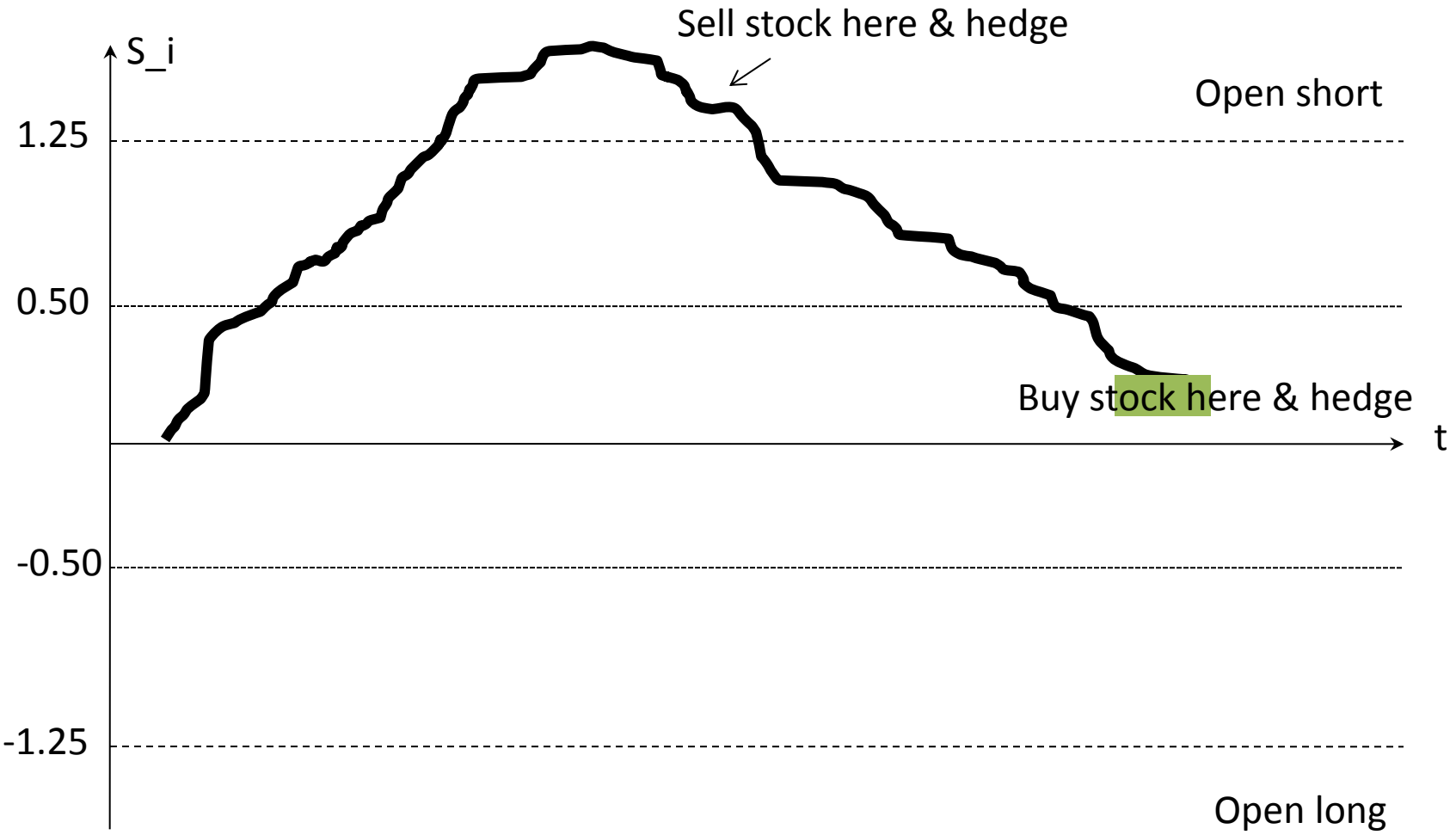
Open long position if $s_i < -1.25$

Open short position if $s_i > +1.25$

Close long position if $s_i > -0.50$

Close short position if $s_i < +0.50$

Schematic view of mean-reversion trading



Stock-ETF trading example : ACGL/XLF trades in 2009
Arch Capital Group Ltd. Market cap: 4.3 BB

ticker	trade_date	close_date	days	stock_PNL	etf_PNL	Total_PNL	etf_ticker	size
ACGL	20090206	20090212	4	3,598.79	2,038.35	5,637.14	XLF	75,579.64
ACGL	20090226	20090302	2	(1,416.04)	4,036.11	2,620.08	XLF	78,906.91
ACGL	20090309	20090319	6	15,016.04	(11,763.40)	3,252.64	XLF	78,469.98
ACGL	20090420	20090428	6	4,643.71	(1,046.79)	3,596.92	XLF	79,350.04
ACGL	20090505	20090512	3	3,989.70	(1,289.76)	2,699.94	XLF	79,815.06
ACGL	20090519	20090602	9	2,257.45	24.34	2,281.79	XLF	79,201.01
ACGL	20090608	20090618	6	(1,784.06)	1,563.52	(220.54)	XLF	79,210.95
ACGL	20090806	20090812	2	955.02	0.00	955.02	XLF	81,552.52

stock_cost	stock_shares	stock_exe_price	etf_cost	etf_shares	etf_exe_price	status	open_s_score	close_s_score
60.13	1,257.00	62.99	9.83	(2,811.52)	9.10	1.00	(1.83)	(0.08)
53.94	1,463.00	52.97	8.18	(3,603.67)	7.06	1.00	(1.30)	(0.49)
45.10	1,740.00	53.73	6.28	(4,801.39)	8.73	1.00	(1.77)	(0.33)
54.02	1,469.00	57.18	10.09	(2,754.71)	10.47	1.00	(1.29)	0.94
56.85	1,404.00	59.69	11.66	(2,528.93)	12.17	1.00	(1.96)	(0.37)
58.28	1,359.00	59.94	12.23	(2,433.83)	12.22	1.00	(1.68)	(0.12)
58.03	1,365.00	56.72	12.44	(2,605.86)	11.84	1.00	(1.69)	(0.87)
61.97	1,316.00	62.70	14.01	(2,293.69)	14.01	1.00	(1.25)	(0.01)

Stock-ETF trading example : EBAY/QQQQ trades in 2009
eBay Inc. Market cap= USD 38 BB

ticker	trade_date	close_date	days	stock_PNL	etf_PNL	Total_PNL	etf_ticker	size
EBAY	10/9/2009	11/9/2009	16	(3,884.70)	(2,447.11)	(6,331.81)	QQQQ	82,152.96
EBAY	5/26/2009	6/8/2009	9	497.31	(5,278.60)	(4,781.29)	QQQQ	79,388.76
EBAY	5/13/2009	5/14/2009	0	2,973.75	(1,391.58)	1,582.17	QQQQ	79,023.75
EBAY	4/16/2009	4/20/2009	1	(1,981.80)	3,673.72	1,691.92	QQQQ	79,547.25
EBAY	9/23/2009	10/7/2009	9	1,304.16	1,409.00	2,713.16	QQQQ	82,127.76
EBAY	9/8/2009	9/10/2009	1	6,439.61	(2,043.87)	4,395.73	QQQQ	81,613.02

stock_cost	stock_shares	stock_exe_price	etf_cost	etf_shares	etf_exe_price	open_s_score	close_s_score	beta
24.32	3378	23.17	42.43	(2,562.42)	43.39	(2.24)	(0.89)	0.756
17.56	4521	17.67	34.69	(2,559.32)	36.75	(1.84)	(1.00)	0.894
16.21	4875	16.82	33.00	(2,676.12)	33.52	(1.53)	(0.41)	0.895
14.45	5505	14.09	33.35	(3,251.08)	32.22	(1.27)	(0.43)	0.734
23.93	3432	24.31	42.58	(2,471.93)	42.01	(2.35)	0.00	0.780
21.81	3742	23.53	40.62	(2,579.02)	41.41	(2.26)	0.13	0.779

Trading Time vs. Actual Time

Statistics on equity returns (residuals) can be done

-- in **actual time** (% change/day)

-- in **trading time** (% change per share/day)

Trading time incorporates **volume information**.

In trading-time framework, mean-reverting signals (S-Scores) are

-- **weaker** when volume is heavy

-- **stronger** when volume is light

Trading Time vs. Actual Time, II

Using the daily trading volume, construct a residual process which measures the change in price **per share**

$$\varepsilon = \frac{\Delta S}{S} - \beta \frac{\Delta I}{I}$$ (usual residual)

$$\bar{\varepsilon} = \frac{< \Delta V >}{\Delta V} \varepsilon, \qquad \Delta V = \text{daily volume} \qquad < \Delta V > = \text{average } \Delta \text{V}$$

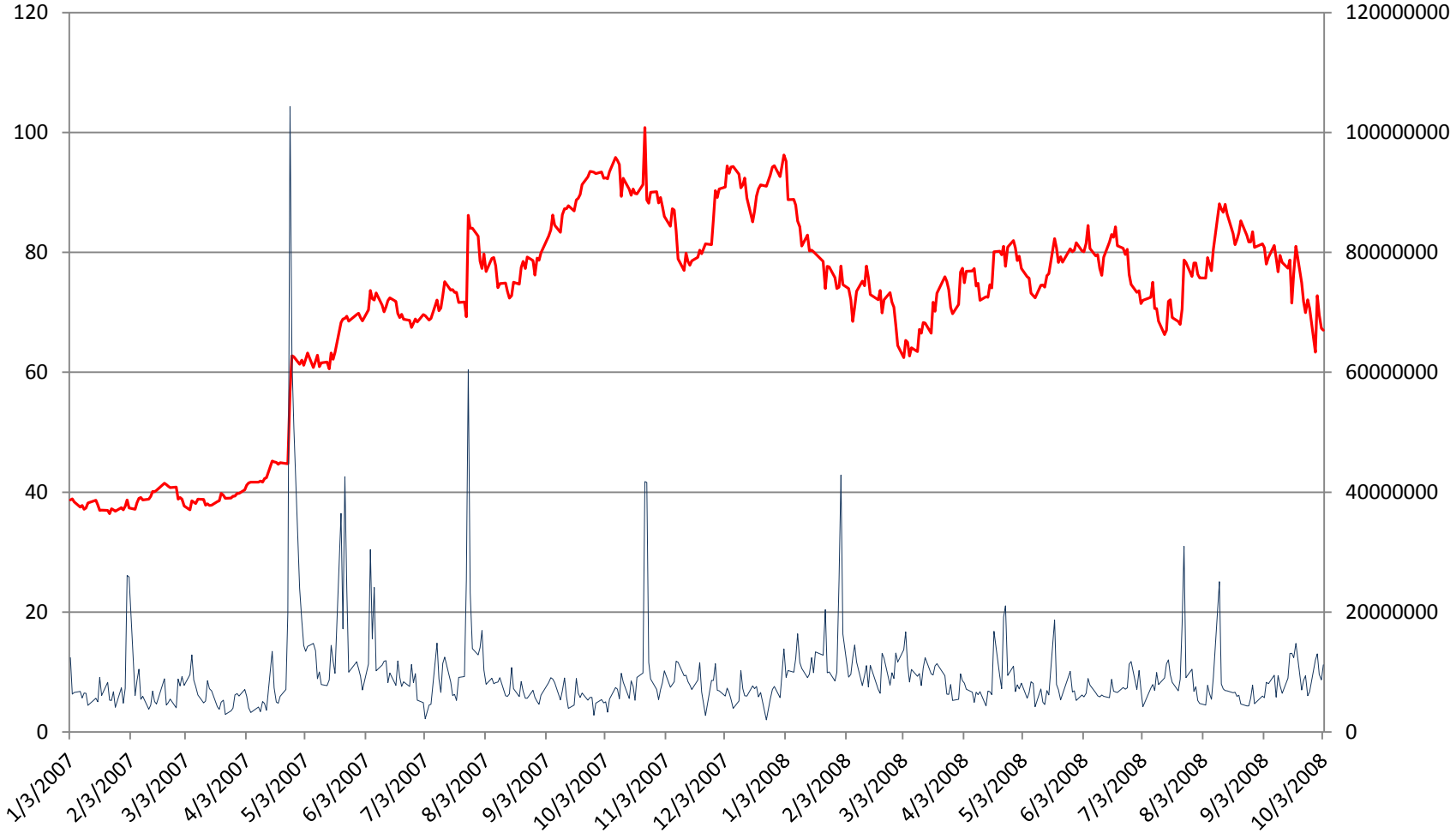
$$Y_t = \sum_{i=1}^{t} \bar{\varepsilon}_i$$

$$dY = \kappa(m - Y)dt + \sigma dW$$

Estimate AR-1 / OU process for the new process Y(t)

This makes deviations on unusually high-volume more likely, so the signal is weaker

Amazon.com Jan 2007-Oct 2008: Avoiding short-selling on large volume



Building a portfolio from ETF-based signals: the ``PLATA'' strategy

-- Large, diversified trading universe of equities (~ 500 names)

-- Select those stocks within the trading universe that have a trading signal (s-score) and open trades

-- All trades consist of stocks paired with ETFs

-- Monitor for closing trades through s-score

-- Monitor for degradation of statistical parameters, stop-losses, etc.

