What Do We Know About Hedge Funds?

Prof. Massimo Guidolin

20135 – Theory of Finance, Part I
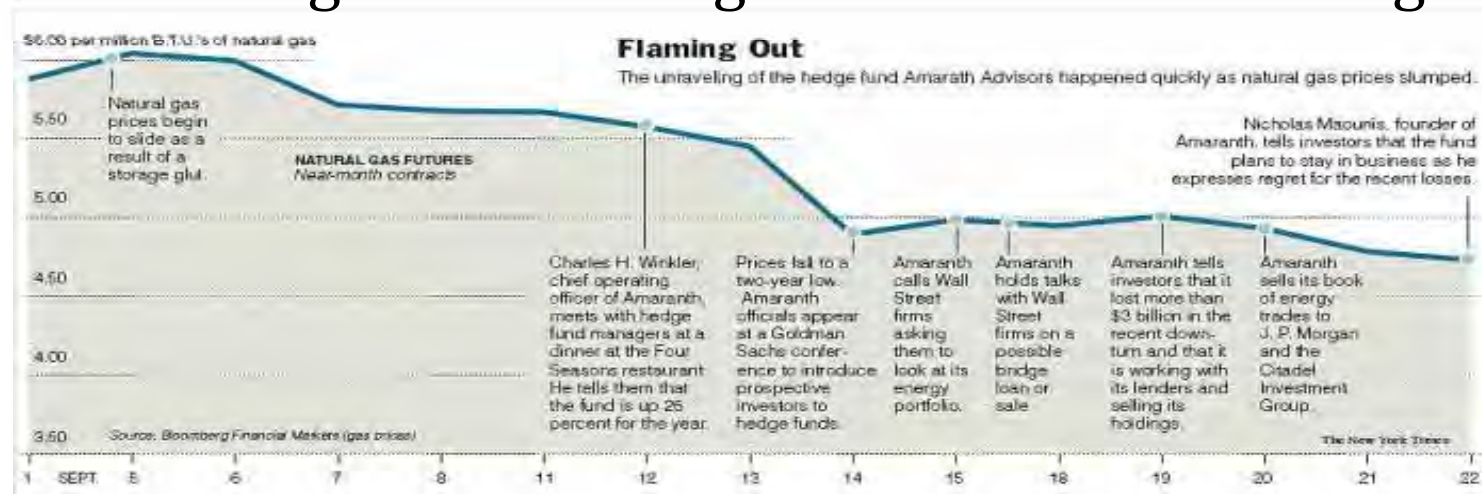(Sept. –October)

Fall 2019

Generalities and Motivation

- The term "hedge fund" was first used in 1949 by Alfred Winslow Jones to describe an investment partnership whereby he "hedged" risk by purchasing undervalued and shorting overvalued stocks
  - Only precursor Karsten Statisitcal Lab, in 1930
- With the speculative attack by George Soros on the British pound in 1992 and the LTCM collapse in 1998, HFs received a lot of coverage
- In 2007, John Paulson made "the greatest trade ever" (2009) by betting against mortgages
- His HF made $15 billion on the move, of which Paulson personally took home $3.7 billion
- HFs can lose big: LTCM collapsed when its credit bets went sour after Russia defaulted; LTCM had begun 1998 with $5 billion in assets and bor-rowings of $125 billion (a leverage ratio of 25:1)

Generalities and Motivation

- By Sept. 21, assets had dropped < $1 billion and leverage > 100:1
- The largest loss incurred by a HF to date is Amaranth Advisors in September 2006: Amaranth lost $6 billion, or close to 65%, thanks to a lot of leverage and a wrongheaded bet on natural gas futures

Flaming Out
The unraveling of the hedge fund Amaranth Advisors happened quickly as natural gas prices slumped.

- Participation in hedge funds is restricted to high net-worth individuals and to institutional investors such as foundations, life insurance companies, endowments and investment banks
  - A fund of hedge funds (a basket of hedge funds) is not as restrictive
- Unlike other traditional investments such as mutual funds, hedge funds are not currently regulated by the Securities Act of 1933 and are not required to disclose their positions

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The Growth of the Industry

- A common structure is to have the onshore fund and the offshore fund invest in a so-called master fund, while the onshore and offshore funds are then called feeder funds

- The management company in the case of a HF fund has few clients — only the funds it manages ⇒ the mgmt company does not have to register with the SEC

- HFR estimates that the total assets under mgmt (AUM) of the HF industry increased from $39 billion in 1990 to more than $3 trillion as of the end of 2016, with global macro funds growing the most

Estimated Growth of Hedge Fund Assets by Regional Investment Focus
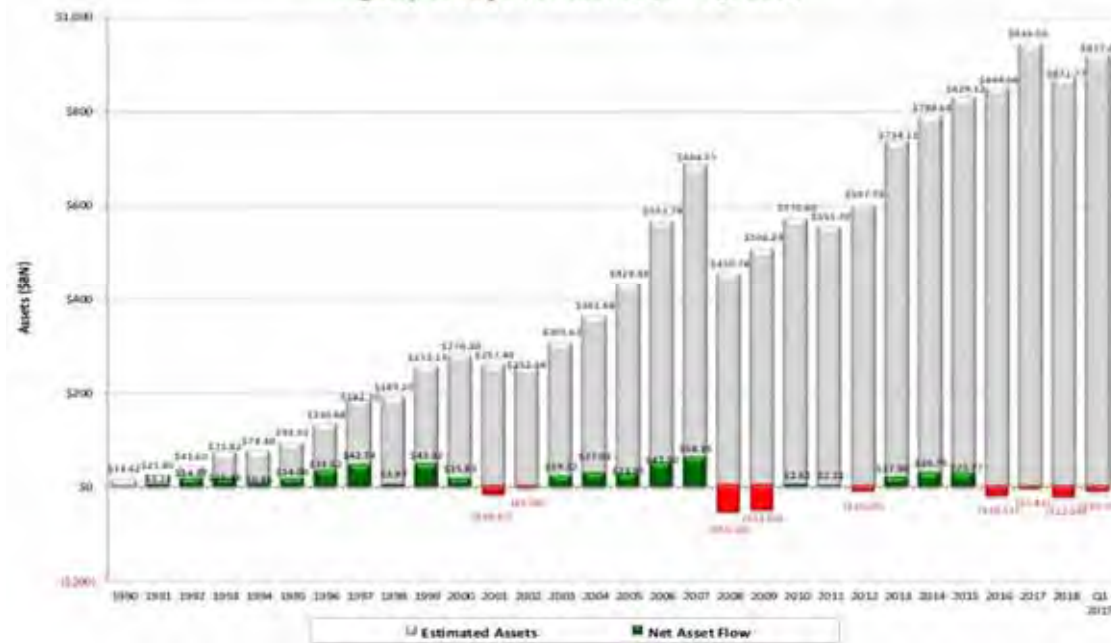**Emerging Markets vs. Global vs. Total Industry 2002 – 2016**

Legend: Emerging Markets · Global · Total Industry
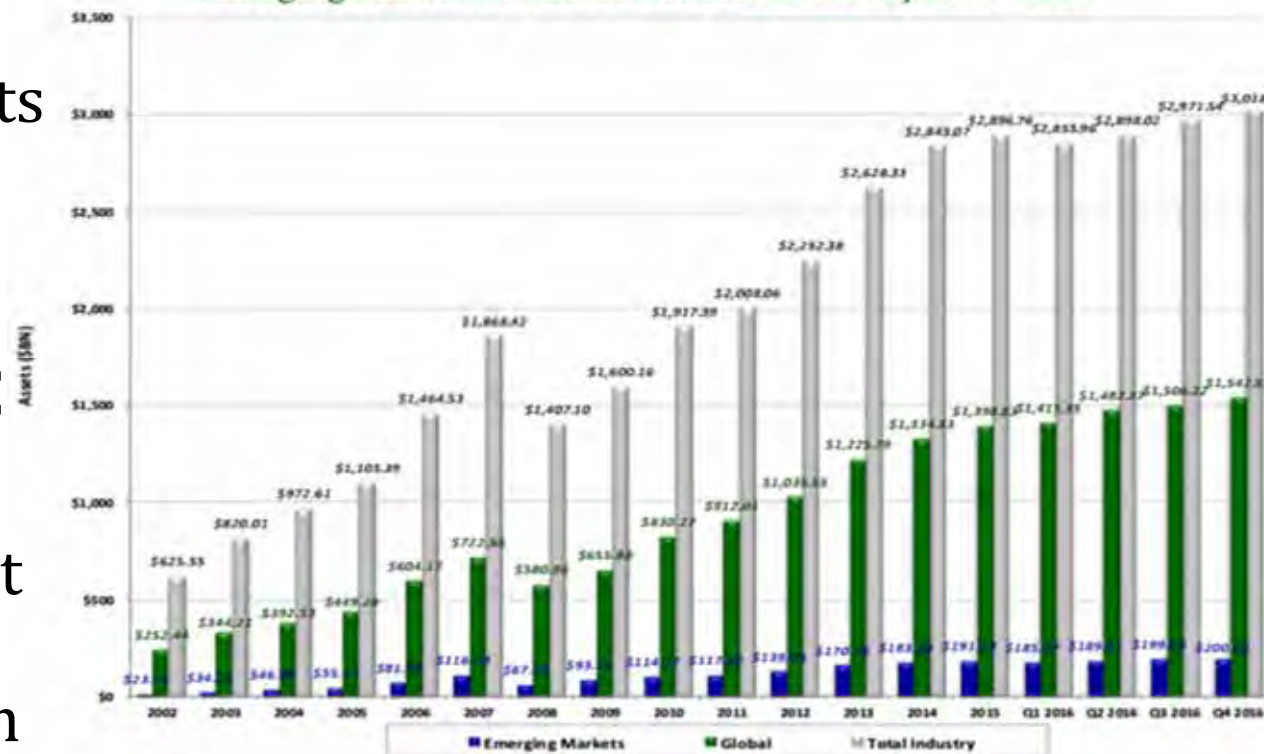
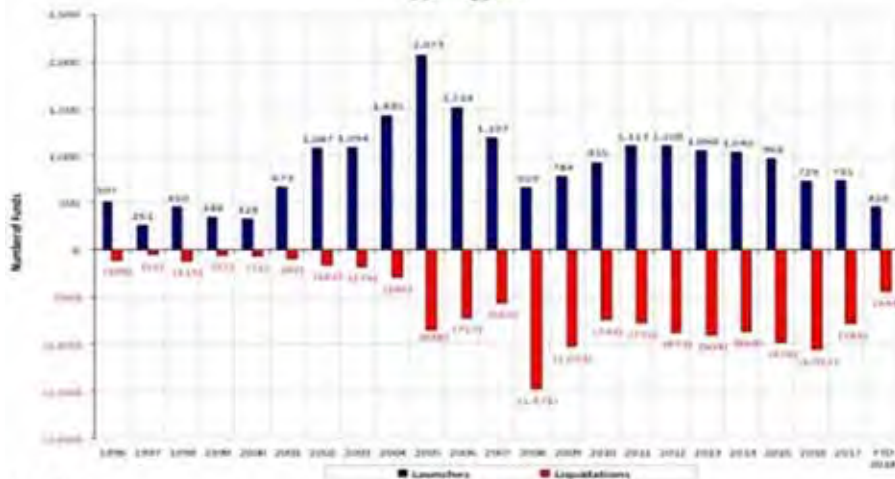HFR — Hedge Fund Research, Inc. © 2017   SOURCE AS: HFR