-- Investment per stock ~ 25 bps (~250K per 100MM notional capital)

-- Typical profile 30 to 50 % long / 30 to 50 % short, dollar-neutral.

-- Portfolio-level risk management used to ``vet'' trades.

Portfolio Risk-Management

$Q_i \quad i = 1,\ldots,N$ holdings in stock or ETF i.

$V(Q_1, Q_2, \ldots, Q_N) = \sum_{ij=1}^{N} C_{ij} Q_i Q_j$ daily portfolio variance

C: covariance matrix estimated with 3m window

$\mathbf{Q} = (Q_1, Q_2, \ldots, Q_N)$ position at date T

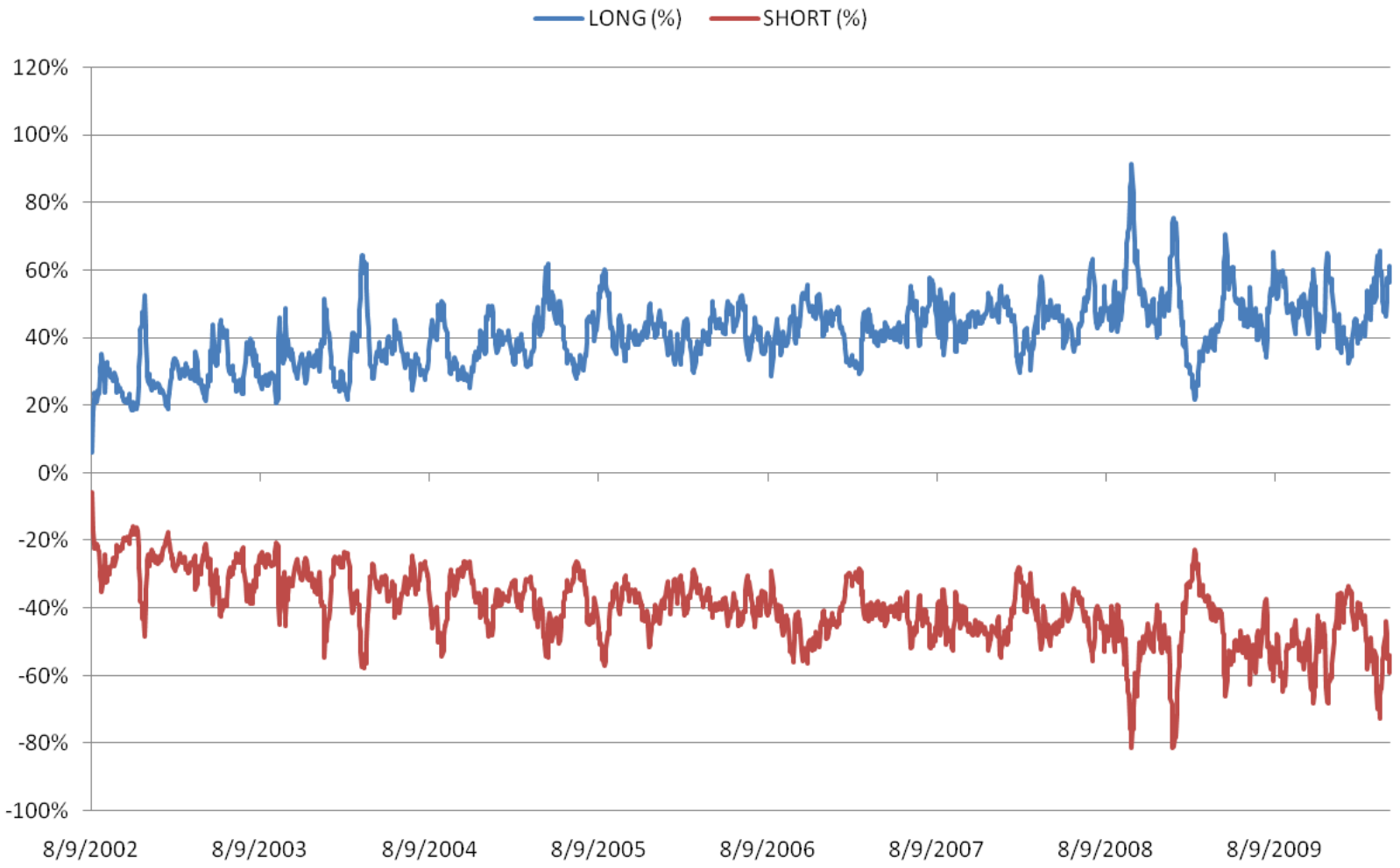
$\mathbf{Q}' = (Q_1', Q_2', \ldots, Q_N')$ target (desired) position date $T+1$

Risk - control algorithm : let ε denote a risk threshold (e.g. 25bps of daily stdev)

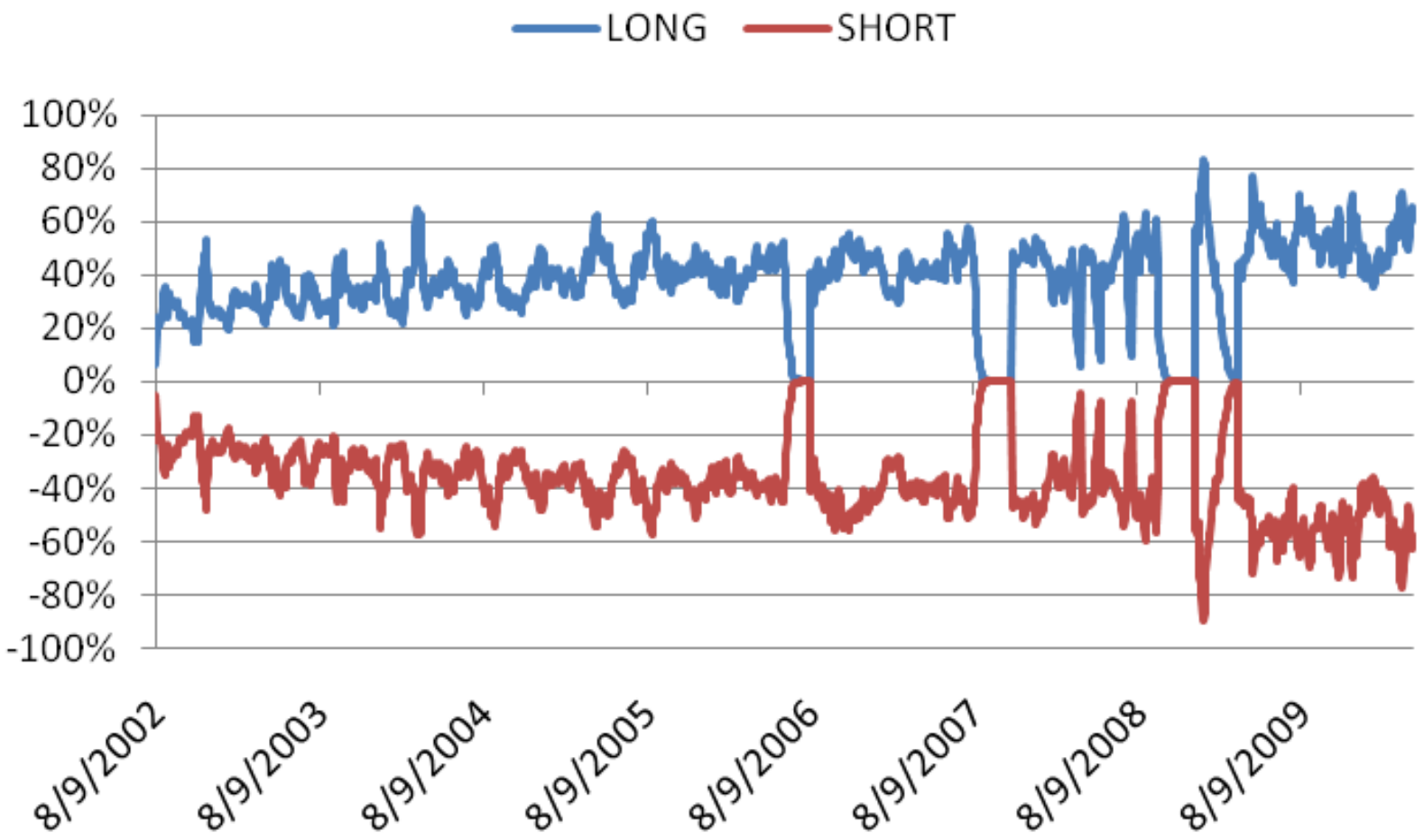
If $V(\mathbf{Q}') > \varepsilon$ then only execute `closing trades' $\mathbf{Q} \to \mathbf{Q}'$

If $V(\mathbf{Q}') \leq \varepsilon$ then execute all trades $\mathbf{Q} \to \mathbf{Q}'$