The Growth of the Industry

Estimated Growth of Assets / Net Asset Flow
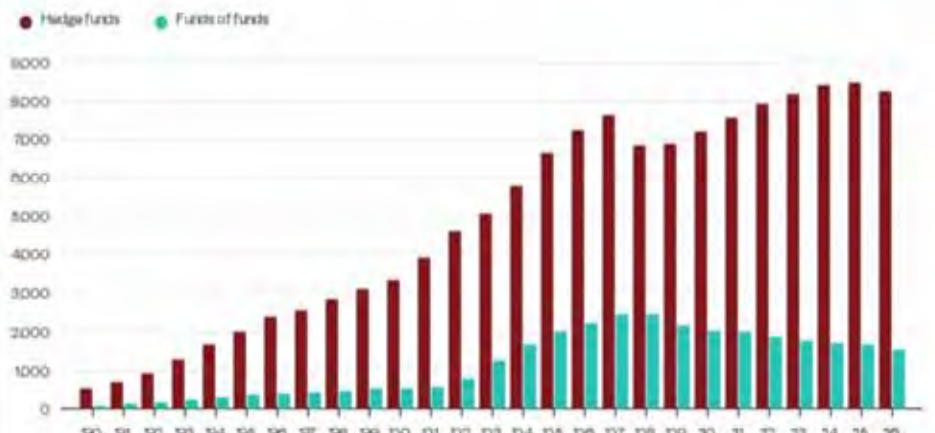Equity Hedge (Total) 1990 – Q1 2019

- During the same period, the total number of active HFs rose from 610 to over 8,000

Estimated Number of Funds Launched/Liquidated
1996 – Q3 2018

Golden Years

The number of hedge funds skyrocketed from 2001 to 2007

Hedge Funds Die as Quickly as They Spring Off

- HFs are also characterized by massive attrition (mortality) rates
- Liang (2000, JFQA) finds that the annual hedge-fund attrition rate is 8.3% for the 1994–1998 sample period using Lipper TASS data, and Horst and Verbeek (2007) find a slightly higher rate of 8.6% for the 1994–2000 sample period
- Brown, Goetzmann, and Park (2001, JF) find that the half-life of typical Lipper TASS HFs is 30 months
- Brooks and Kat (2002) estimate that approximately 30% of new HFs do not make it past 36 months due to poor performance
- Amin and Kat (2003) find that 40% of their sample do not make it to the 5th year
- Howell (2001) finds that the prob. of HFs failing in their 1st year is 7.4%, only to increase to 20.3% in their 2nd year

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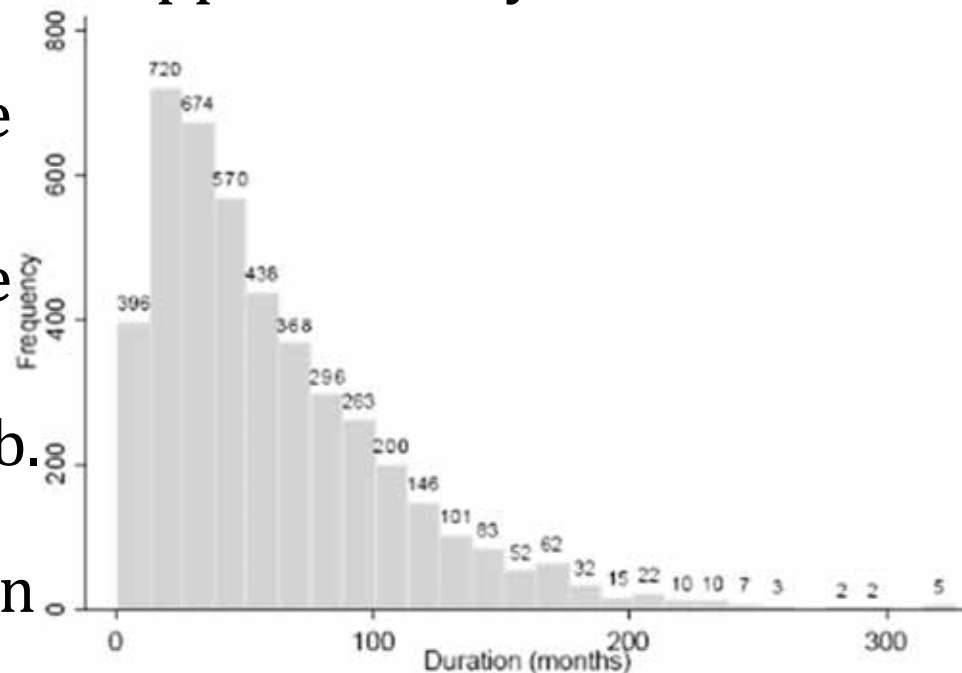
Hedge Funds are Drawing Diverging Views

- A few parties have voiced serious perplexities on the AUM success of HFs and their ability to generate risk-adjusted performance

  o Ang (2014) writes "Many investors are drawn to HFs by the record of returns (sketchy as it is), which was produced largely when the industry was nascent (...). Risks in the early years were high, but early investors prospered (...). The HF industry has since matured, and true outperformers are harder to find. Often the best HFs are small. But many asset owners are reluctant to select small, unproven HFs. They gravitate instead toward large HFs with long track records (...) The returns on these large funds aren't as high, on average, as small ones."

  o Lack (2012) writes "If all the money that's ever been invested in hedge funds had been put in T-bills instead, the results would have been twice as good."
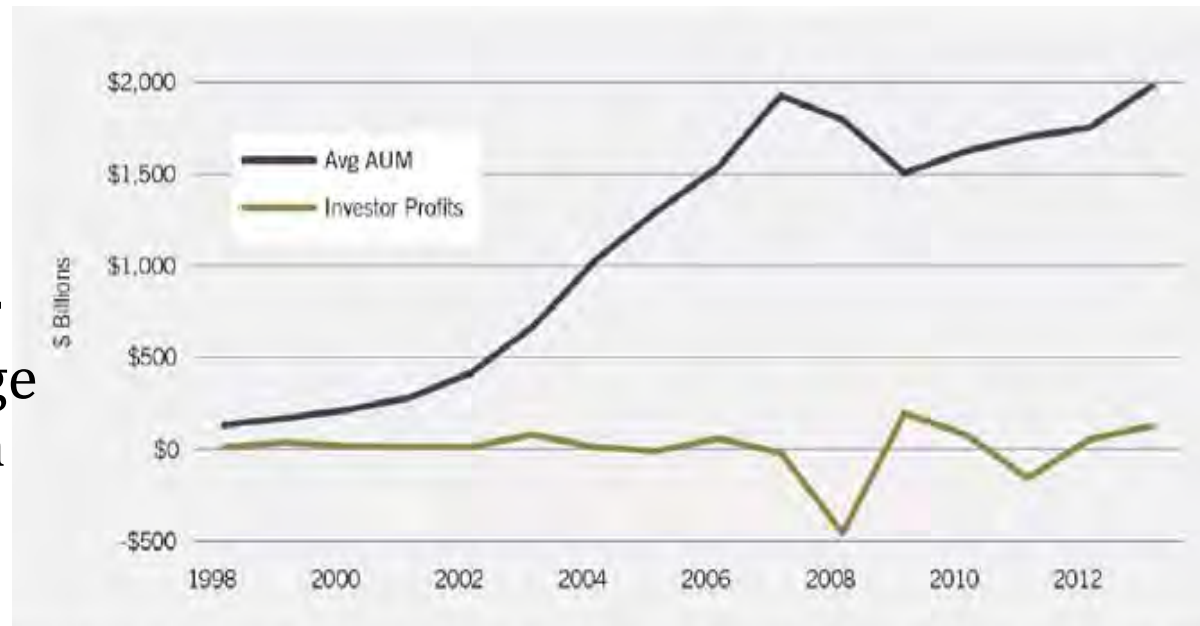
Source: Simon Lack presentation "The Fallacy of Hedge Funds: The Hedge Fund Mirage, The Illusion of Big Money and Why It's Too Good To Be True." May 2014

And Yet They Cannot be Ignored in a Systemic Perspective

- HF also hold an increasingly large percentage of the stock market: a recent study by Cao, Liang, Lo, and Petrasek (2014) finds that average holding of HFs in publicly traded stocks has risen over time from 3% during 2000-2003 to 9% in 2008-2012
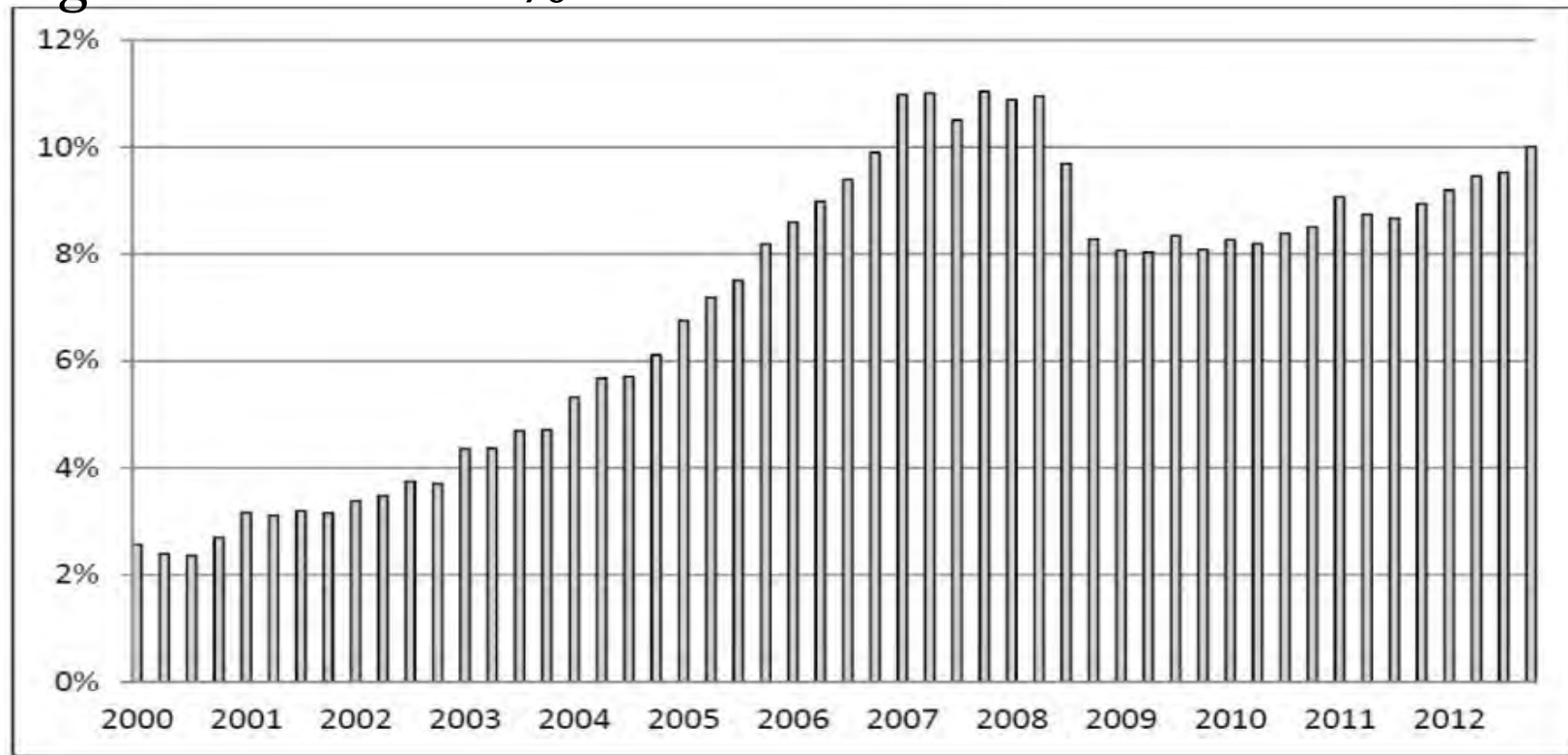
Fig. 1. Percentage of shares held by hedge funds

This figure plots the average percentage of shares held by hedge funds for the sample stocks over the 2000:Q1–2012:Q4 period. Sample stocks are listed on NYSE, AMEX, or NASDAQ. Institutional ownership data come from 13F reports. We classify 1,594 filers of 13F reports as hedge management firms based on information from hedge fund databases and SEC Form ADV.

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Absolute Return Investment Targets

- Rather than comparing themselves to a benchmark, hedge funds typically focus on absolute returns in all market conditions

- Numerous large pension funds are beginning to accept hedge fund allocations of 5 – 20 %

- HF typically charge a management fee of 2 per cent and a performance fee of 20 per cent on capital appreciation

2019 Position	2019 Wealth	Name	Hedge Fund (Family Office)	2018 Position	2018 Wealth	Change £m
38	£3.7bn	Michael Platt	Blue Crest Management	46	£3bn	+£700m
88	£1.66bn	Nick Roditi	N. Roditi & Co.	118	£1.19bn	+£476m
101	£1.5bn	Sir Michael Hintze	CQS	100	£1.38bn	+£120m
125	£1.2bn	Sir Chris Hohn	TCI Fund Management	136	£1.0bn	+£200m
137	£1.102bn	Tom Sandell	Sandell Asset Management	129	£1.107bn	+£28m
138	£1.1bn	Jim Mellon	Regent Pacific/Charlemagne	136	£1bn	+£100m
144	£1.04bn	Alan Howard	Brevan Howard	134	£1.01bn	+£30m
146	£1.02bn	David Harding	Winton Capital	136	£1bn	+£20m
186=	£775m	Crispin Odey	Odey Asset Management	180	£750m	+£25m
186=	£775	Chris Rokos	Rokos Capital Management	174	£775	n/c

Manager	Location	Year Established	Assets under Management
Bridgewater Associates	US	1975	$162.9bn as at 31 December 2018
AQR Capital Management	US	1998	$113.8bn as at 30 September 2018
Man Group	UK	1983	$78.5bn as at 30 September 2018
Renaissance Technologies	US	1982	$60.1bn as at 31 December 2018
J.P. Morgan Asset Management	US	1974	$53.5bn as at 31 March 2018
Two Sigma Investments	US	2001	$38.8bn as at 30 June 2018
Marshall Wace	UK	1997	$35.4bn as at 1 October 2018
Millennium Management	US	1989	$35.0bn as at 30 June 2018
Elliott Management	US	1977	$34.8bn as at 30 September 2018
Adage Capital Management	US	2001	$32.4bn as at 31 December 2017
Citadel Advisors	US	1990	$31.7bn as at 30 September 2018
D.E. Shaw & Co.	US	1988	$31.2bn as at 1 October 2018

How Are Hedge Fund Managers Compensated?

- Most funds specify a 'high water mark' on their performance fees, assuring that in the event of poor performance, the fee will not be charged until prior losses are recuperated (== just on new profits)

- Several funds include a proportional adjustment clause that states that if a fund loses money and some investors consequently with-draw their assets, the fund is allowed to reduce proportionally the loss he has to recover by the % of the assets that are removed

  o A manager who lost $20 out of $100 would have to recover the $20 before charging performance fees; but if investors withdraw $40 out of the remaining $80, the loss carried forward is reduced to $10

- Some funds have even gone one step further by introducing a clawback clause and a loss recovery account

- The clawback clause stipulates that a portion of the incentive fee will be retained every year in a clawback account, usually until the account reaches a certain percentage of the assets

- If future performance turns out to be negative, the clawback account is then debited to the client's credit

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Types of Hedge Funds

- There are many types of HFs and in fact not all of them are «hedged»; at least losely speaking, HFs can be classified as follows:

- Equity market neutral: attempt to identify overvalued and undervalued equity securities while neutralizing the portfolio's exposure to market risk by combining long and short positions

- Convertible arbitrage: exploit anomalies in the prices of convertible bonds, warrants, and convertible preferred stock

- Fixed-income arbitrage: identify overvalued and undervalued bonds on the basis of expectations of changes in the term structure of interest rates or credit quality of various issues or sectors

- Distressed securities: ptfs. of distressed securities are invested in the debt and equity of companies that are in or near bankruptcy

  o Most investors are unprepared for the legal difficulties and negotiations with creditors and other claimants that are common with distressed companies

  o Traditional investors prefer to transfer those risks to others

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Types of Hedge Funds

- o Furthermore, many investors are prevented by charter from holding securities that are in default or at risk of default
- o Because of the relative illiquidity of distressed debt and equity, short sales are difficult, so most funds are long