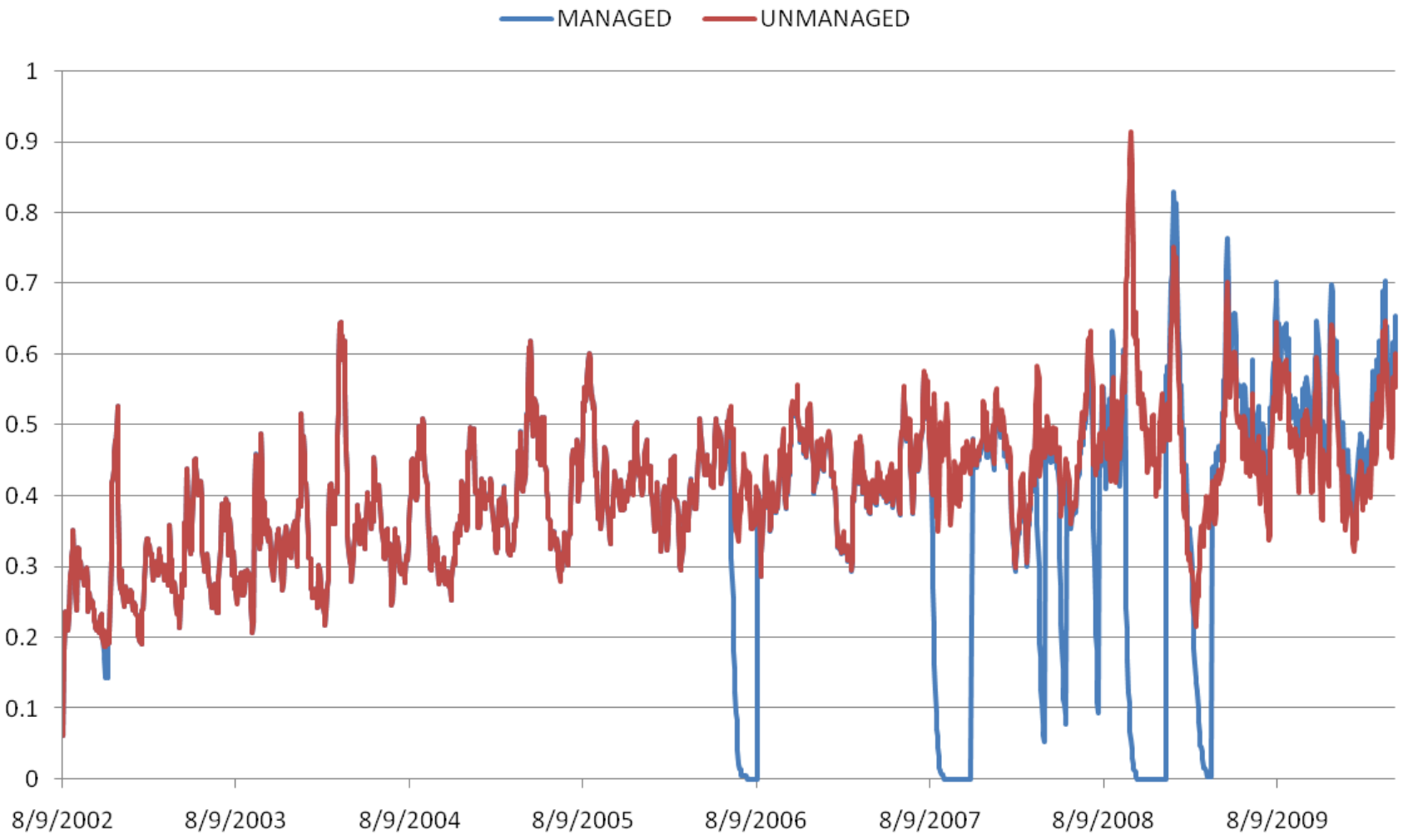
Long and Short positions for unmanaged portfolio (% of account equity)



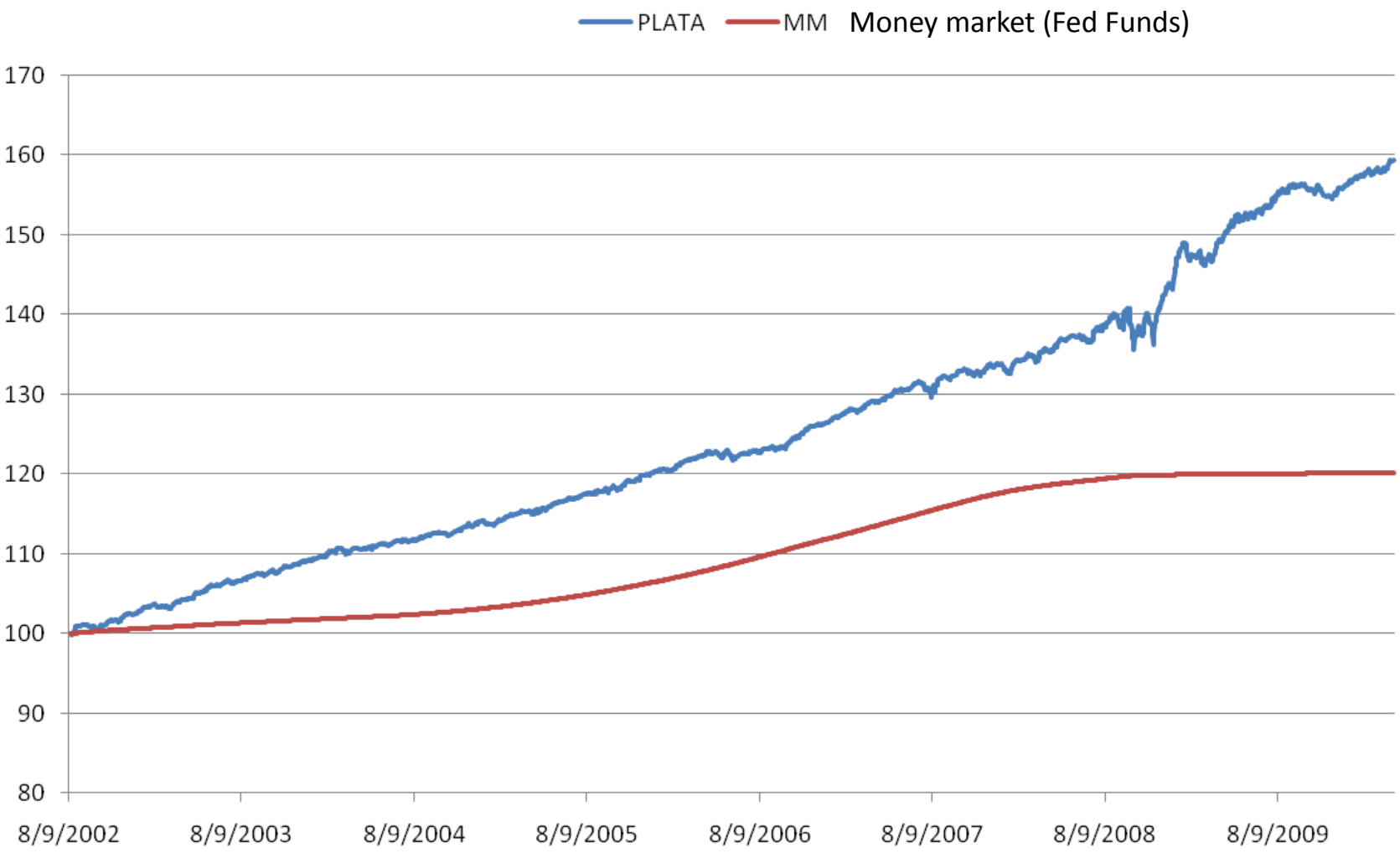
Long/short balances with portfolio risk-management



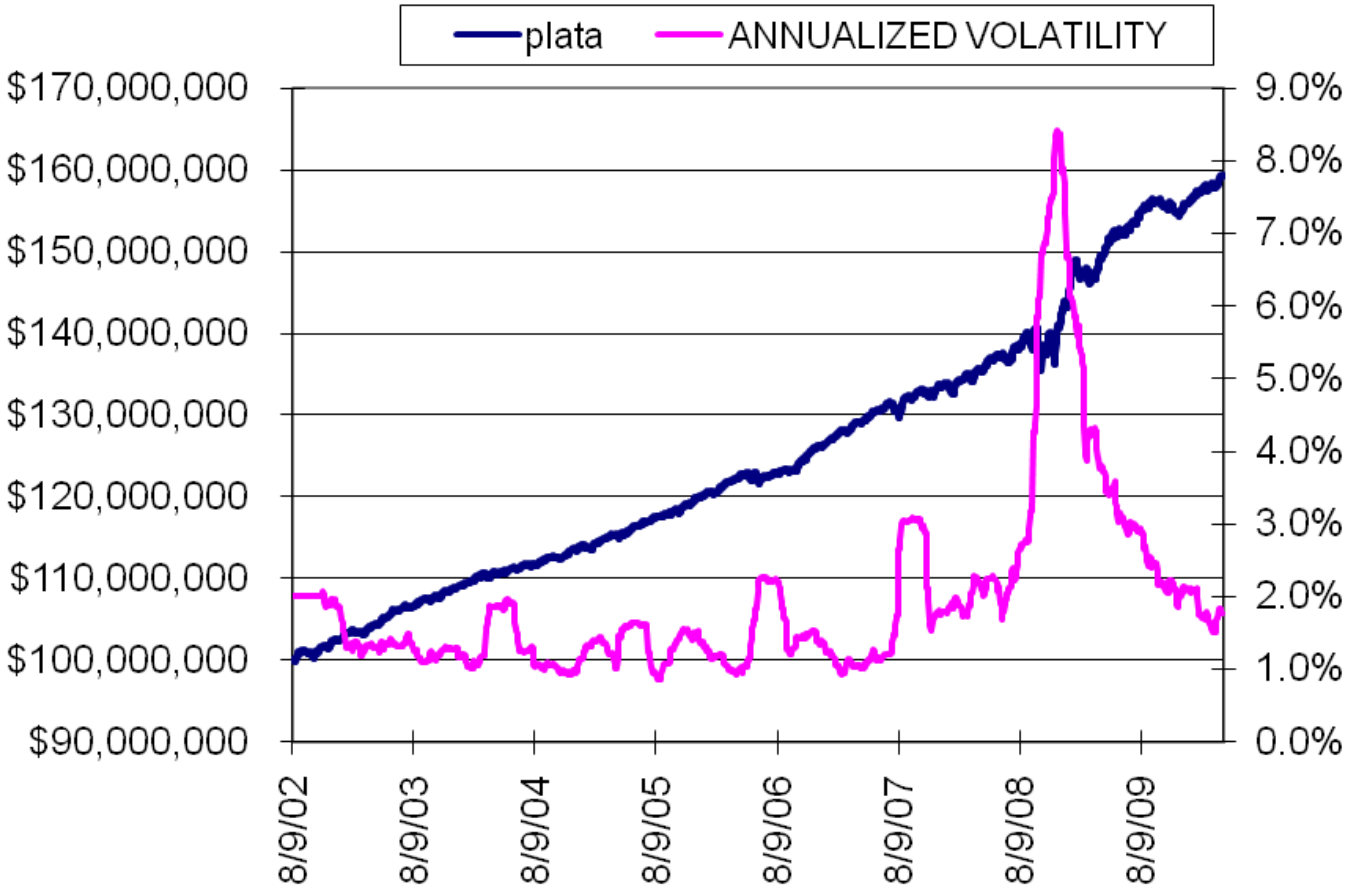
Comparison between Long balances: managed & unmanaged simulations