- **Merger ("deal") arbitrage**: seeks to capture the price spread between current market prices of corporate securities and their value upon successful completion of a takeover, merger, spin-off, or similar transaction involving more than one company

- **Hedged equity**: attempt to identify overvalued and undervalued equities; ptfs are typically not structured to be market, industry, sector, and dollar neutral, and they may be highly concentrated
  - o The value of short positions may be only a fraction of the value of long positions and ptf may have a net long exposure to the market
  - o Hedged equity is largest of the various HF strategies in terms of AUM

- **Global macro**: attempt to take advantage of major systematic moves in major financial and nonfinancial markets through trading in currencies, futures, and option contracts

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Types of Hedge Funds

Strategy or Index	Annual Return (%)	Annual Standard Deviation (%)	Sharpe Ratio	Minimum Monthly Return (%)	Correlation w/S&P 500	Correlation w/Lehman Gov./Corp.
HFCI	13.46	5.71	1.61	−6.92	0.59	0.17
Event driven	13.46	5.59	1.64	−9.37	0.59	0.07
Equity hedge	15.90	9.34	1.24	−9.70	0.64	0.10
Equity market neutral	9.24	2.50	1.98	−1.07	0.09	0.24
Merger/risk arbitrage	9.07	4.86	0.99	−8.78	0.48	0.10
Distressed securities	15.28	6.07	1.81	−9.71	0.42	0.04
Fixed-income arbitrage	7.62	3.61	0.92	−6.61	0.06	−0.06
Convertible arbitrage	10.23	3.96	1.50	−3.42	0.19	0.13
Global macro	16.98	8.38	1.51	−5.41	0.26	0.34
Short selling	−0.61	19.39	−0.25	−14.62	−0.76	−0.01
S&P 500	10.94	14.65	0.45	−14.46	1.00	0.13
Lehman Gov./Corp.	7.77	4.46	0.78	−4.19	0.13	1.00
MSCI World	7.08	14.62	0.19	−13.32	0.86	0.09
Lehman Global	8.09	5.23	0.73	−3.66	0.11	0.74

- **Emerging markets**, because short selling is not permitted in most emerging markets, these funds tend to be long.

- Fund of funds, a typical FOF invests in 10–30 hedge funds
  - Investors have to pay two layers of fees
  - FOFs usually do not impose lock-up periods and permit investor exits
  - FOF managers hold a cash buffer that may reduce expected returns

Types of Hedge Funds

Q3 2015 HF AUM $ Billions by Strategies

- Convertible Arbi 1%
- Distressed Sec 6%
- Emerging Markets 10%
- Equity Long Bias 8%
- Equity Long/Short 8%
- Equity Long Only 5%
- Equity Market Neutral 2%
- Event Driven 11%
- Fixed Income 19%
- Macro 9%
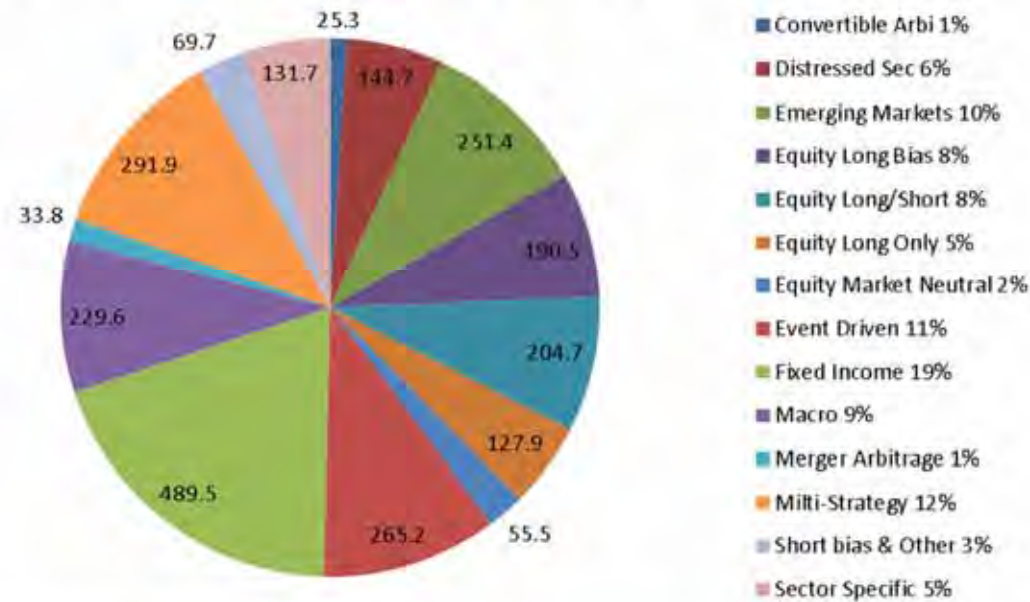- Merger Arbitrage 1%
- Milti-Strategy 12%
- Short bias & Other 3%
- Sector Specific 5%

FIGURE 4: HF Performance – Excess Returns (III / III)

FIGURE 3: HF Performance – Excess Returns (II / III)

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Types of Hedge Funds

- The different sensitivities of various HF strategies to various market factors result in different correlations among hedge fund strategies themselves

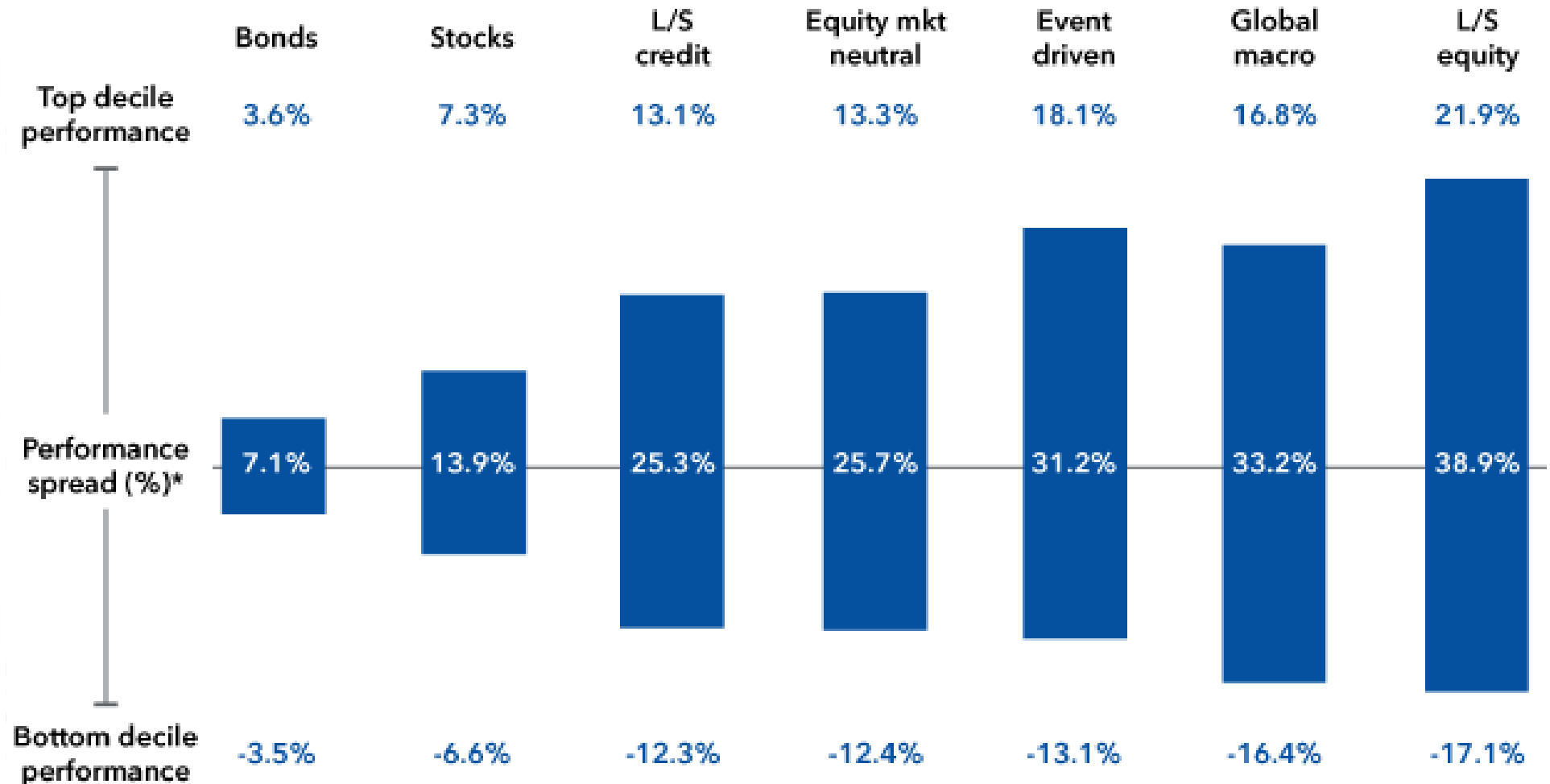|	HFCI	Event Driven	Equity Hedge	Equity Market Neutral	Merger/ Risk Arbitrage	Distressed Securities	Fixed-Income Arbitrage	Convert. Arbitrage	Global Macro	Short Selling	S&P 500	Lehman Gov./ Corp.	MSCI World	Lehman Global
HFCI	1.00													
Event driven	0.76	1.00												
Equity hedge	0.90	0.70	1.00											
Equity market neutral	0.32	0.13	0.27	1.00										
Merger/risk arbitrage	0.52	0.82	0.50	0.06	1.00									
Distressed securities	0.66	0.87	0.56	0.14	0.57	1.00								
Fixed-income arbitrage	0.38	0.34	0.19	0.13	0.12	0.42	1.00							
Convert. arbitrage	0.47	0.55	0.34	0.15	0.35	0.56	0.37	1.00						
Global macro	0.72	0.33	0.46	0.34	0.16	0.29	0.27	0.21	1.00					
Short selling	−0.64	−0.66	−0.77	0.00	−0.50	−0.54	−0.09	−0.28	−0.18	1.00				
S&P 500	0.59	0.59	0.64	0.09	0.48	0.42	0.06	0.19	0.26	−0.78	1.00			
Lehman Gov./Corp.	0.17	0.07	0.10	0.24	0.10	0.04	−0.06	0.13	0.34	−0.01	0.13	1.00		
MSCI World	0.56	0.54	0.62	0.07	0.42	0.39	0.09	0.17	0.24	−0.71	0.86	0.09	1.00	
Lehman Global	0.05	−0.03	0.06	0.21	0.04	−0.06	−0.16	0.00	0.19	−0.03	0.11	0.74	0.22	1.00

- Diversification among HF strategies should therefore also reduce the volatility of HF–based investment portfolios

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Types of Hedge Funds

- Regardless of the type, the real issue remain to pick out good HFs

	Bonds	Stocks	L/S credit	Equity mkt neutral	Event driven	Global macro	L/S equity
Top decile performance	3.6%	7.3%	13.1%	13.3%	18.1%	16.8%	21.9%
Performance spread (%)*	7.1%	13.9%	25.3%	25.7%	31.2%	33.2%	38.9%
Bottom decile performance	-3.5%	-6.6%	-12.3%	-12.4%	-13.1%	-16.4%	-17.1%

Source: Morningstar, Lipper TASS database. **Past performance is no guarantee of future results.** Stocks represented by Morningstar US Large Cap Core Funds. **Bonds** represented by Morningstar US Core Bond Funds. **Hedge fund categories** represented by the following TASS fund classifications: Equity Market Neutral; Fixed Income Arbitrage (representing Long/Short Credit); Event Driven; Global Macro; Managed Futures; Long/Short Equity. For illustrative purposes only.

Source: Blackrock, data through the end of 2018

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Are HFs Just Glorified Mutual Funds?

- Although HFs and MFs are both investment vehicles, the trading strategies they employ are very different

- Compared to MFs, HFs employ more dynamic strategies, typically take both long and short positions, often purchase illiquid assets

- Until 1997, the tax code made short sales extremely expensive for mutual funds, but it no longer does

- The binding short-sale restriction for MFs is a restriction that funds select—in 2000, 2/3 of reporting MFs prohibited short sales (see Almazan, Brown, Carlson, and Chapman, 2004, JFE).

- The literature has generally found that hedge funds have higher risk-adjusted performance and bear higher risk (Ackermann, McEnally, and Ravenscraft, 1999, JF; Liang, 1999, FAJ)

- Agarwal and Naik (2000, JAI) find that a ptf comprising of passive asset classes and investment in mainly nondirectional HFs, provides better risk-return tradeoff than just investing passively in equities, bonds, currencies, and commodities

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Are HFs Just Glorified Mutual Funds?

Efficient frontier using both alternative and passive asset classes

Efficient frontier using alternative asset classes

Efficient frontier using passive asset classes

Ibbotson's methodology based on corner ptfs (CPs), loci on the efficient frontier where an asset is either added or dropped: every efficient portfolio is a linear combination of two adjacent CPs
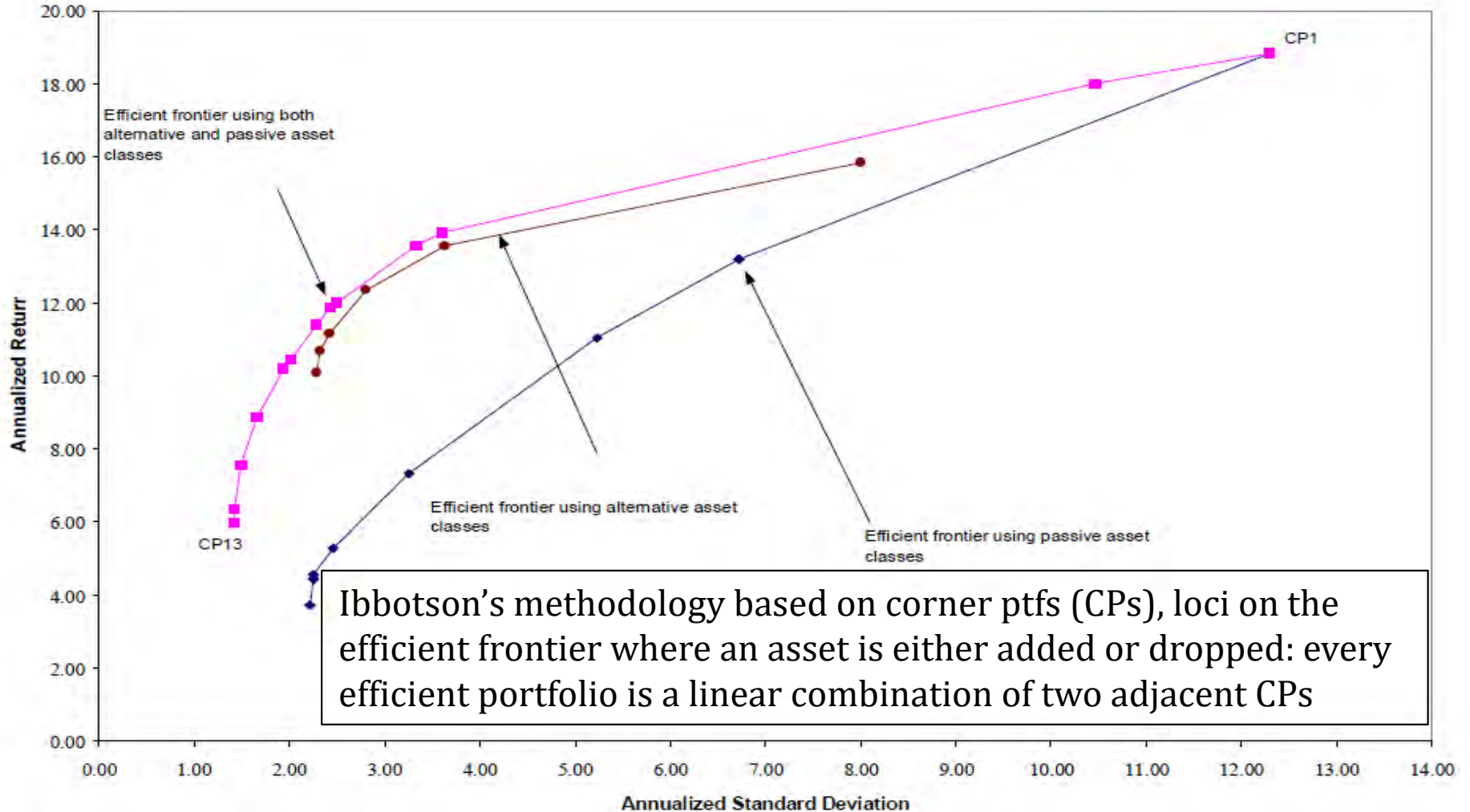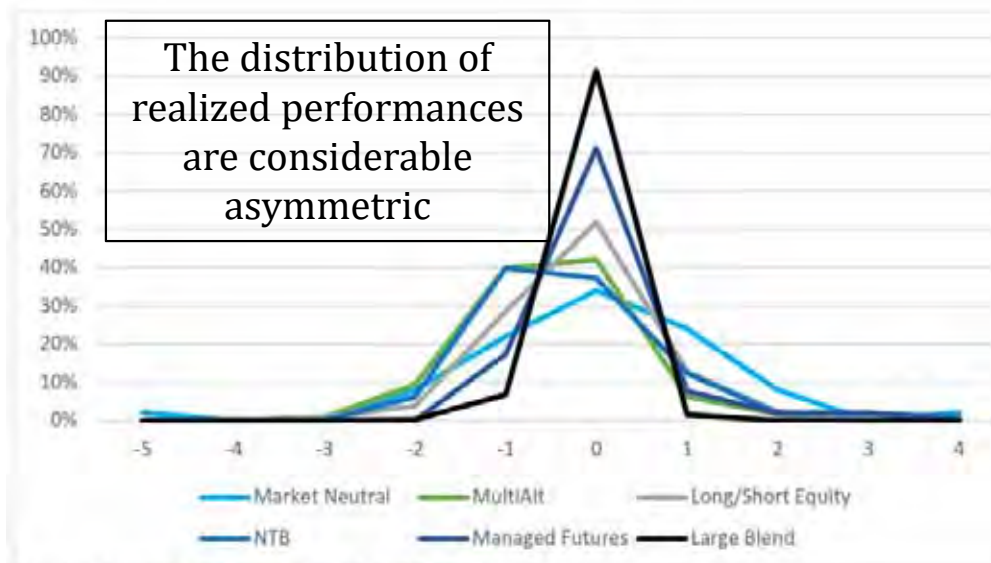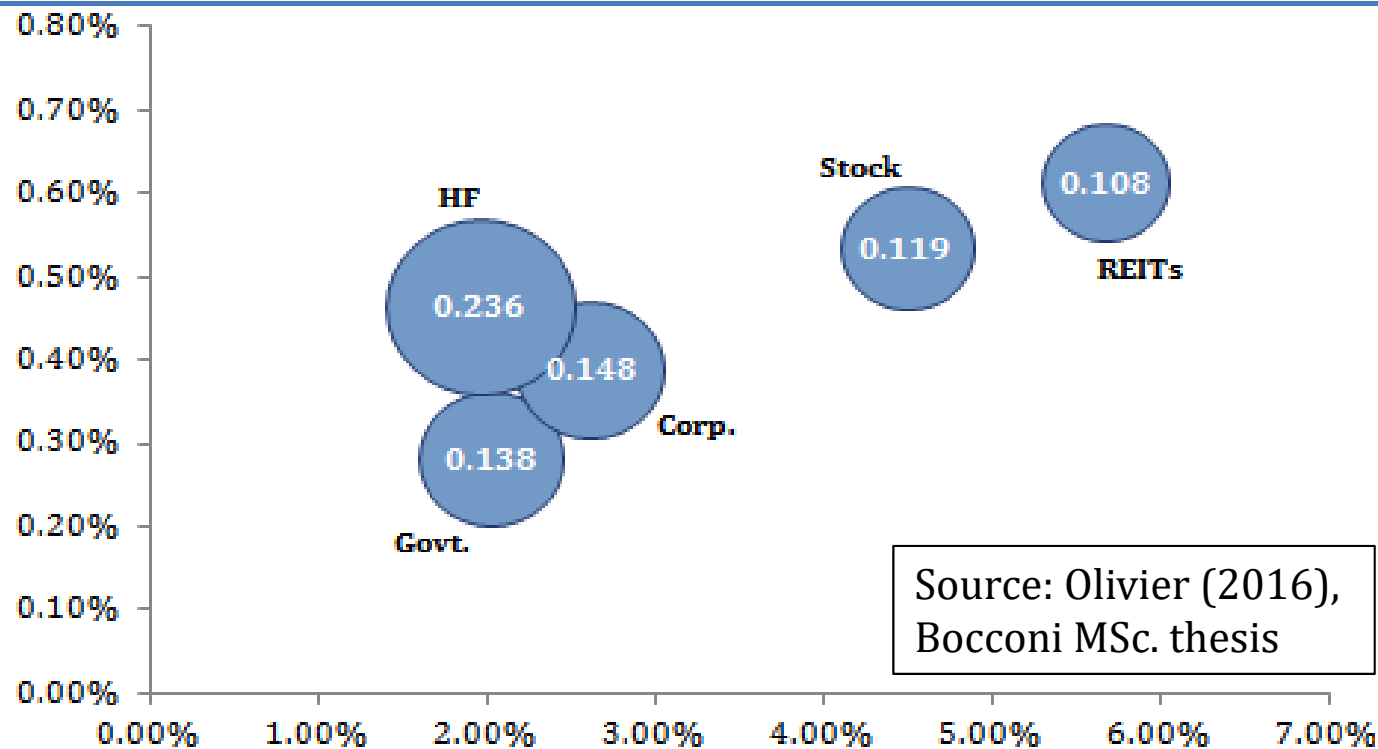
- Agarwal, Boyson, and Naik (2011, JFQA) compare HFs, traditional MFs, and what they refer to as "hedged mutual funds" (HMFs)
  - MFs that employ HF-like strategies but lack the incentive structure and regulatory freedom available to their HF counterparts