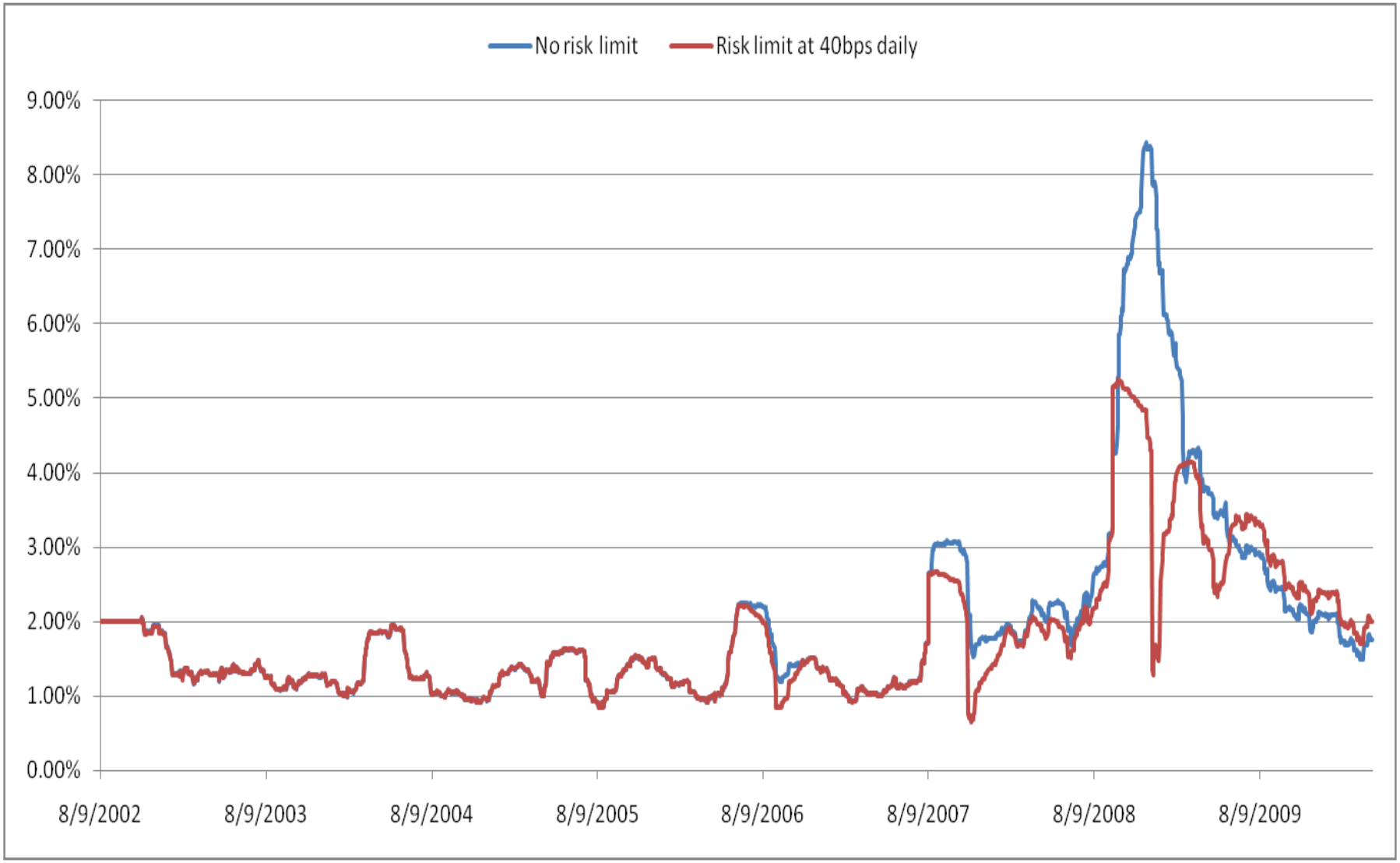
Basic PLATA : 0.25% per stock position
Leverage: 20/20 to 40/40, target daily vol=25 bps



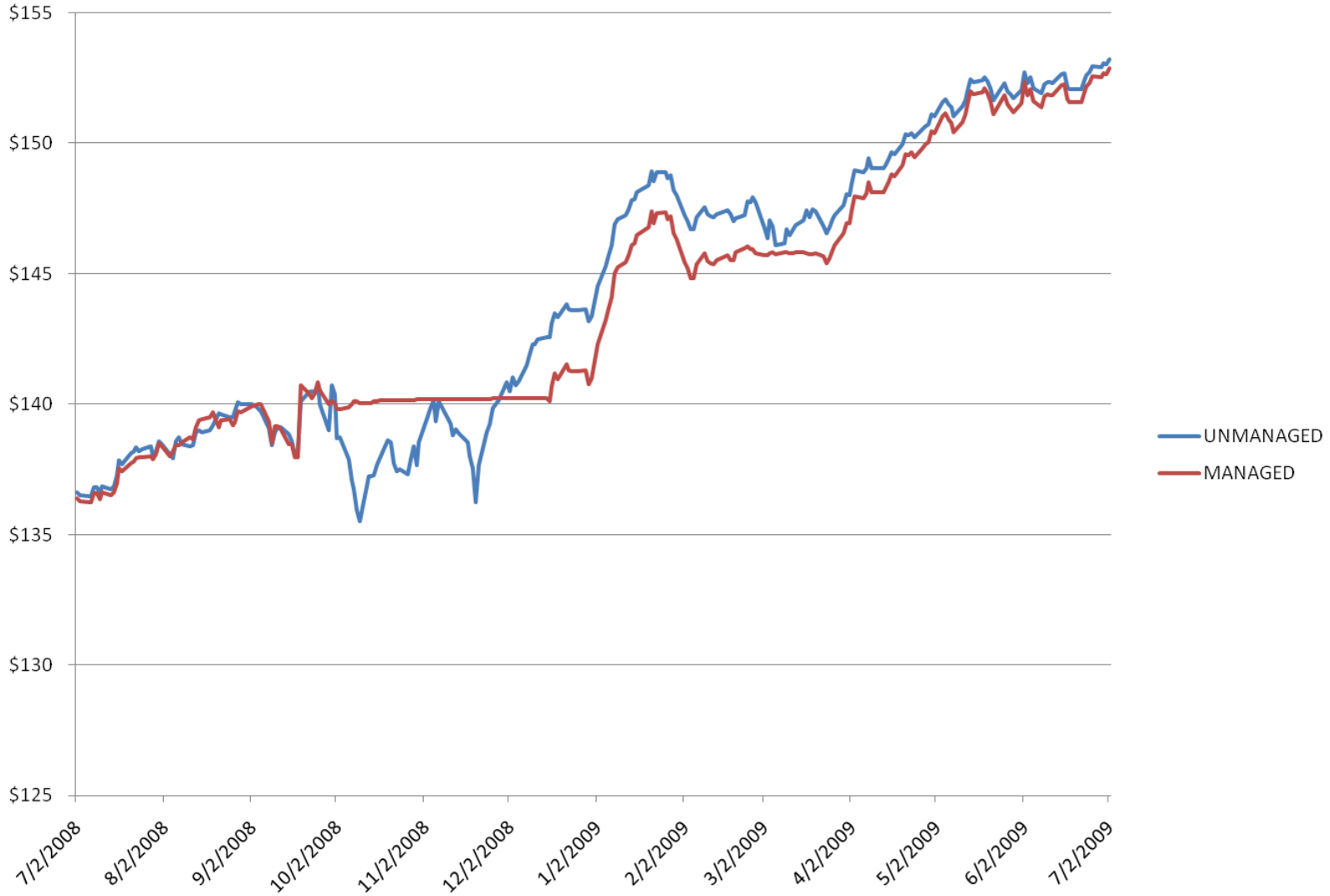
Trailing annualized volatility without portfolio risk management



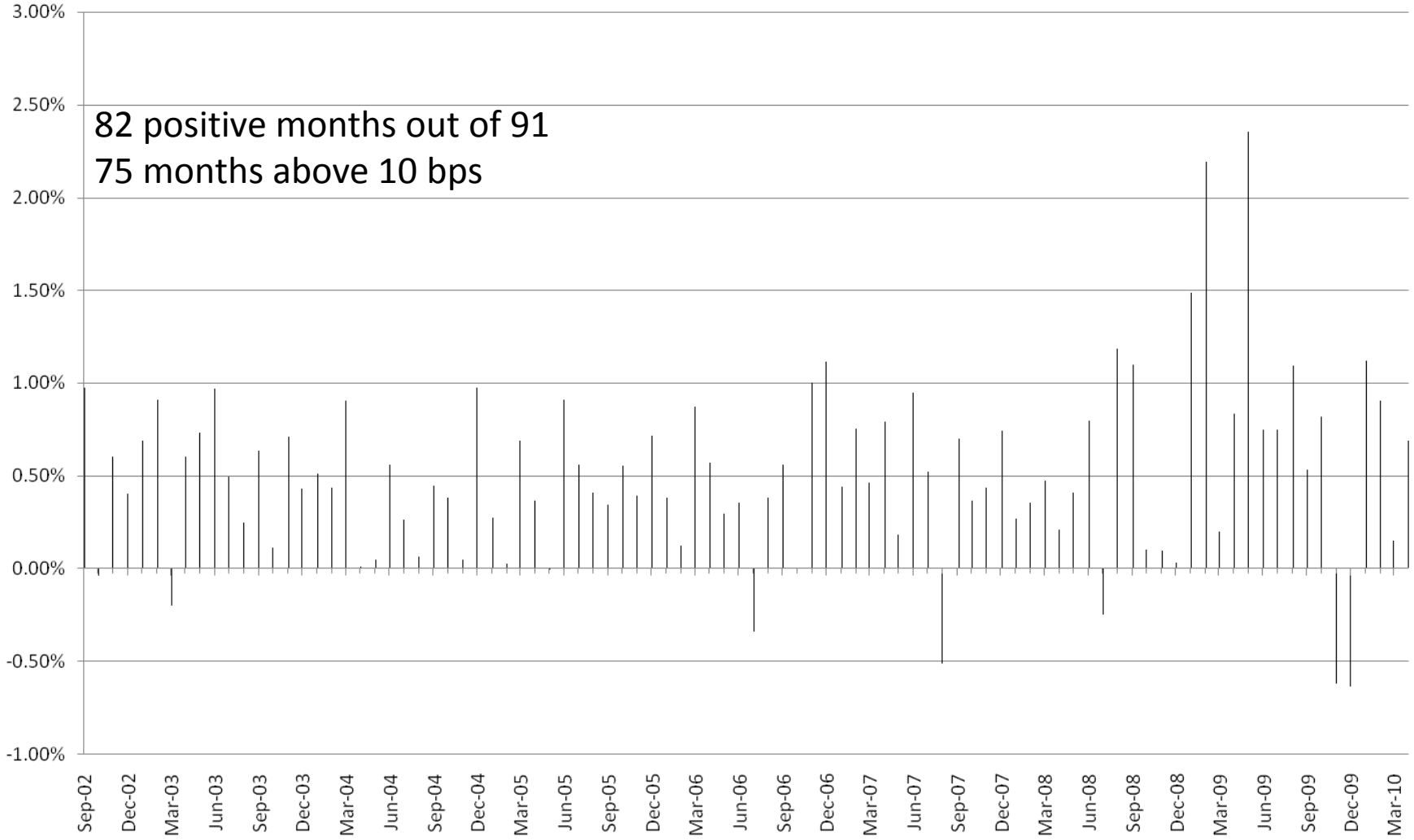
Volatility of PLATA with and without risk limit