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Are HFs Just Glorified Mutual Funds?

- Although HMFs use strategies similar to those of HFs, they under-perform by about 3.3% per year after accounting for fees and risk
  - HMFs outperform traditional MFs

- Stulz (2007, JEP) points out that several industry trends will likely cause HFs to more closely resemble and converge to MFs:
  - Increased belief they take too much risk or that their actions desta-bilize financial markets may result in increased regulation
  - Because HFs' clientele shifted from primarily high net worth indivi-duals to institutional investors, their risk taking may decrease in the face of monitoring by these institutions fulfilling fiduciary duties

- Ackermann, McEnally, and Ravenscraft (1999, JF) use Sharpe ratios and find mixed evidence of hedge funds outperforming primary asset classes such as stock and bond indices

- Recently, Bali, Brown, and Demirtas (2013, MS) revisit this issue by addressing the documented limitations of Sharpe ratio

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Are HFs Just Glorified Mutual Funds?

Source: Olivier (2016), Bocconi MSc. thesis

The distribution of realized performances are considerable asymmetric

The dispersion of the Sharpe ratios is considerable

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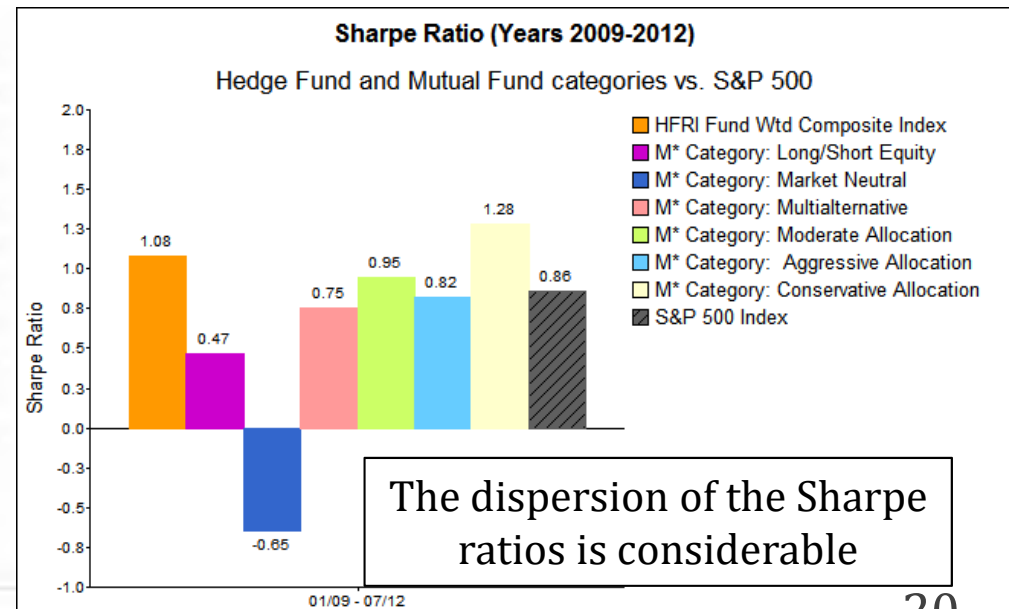
Are HFs Just Glorified Mutual Funds?

- o HF payoffs are nonlinear due to dynamic option-like strategies
- o This can potentially lead to non-normality of fund returns, making Sharpe ratio a less appropriate measure of HF performance
- Standard deviation and historical beta measures can be misleading because the strategies listed frequently display decidedly non-normal return distributions

Index	Mean	St. Dev.	Skewness	Excess Kurtosis	Correl. w/ Russell 1000
Hedge Fund (all)	0.48	2.06	-0.30	2.88	0.59
Convertible Arbitrage	0.37	1.89	-2.64	17.39	0.38
Dedicated Short Bias	-0.60	4.71	0.72	1.59	-0.79
Emerging Markets	0.44	4.07	-0.85	5.94	0.55
Equity Market Neutral	0.22	2.80	-12.50	181.20	0.30
Event Driven	0.53	1.76	-2.24	11.65	0.65
Fixed Income Arbitrage	0.23	1.57	-4.47	32.93	0.34
Global Macro	0.68	2.64	-0.06	4.53	0.24
Long/Short Equity	0.56	2.73	-0.11	3.63	0.70
Managed Futures	0.26	3.31	0.00	-0.01	-0.08

O'Doherty, M. S., Savin, N. E., & Tiwari, A. (2016). Hedge Fund Replication: A Model Combination Approach. *Review of Finance*, *21*(4), 1767-1804.

Mean-Variance Allocations for Hedge Funds?

- Mean-variance optimizers tend to generate massive weights to HFs
  - Usually helpful to constrain the set of solutions by eliminating solutions that are too risky, too illiquid, involve too much leverage, or are outside the feasible investment universe
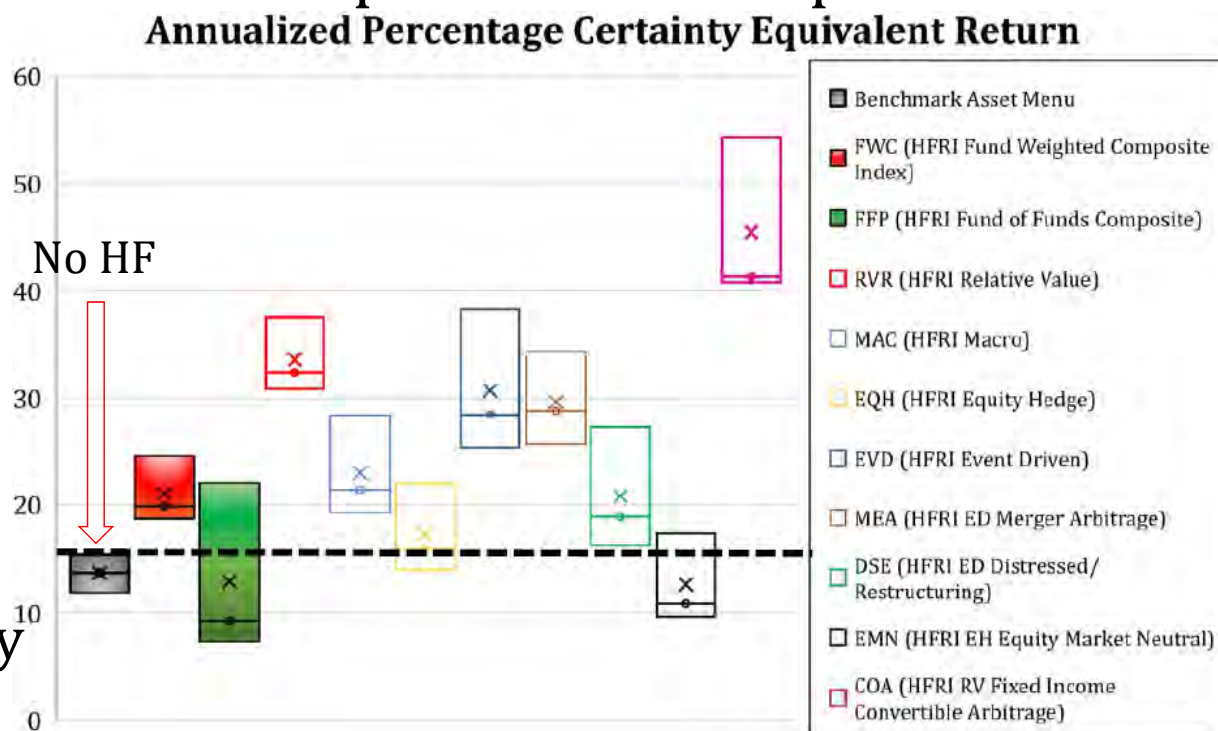
Optimization Parameters			Characteristics of Optimal Portfolio			Optimal Portfolio Weights													
Maximum Volatility	Maximum Auto-correlation	Shorting Constraints	Optimized Annualized Return	Optimized Annualized Volatility	Optimized Auto-correlation	3 Month Treasury Bills	S&P 500 Total Return Index	Barclay U.S. Aggregate Bond Index	Convertible Arbitrage	Dedicated Short Bias	Emerging Markets	Equity Market Neutral	Event Driven	Fixed Income Arbitrage	Global Macro	Long/Short Equity Hedge	Managed Futures	Multi-Strategy	Fund of Funds
0.05	0.1	Long Only	6.8%	5.0%	0.10	0.00	0.15	0.54	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.30	0.00	0.00	0.00
0.05	0.25	Long Only	6.8%	5.0%	0.17	0.00	0.12	0.43	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.27	0.00	0.00	0.00
0.05	0.4	Long Only	6.8%	5.0%	0.17	0.00	0.12	0.43	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.27	0.00	0.00	0.00
0.1	0.1	Long Only	8.2%	10.0%	0.10	0.00	0.54	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00
0.1	0.25	Long Only	8.3%	10.0%	0.16	0.00	0.34	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00
0.1	0.4	Long Only	8.3%	10.0%	0.16	0.00	0.34	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00
0.15	0.1	Long Only	9.4%	15.0%	0.09	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
0.15	0.25	Long Only	9.4%	15.0%	0.09	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
0.15	0.4	Long Only	9.4%	15.0%	0.09	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
0.2	0.1	Long Only	9.4%	15.4%	0.08	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.2	0.25	Long Only	9.4%	15.4%	0.08	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.2	0.4	Long Only	9.4%	15.4%	0.08	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.05	0.1	Can Short T-bills	8.6%	5.0%	0.10	-1.06	0.03	1.12	0.00	0.13	0.00	0.27	0.24	0.00	0.01	0.22	0.04	0.00	0.00
0.05	0.25	Can Short T-bills	8.8%	5.0%	0.17	-1.11	0.02	1.03	0.00	0.12	0.00	0.37	0.42	0.00	0.00	0.14	0.02	0.00	0.00
0.05	0.4	Can Short T-bills	8.8%	5.0%	0.16	-1.12	0.02	1.03	0.00	0.12	0.00	0.39	0.40	0.00	0.00	0.14	0.02	0.00	0.00
0.05	0.1	Can Short Anything	12.0%	5.0%	0.10	-0.60	-0.06	0.75	-0.46	0.16	0.11	0.03	0.86	0.25	0.21	0.72	0.09	0.76	-1.82
0.05	0.25	Can Short Anything	12.1%	5.0%	0.14	-0.55	-0.06	0.76	-0.40	0.15	0.12	0.01	0.92	0.19	0.20	0.69	0.10	0.74	-1.88
0.05	0.4	Can Short Anything	12.1%	5.0%	0.14	-0.54	-0.06	0.76	-0.40	0.15	0.12	0.01	0.92	0.20	0.21	0.69	0.10	0.73	-1.89
0.1	0.1	Can Short Anything	21.4%	10.0%	0.10	-2.27	-0.12	1.50	-0.96	0.33	0.20	0.09	1.77	0.49	0.38	1.42	0.19	1.48	-3.50
0.1	0.25	Can Short Anything	21.5%	10.0%	0.14	-2.15	-0.11	1.51	-0.80	0.32	0.20	0.07	1.88	0.35	0.37	1.37	0.21	1.46	-3.66
0.1	0.4	Can Short Anything	21.5%	10.0%	0.14	-2.14	-0.11	1.51	-0.80	0.31	0.21	0.06	1.87	0.36	0.37	1.36	0.21	1.46	-3.68
0.15	0.1	Can Short Anything	30.8%	15.0%	0.10	-3.91	-0.18	2.23	-1.43	0.50	0.29	0.15	2.61	0.71	0.56	2.17	0.28	2.25	-5.23
0.15	0.25	Can Short Anything	31.0%	15.0%	0.14	-3.71	-0.16	2.25	-1.21	0.48	0.31	0.11	2.79	0.50	0.53	2.07	0.31	2.22	-5.49
0.15	0.4	Can Short Anything	31.0%	15.0%	0.15	-3.71	-0.17	2.26	-1.20	0.47	0.31	0.09	2.80	0.54	0.55	2.05	0.31	2.19	-5.50
0.2	0.1	Can Short Anything	40.2%	20.0%	0.10	-5.54	-0.24	2.98	-1.92	0.66	0.38	0.21	3.45	0.94	0.74	2.90	0.36	3.02	-6.95
0.2	0.25	Can Short Anything	40.4%	20.0%	0.14	-5.26	-0.22	3.03	-1.64	0.64	0.42	0.14	3.70	0.65	0.69	2.79	0.40	2.94	-7.30
0.2	0.4	Can Short Anything	40.4%	20.0%	0.14	-5.27	-0.22	3.01	-1.62	0.64	0.41	0.15	3.71	0.66	0.70	2.77	0.41	2.95	-7.30

Mean-Variance Allocations for Hedge Funds?

- Historical data show that HFs have not, on average, outperformed traditional ptfs of stocks and bonds after fees
  - On avg., once returns have been adjusted for various sampling biases, HFs do not routinely generate double-digit returns
- However, the ride for HF investors has generally been "smoother"
- There are a number of styles of HF investing: while many are correlated and have much in common, on the whole they are a heterogeneous lot: some are as dissimilar as stocks and bonds
- Guidolin & Orlov (2018,https://www.institutionalinvestor.com/article/b1bk9v1c38jk3v/Are-These-the-Best-Hedge-Fund-Strategies) study the optimal allocation to HF strategies allowing for predictability across two alternative allocations
  - Those that exclude HFs from the asset menu
  - Those that abstain from exploiting predictability
- Because there is evidence (see below) that simple quadratic, MV preferences may inappropriate for HFs, they solve for optimal portfolios under expected power utility and assess OOS evidence
  - The predictors are both classical (e.g., dividend yield) and HF-specific

Mean-Variance Allocations for Hedge Funds?

- Not all HFs are likely to benefit a long-term investor already well diversified in stocks, government and corporate bonds, and REITs
- Only strategies whose payoffs are highly nonlinear (relative value, merger arbitrage, distressed restructuring, convertible arbitrage), and therefore not easily replicable, constitute viable options
- HF strategies which are well diversified (e.g., fund of funds) or which invest primarily in stocks (e.g., equity market neutral) may result in lower utility relative to the optimal baseline portfolio
- Medium to highly risk-averse investors benefit the most from this alternative asset class
  - HFs do not increase realized OOS Sharpe ratios
 - However, they create right-skewness and may deflate tails

Annualized Percentage Certainty Equivalent Return

No HF

- Benchmark Asset Menu
- FWC (HFRI Fund Weighted Composite Index)
- FFP (HFRI Fund of Funds Composite)
- RVR (HFRI Relative Value)
- MAC (HFRI Macro)
- EQH (HFRI Equity Hedge)
- EVD (HFRI Event Driven)
- MEA (HFRI ED Merger Arbitrage)
- DSE (HFRI ED Distressed/Restructuring)
- EMN (HFRI EH Equity Market Neutral)
- COA (HFRI RV Fixed Income Convertible Arbitrage)

Mean-Variance Allocations for Hedge Funds?