Difference between managed risk and unmanaged risk in the Fall of 2008

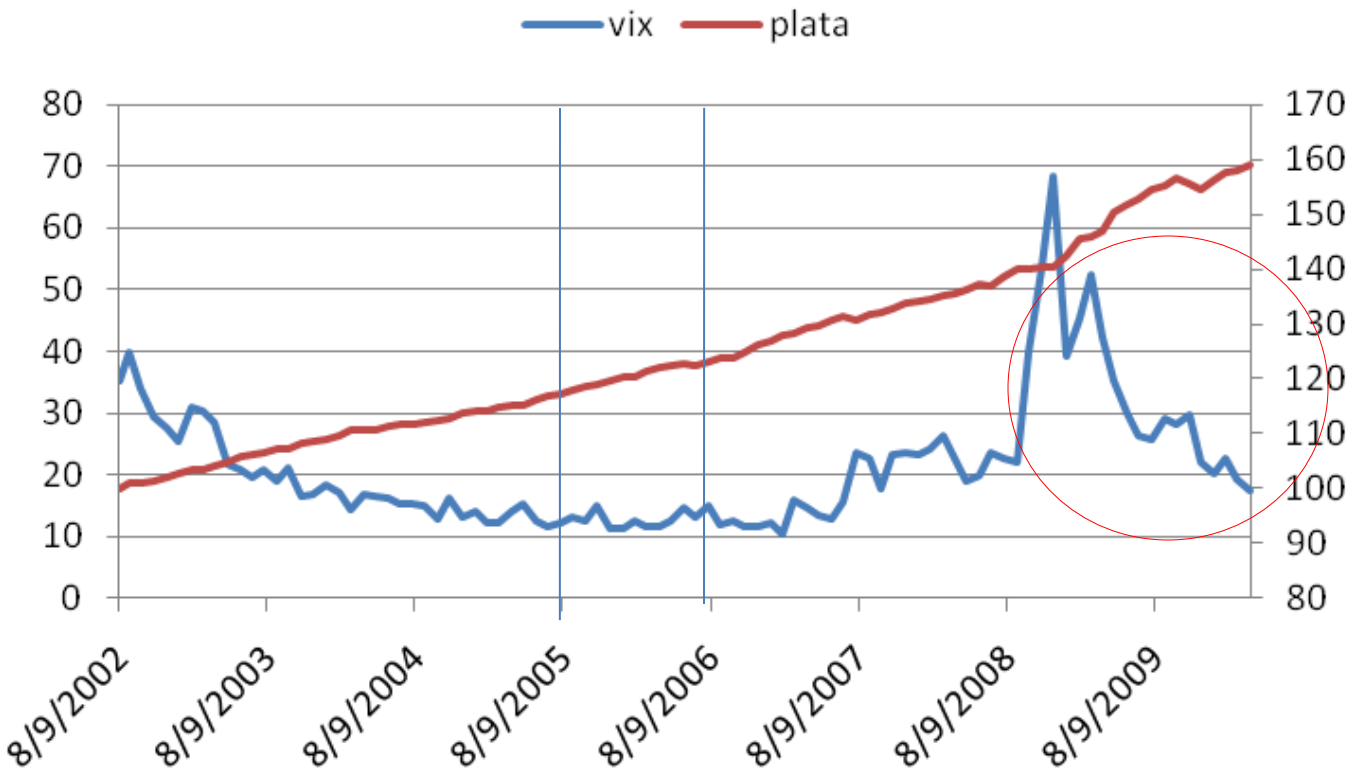


PLATA monthly performance since September 2002



PLATA Monthly Statistics	
Mean	0.50%
Standard Error	0.05%
Median	0.46%
Mode	NA
Standard Deviation	0.48%
Sample Variance	0.00%
Kurtosis	3.01
Skewness	0.75
Range	3%
Minimum	-1%
Maximum	2%
Sum	0.46
Count	91
Largest(5)	1.12%
Smallest(5)	-0.25%
Confidence Level(99.0%)	0.13%

Volatility and Stat Arb (Plata)



PLATA works better in the aftermath of volatility spikes and less well when volatility drops. It is therefore reasonable to blend it with an index strategy

Statistical Arbitrage and 130/30

Indexers: mutual fund managers and long-only managers

Objective: Track (or beat) returns of the overall market or sector

Underlying theory: CAPM, etc.

130/30 Managers: Long 130%, short 30% with periodic revisions of the portfolio

Essentially, a beta strategy with stock picking

Market-neutral managers: Seek returns that are uncorrelated with the market (alpha)

Long-Short Equity MN: Fundamental Stock Picking with shorting

Statistical Arbitrage: Quantitative long-short MN

SPY+PLATA: a synthetic 130/30 fund

Based on a notional amount of 100 MM:

-- go long 100 MM SPY and

-- enter into a PLATA strategy based on 100MM notional amount
(30 to 50 mm long/ 30 to 50 mm short)

(parameters for PLATA: big universe, 25bps per stock,
target daily stdev of portfolio=25bps)

Due to market-neutrality of PLATA, this portfolio looks essentially like a 130/30 to a 150/50 depending on the volatility in the market and the turnover.

-- Assume fee structure: ~ 1.20% per year (average for quant mutual funds)

Comparing SPY+PLATA with SPY

MainStay 130 30 Core C (MYCCX)

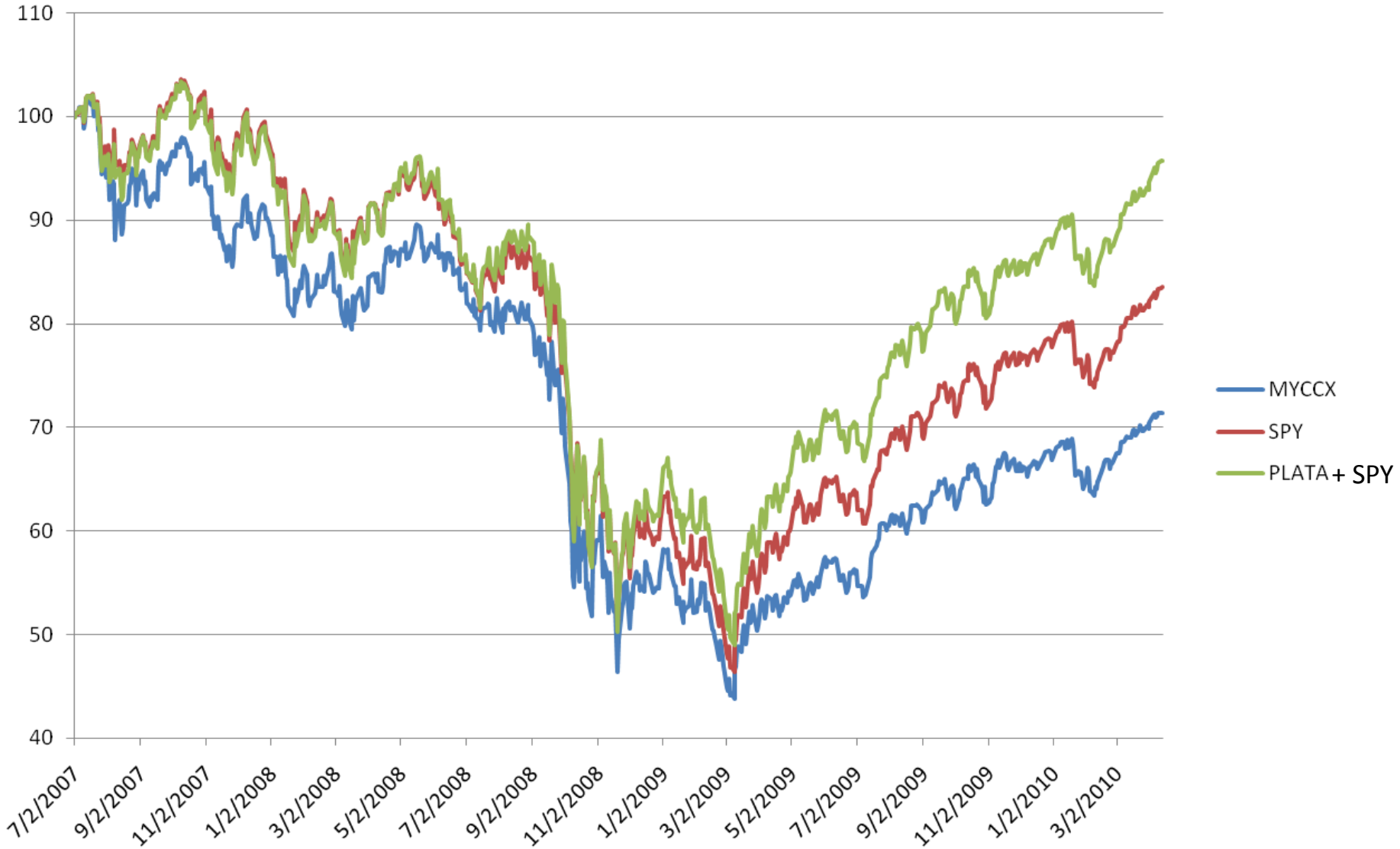
The investment seeks long-term growth of capital, with income as a secondary consideration. The fund primarily invests in common stocks of well-established U.S. companies, primarily those with large-capitalizations that are similar to companies in the Russell 1000 index. It generally holds long positions, either directly or through derivatives, equal to approximately 130%(within a range of 120% to 140%) of net assets, and short positions, either directly or through derivatives, equal to approximately 30% (within a range of 20% to 40%)of net assets.

Expense	MYCCX	Category Avg
Total Expense Ratio:	2.35%	1.12%
Max 12b1 Fee:	1.00%	N/A
Max Front End Sales Load:	N/A	5.28%
Max Deferred Sales Load:	1.00%	2.53%
3 Yr Expense Projection*:	1,027	596
5 Yr Expense Projection*:	1,741	894
10 Yr Expense Projection*:	3,631	1,787

AUM: 327 Million USD

Source: Yahoo!Finance

MainStay 130 30 Core C (MYCCX)



Fidelity Advisor Large Cap 130/30

FITOX, FOATX

The investment seeks long-term growth of capital. The fund normally invests at least 80% of assets in common stocks of companies with large market capitalizations. It normally establishes long and short positions in equity securities. The fund invests either in "growth" stocks or "value" stocks or both. It may invest in domestic and foreign issuers.

Expense Ratio: 1.12 %., 1.56%
AUM: 26 MM,.

Source: Yahoo!Finance

Fidelity Advisor Large Cap 130/30 (FITOX, FOATX)

BNY Mellon US Core Equity 130/30

MUCIX

The investment seeks capital appreciation. The fund normally invests at least 80% of net assets in equity securities. It focuses on growth and value stocks of large cap companies. Although the fund typically invests in seasoned issuers, it may purchase securities of companies in initial public offerings (IPOs) or shortly thereafter.

AUM: USD 222 Million
Fee: 2%

Source: Yahoo!Finance

BNY Mellon US Core Equity 130/30 (MUCIX)

CSM: the first 130/30 ETF

-- Proshares launched the first 130/30 ETF in July 2009

-- Based on the 13030 Large Cap Index constructed by Andrew Lo (MIT) and Panjak Patel (Credit Suisse)

-- Based on ranking stocks in S&P 500 according to 10 quantitative criteria (Book to Value, Momentum, etc)

-- Monthly rebalancings

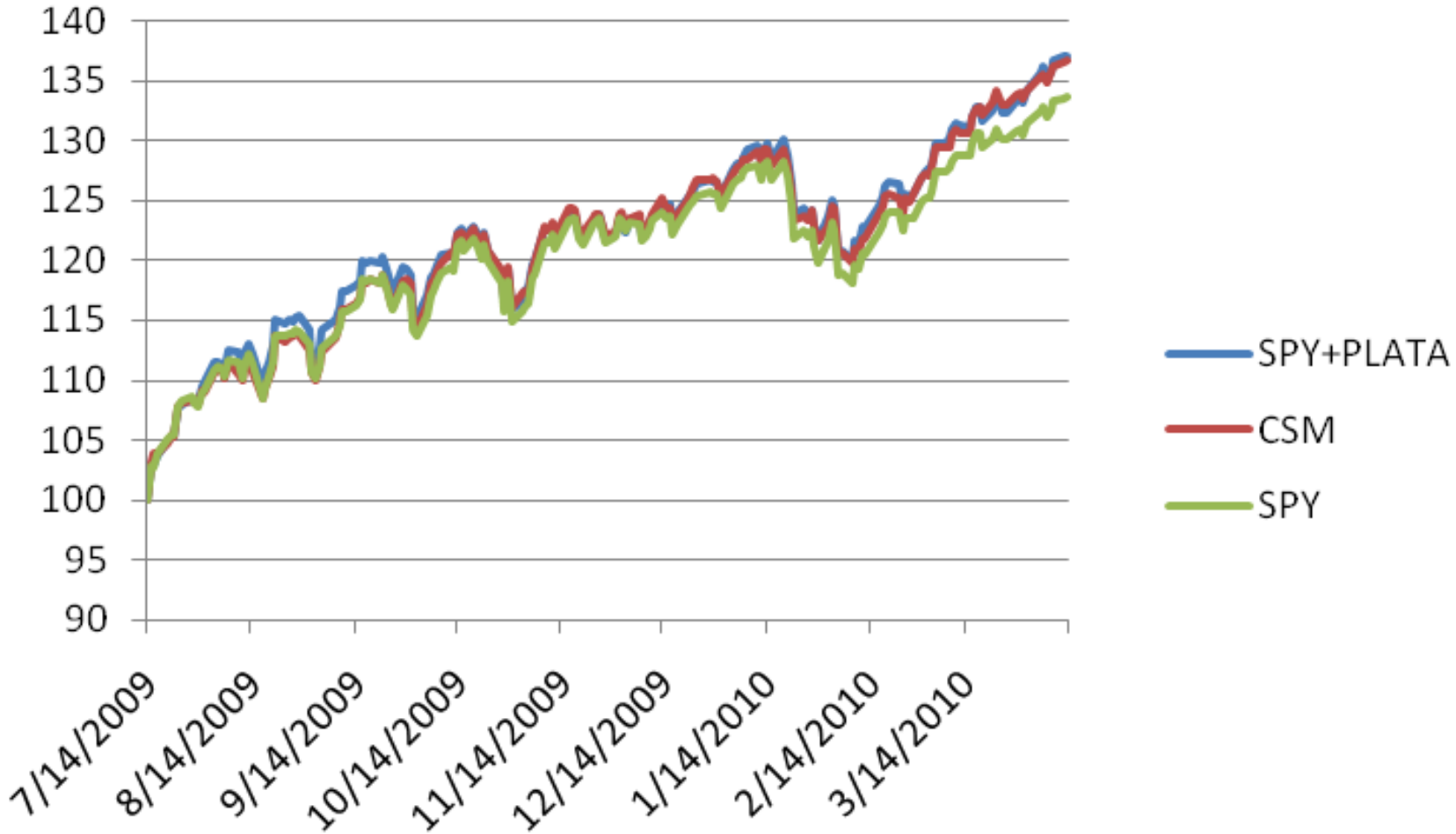
-- Data available does not include the credit crunch

The investment seeks investment results, before fees and expenses, that track the performance of the Credit Suisse 130/30 Large Cap Index. The fund invests in a combination of equity securities and derivatives that Proshares Advisors believes should track the performance of the Index. It invests typically the rest of the assets in money market instruments. The fund is non-diversified.

AUM: USD 60 Million
Fee: 0.95%

Source: Yahoo!Finance

Comparison of SPY+ PLATA with CSM since inception (7/2009)



Conclusions

Main properties of Stat Arb:

-- It provides a systematic way of picking stocks (long and short) based on relative-value criteria

-- It operates in medium frequency with relatively low turnover costs, so it is highly scalable

-- It can be leveraged an treated as a total-return strategy (benchmark=cash)

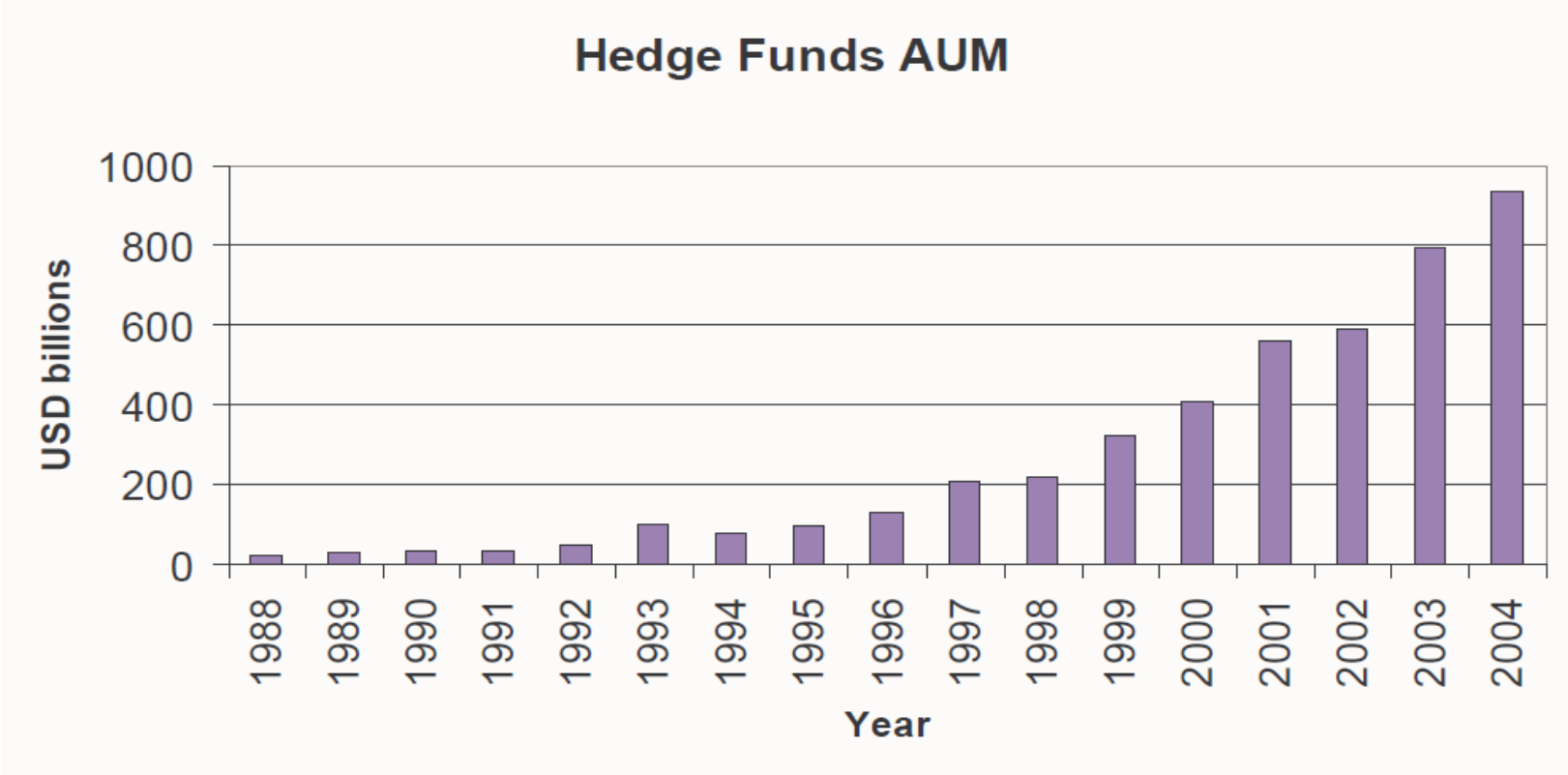
-- It can be merged with a long-index fund to create a systematic enhanced-indexing fund or quantitative 130/30 (benchmark=S&P 500)

-- Stat arb makes money when the market has high cross-sectional volatility, which is typically when indexing works less well. This is why Stat Arb and indexing can be combined to make a superior yet simple investment product.

-- BUT: The devil is in the details and the investor community must understand how the strategy works and its overall sensitivity to market volatility (e.g. VIX)

A systemic view of hedge funds

1988 – 2004: Steady growth of AUM to 1000 Billion



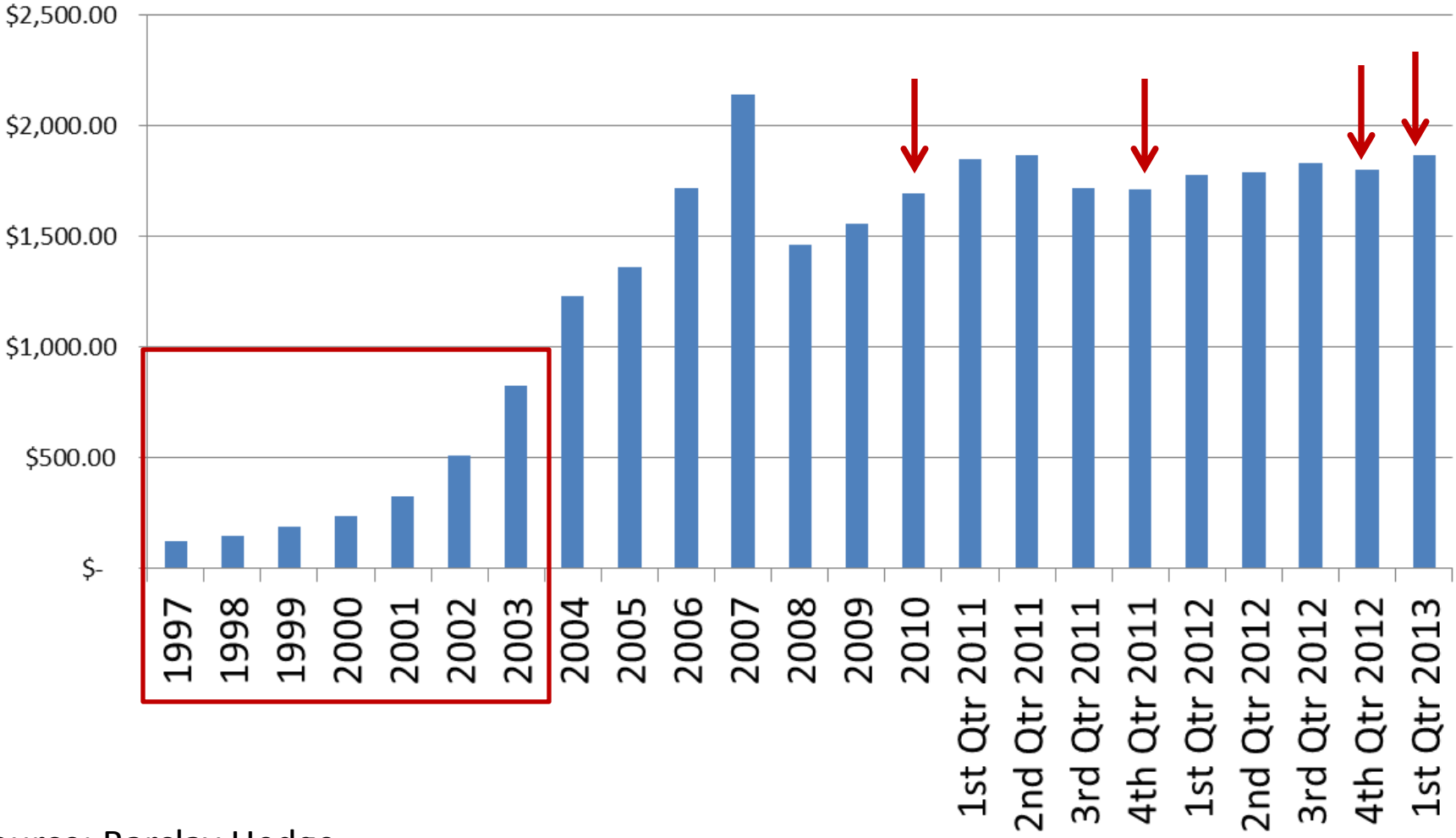
LTCM

- Long Term Capital Management, created by Solomon Brothers veterans when Solomon Brothers was acquired by Citigroup (late 1990's)
- AUM= 4Bn
- Strategy: Fixed-income relative value (hedged)
- Wall Street Firms (PBs) were financing LTCM at 25:1 leverage
- In 1998, Long Term Capital blows up and is bailed out by the Federal Reserve Bank of New York (sold the book for $1 to a consortium of Wall Street firms)
- Increased public awareness of systemic risk of HFs
- Disrepute of so-called ``convergence trades'' (but see MF Global 2012).
- Liquidity problem

HFs take off in the 2000's

- Hedge funds provide an alternative to classical investments
- Appetite for HFs grows after the 2000 stock bubble
- **Regulation on HF in the US evolves considerably since 2005**
- Registration as HF was mandatory for a while (in 2006)
- More regulation means higher barriers to entry
- Entrance of Pensions (CALPERS) and College Endowments (Yale)
- 2002-2007 sees massive inflows to alternatives
- Bear Stearns- and Soc. Gen-sponsored HFs blow up at the inception of the Credit Crunch in Fall 2007

1997 – 2013 Hedge Funds AUM

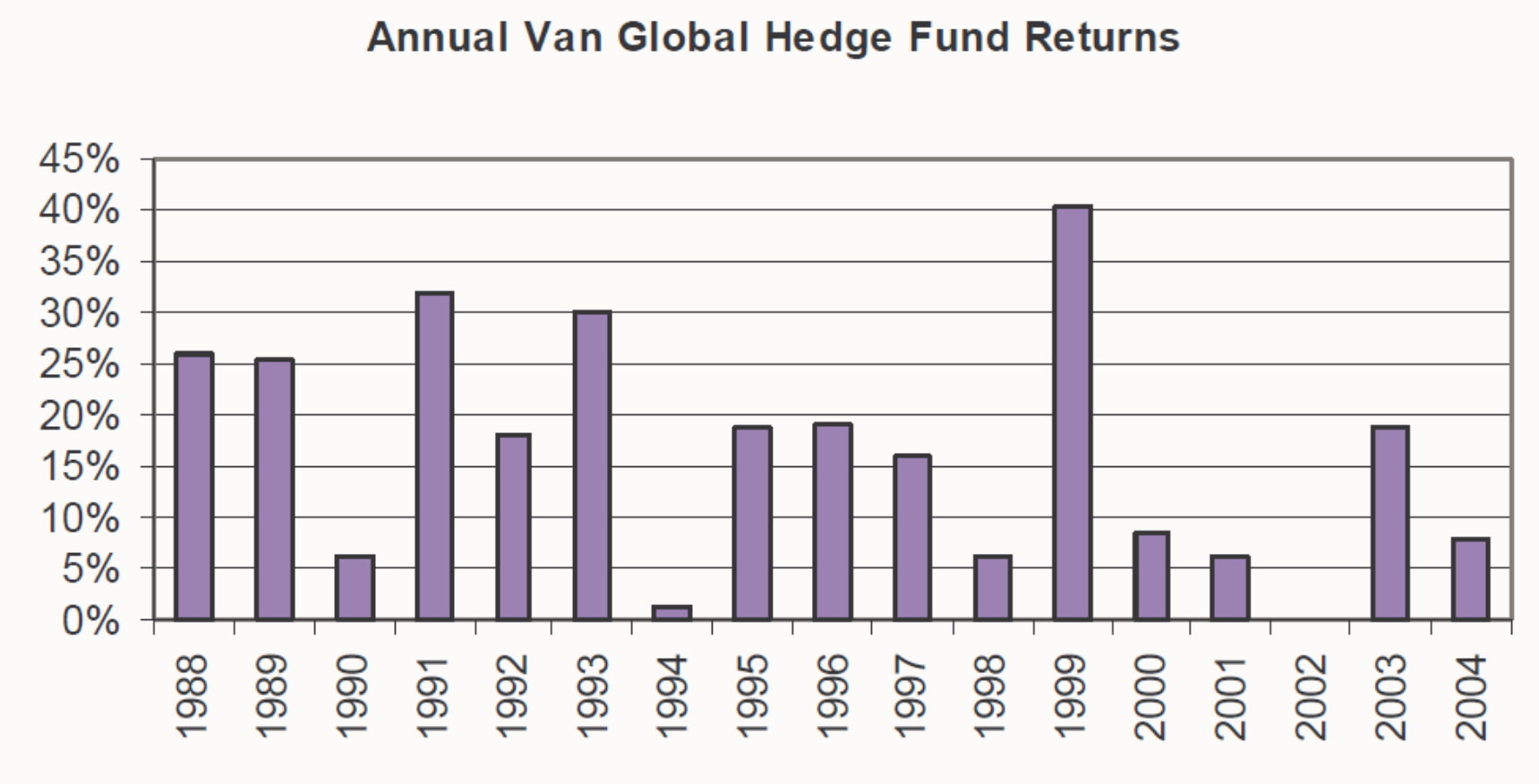


Source: Barclay Hedge

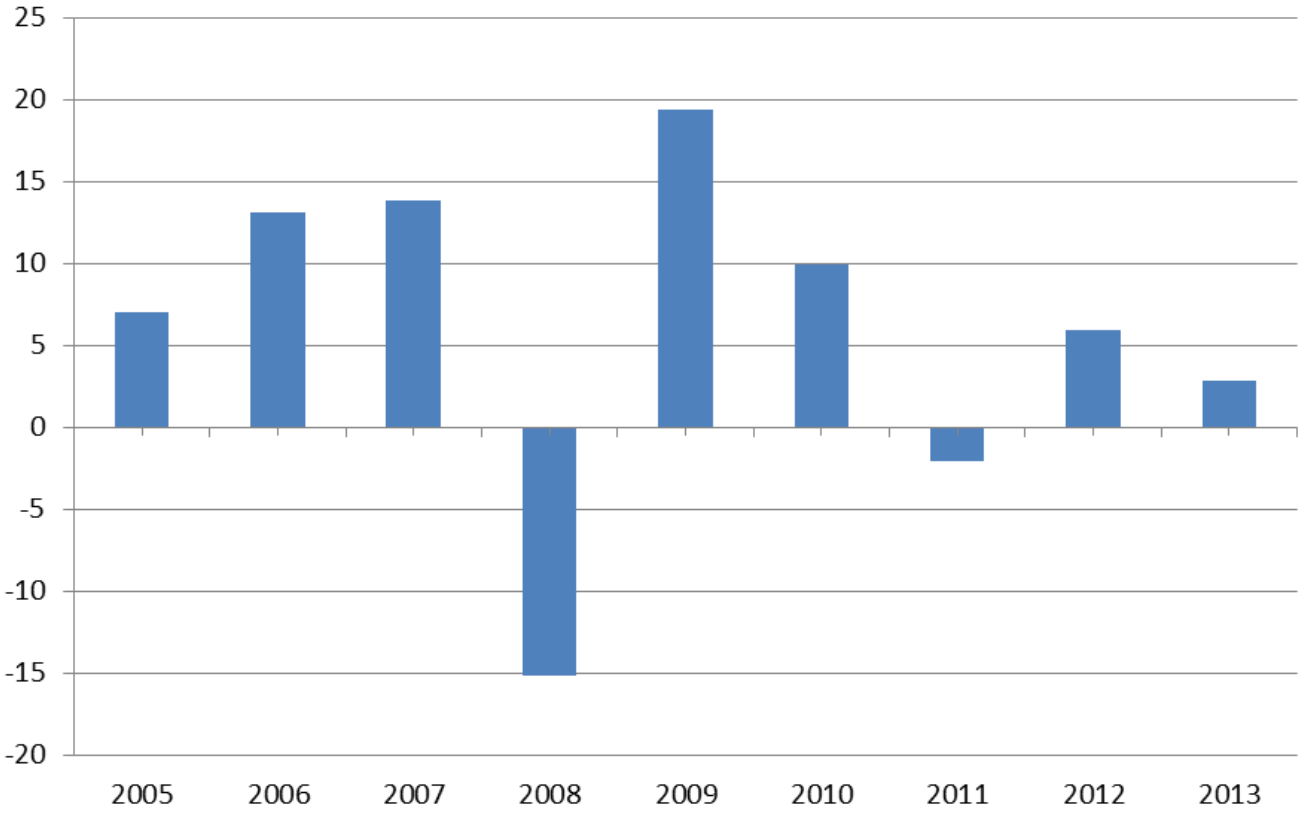
A Market for Managers

- With bad stock markets and low yields, the search for alternatives is on.
- Thesis: smart managers can outperform the market and produce superior results
- Antithesis: we cannot all be ``better than the market''
- This means that if all $$ went into alternatives, the returns should look essentially like the market, or worse, due to fees and transaction costs
- Capacity: the natural size of AUM that a strategy can run

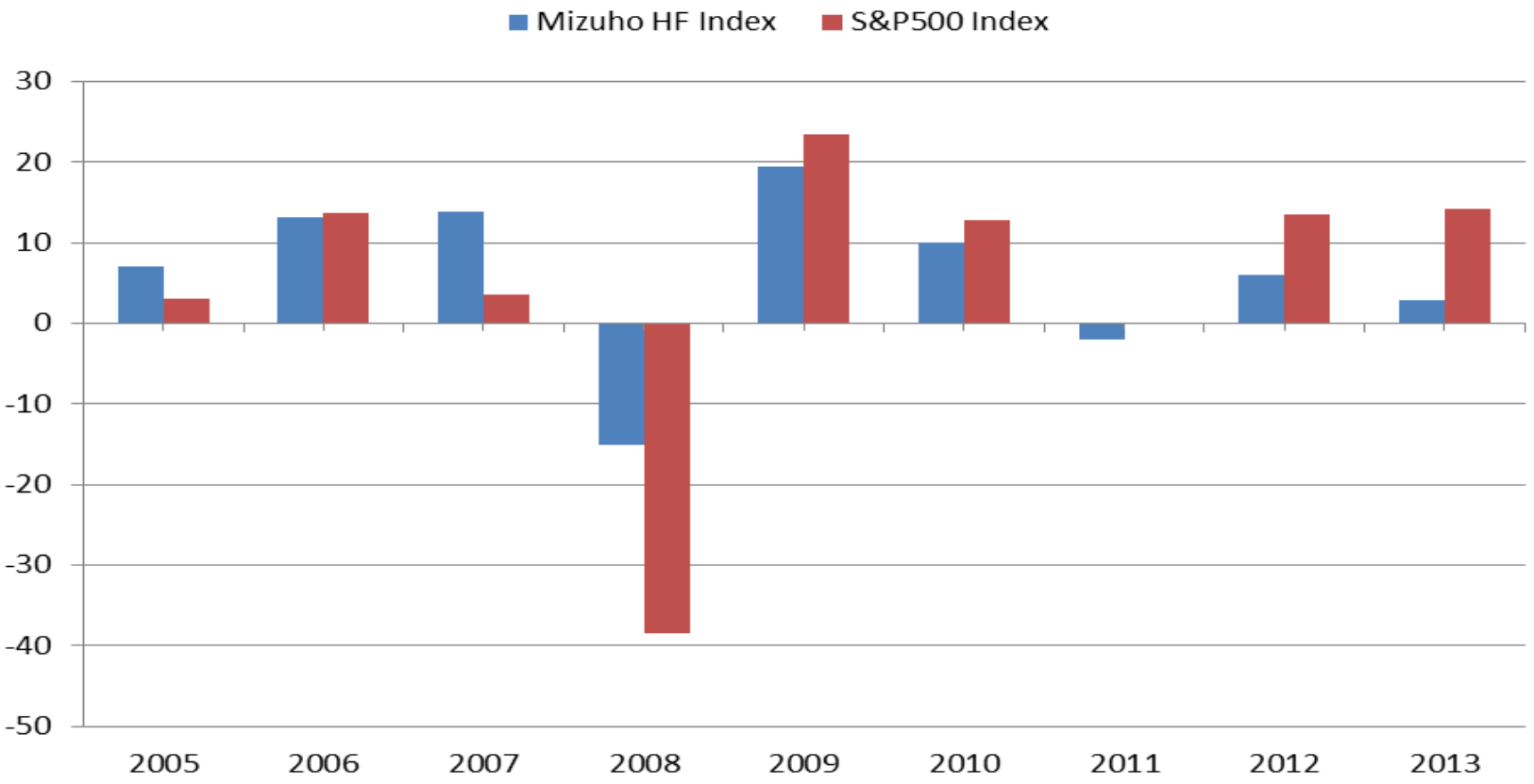
Returns


Annual Van Global Hedge Fund Returns
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004

Annual Returns Mizuho HF Index

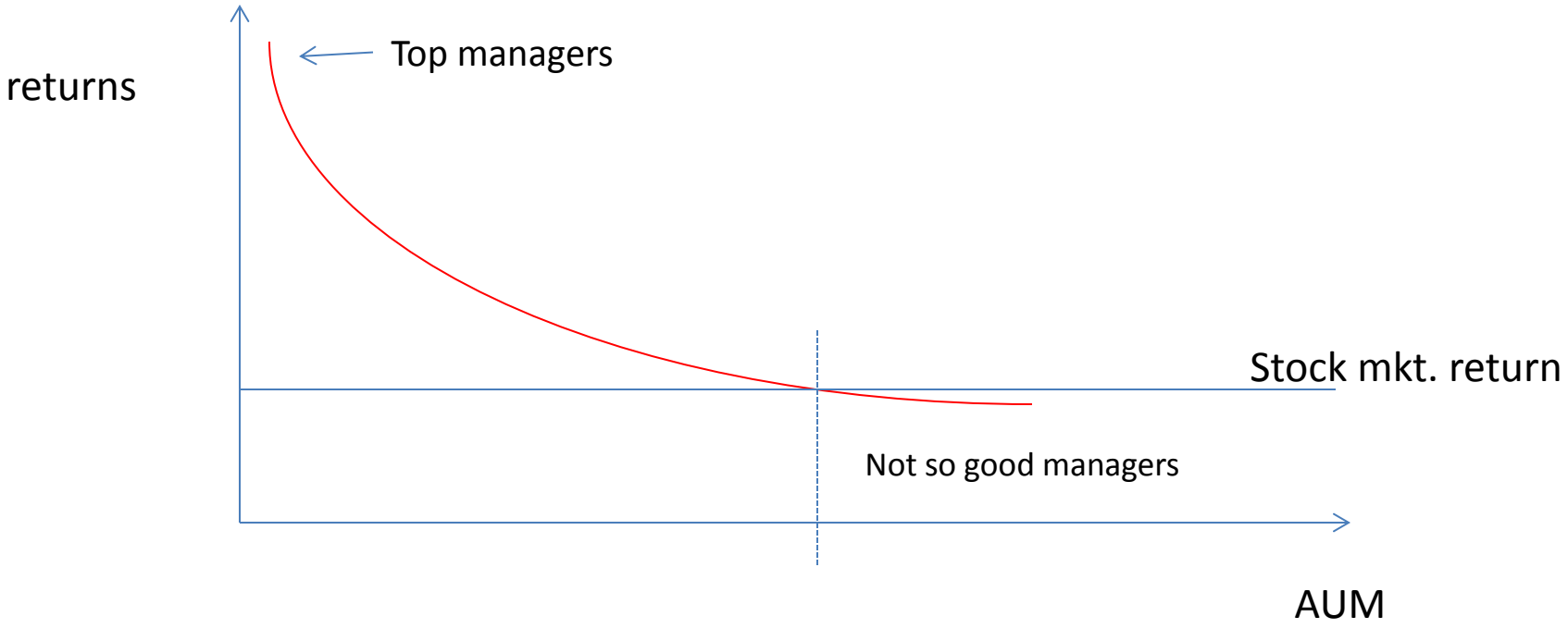


HF Returns vs. S&P 500 Returns



Equity Index outperforms HFs in Post Lehman period.

Law of diminishing returns



Thesis: The maximal size of the HF industry should be reached when the marginal return on a $$ invested in HFs is no greater than the return on standard returns (adjusting for taxes, etc).

M Avellaneda, P Besson, 2005, unpublished

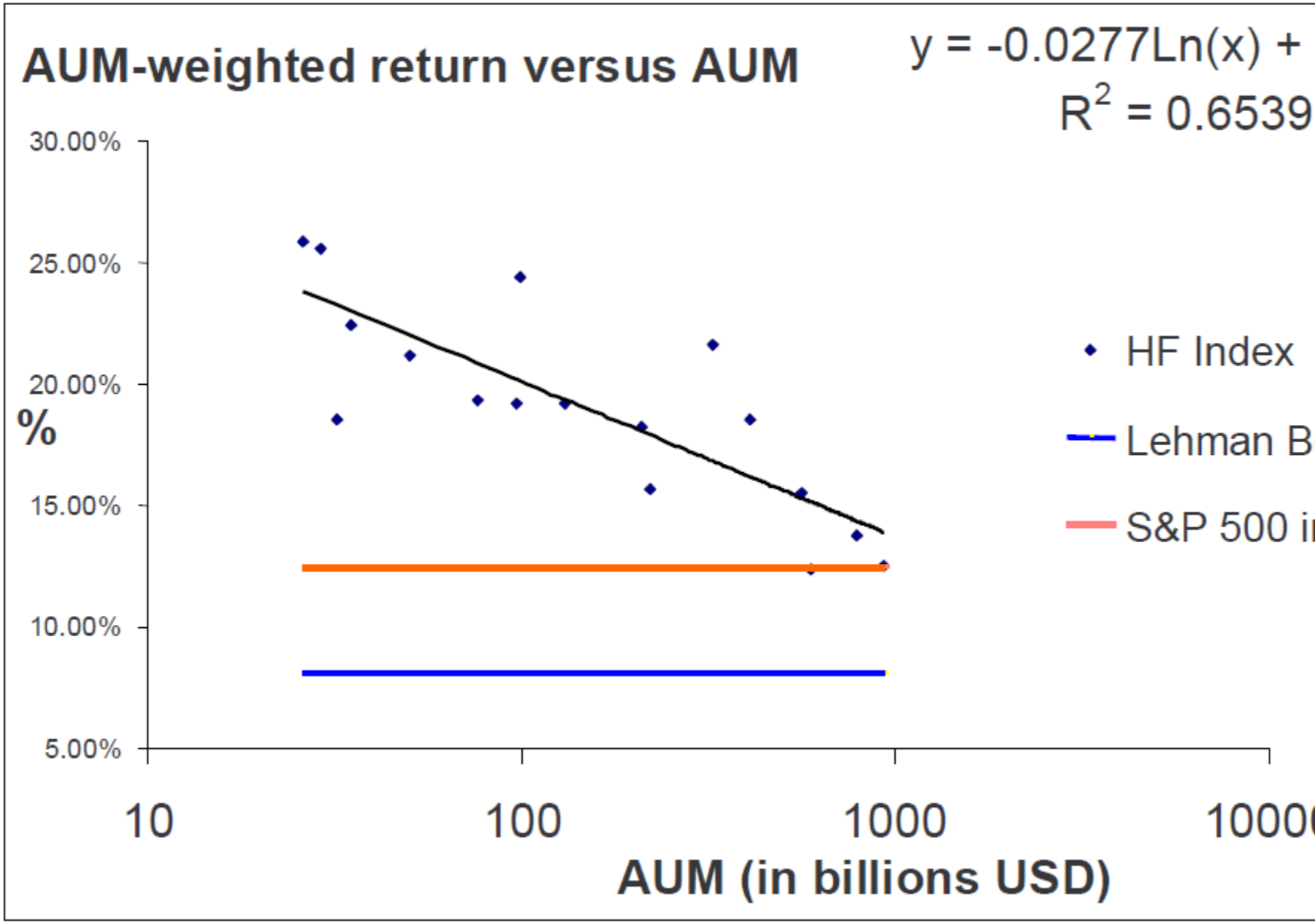
AUM-weighted Return

$$R_t = \frac{\sum_{k=1}^{t} a_k r_k}{\sum_{k=1}^{t} a_k}$$

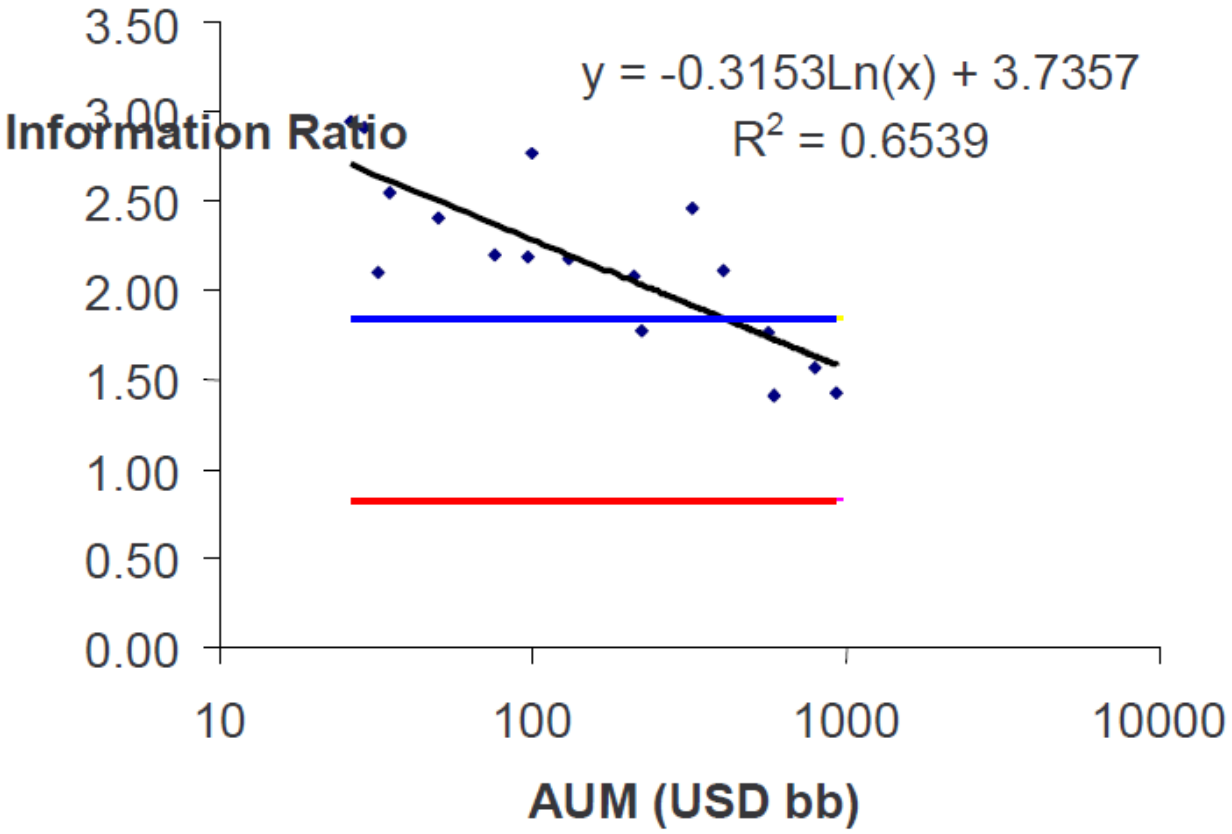
a_k = assets under management in year k

r_k = returns of HF Index in year k $\quad (\mathrm{k} = 1 \Leftrightarrow 1988)$

This justifies that if assets were constant then the return would be the average HF return, but bigger assets have more weight.


AUM-weighted return versus AUM
y = -0.0277Ln(x) +
R2 = 0.6539
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
%
HF Index
Lehman B
S&P 500 i
10
100
1000
1000
AUM (in billions USD)

Risk Adjusted AUM-weighted Returns vs AUM



Forecasting the size of HF industry based on returns (in 2004)

Avellaneda and Besson, 2005

HF AUM (billions) (hypothetical)	Asset-weighted Returns (forecast from regression)	Equivalent Investment
945 (current)	14.10	Hedge Fund Index
1964	12.40	S&P 500 Index
10,450	8.10	Lehman Int'l Bond Index

HF line and stock market returns intercept at around 2000 Billion , which is roughly the size of the HF industry in 2012!!!

HF in the post-internet bubble

- Dodd-Franck and Volker Rule
- Migration of sell-side traders to buy side
- Supply of traders for HF, but trading a bank's book is much different than trading client's money
- Different sources of capital
- Different risk profiles
- No hedging with other bank activities (retail, IB, flow)

Hedge Funds: Looking Ahead

- Need for size. Emergence of giant funds 30+ bb
- Size contradicts capacity limits
- New strategies are necessary, otherwise the ``law of diminishing returns'' caps the size of the industry
- It is more and more difficult to find truly uncorrelated strategies
- Arguably, commodities are no longer uncorrelated with the market, since they ARE an alternative asset class (see post 2008)