Annualized Mean
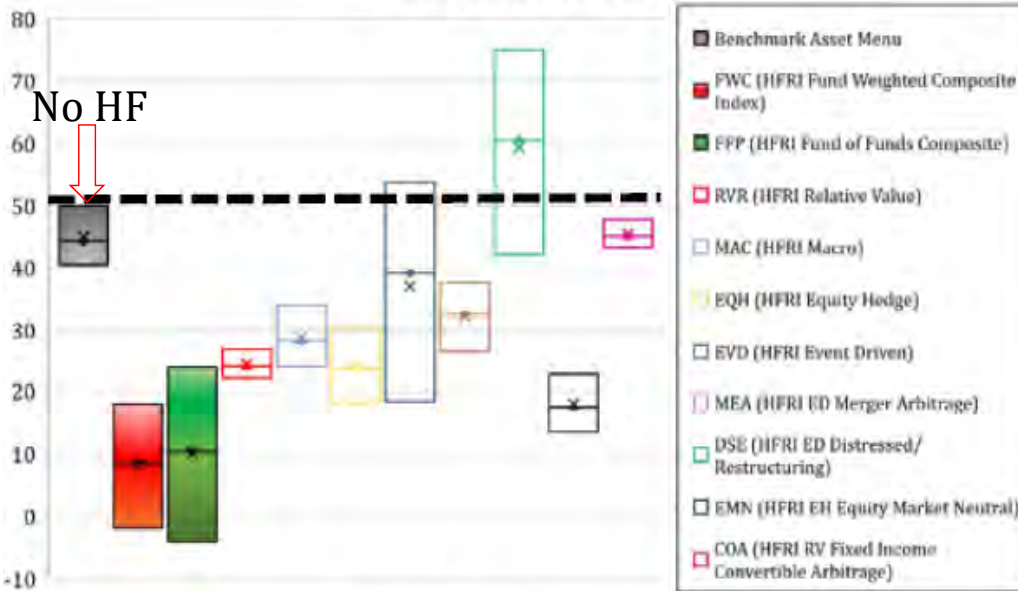
Annualized Sharpe Ratio
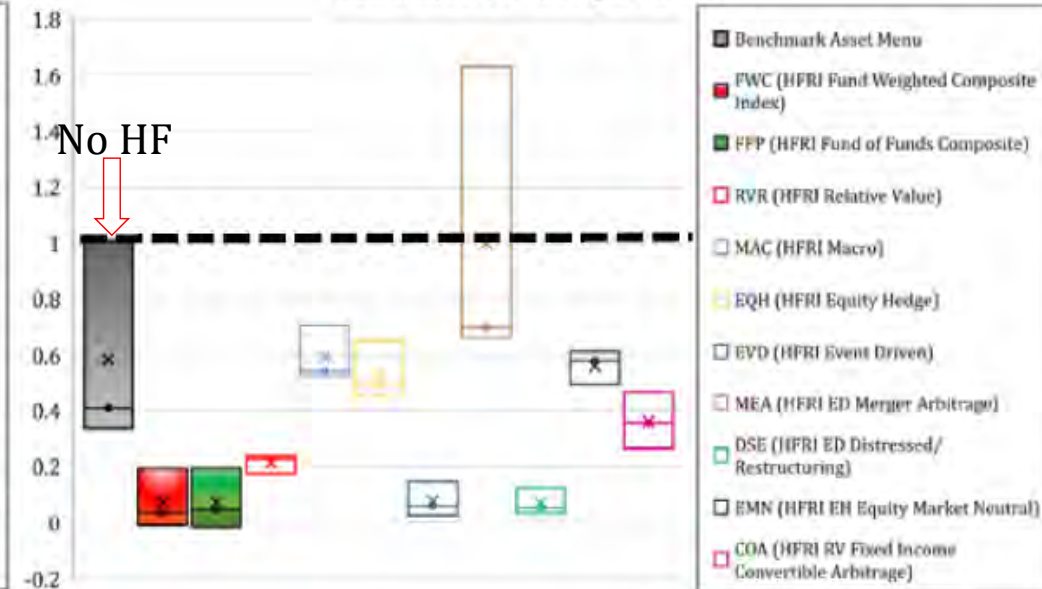
Portfolio Skewness

Portfolio Kurtosis

Lecture 7: What Do We Know About Hedge Funds? – Prof. Guidolin

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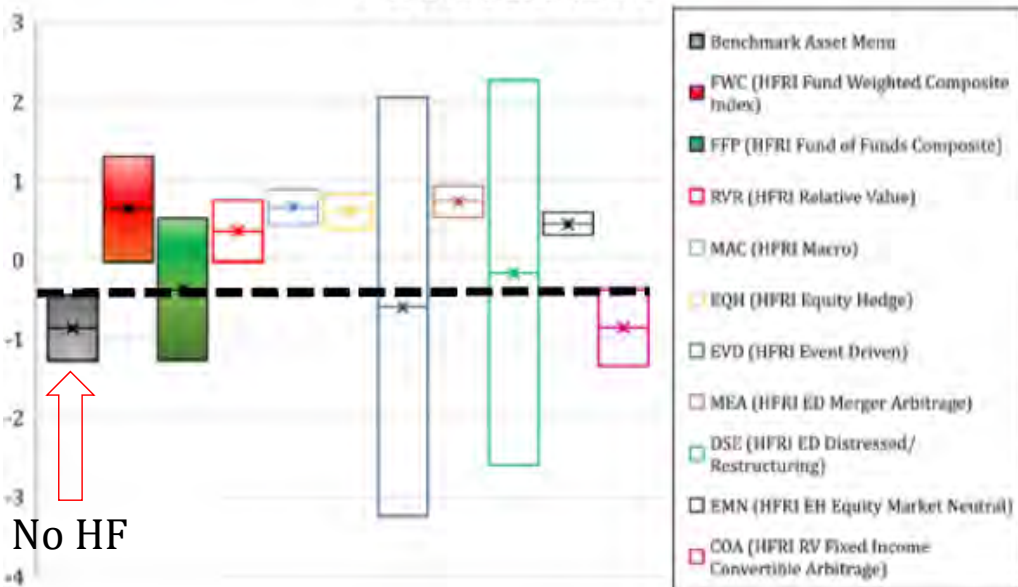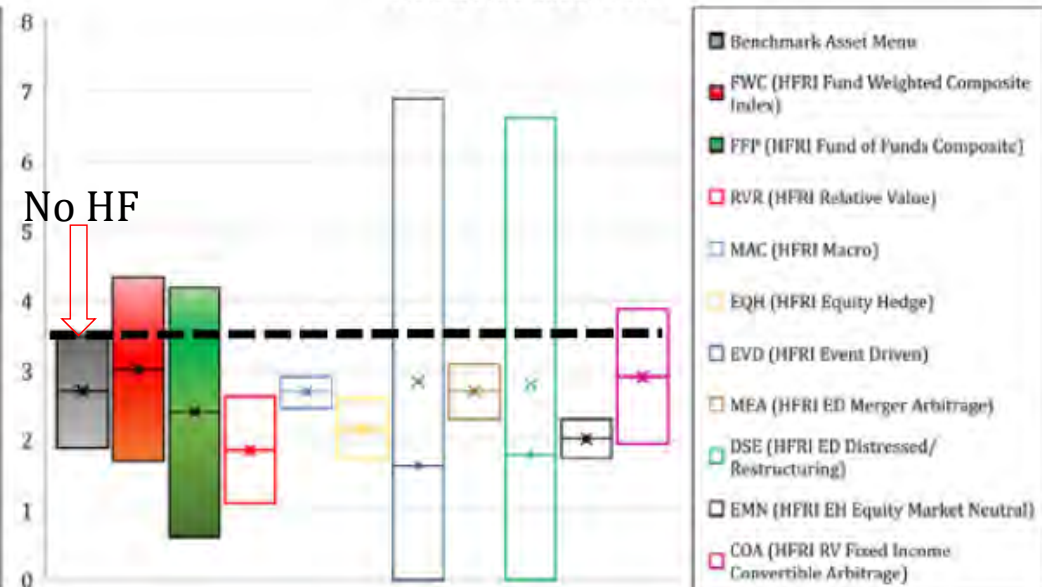
How Do HFs Generate Performance? Do They Hedge?

- **How do HFs generate returns**,? Employ linear multifactor models
  - Betas correspond to the component of the fund's return related to its exposure to different systematic risk factors
  - Alpha is the portion of the HF return not explained by the risk factors

$$(R_h - R_f) \quad = \quad \alpha + \beta (R_i - R_f) + e_h$$

  - A fund is said to be market neutral if its returns are uncorrelated with those of market indices or a collection of other systematic risk factors

- Early studies concluded that HFs had low risk exposure to the U.S. equity market (see Fung and Hsieh, 1997, RFS; Liang, 1999, FAJ)

Figure 1

Lecture 7: What Do We Know About Hedge Funds? – Prof. Guidolin
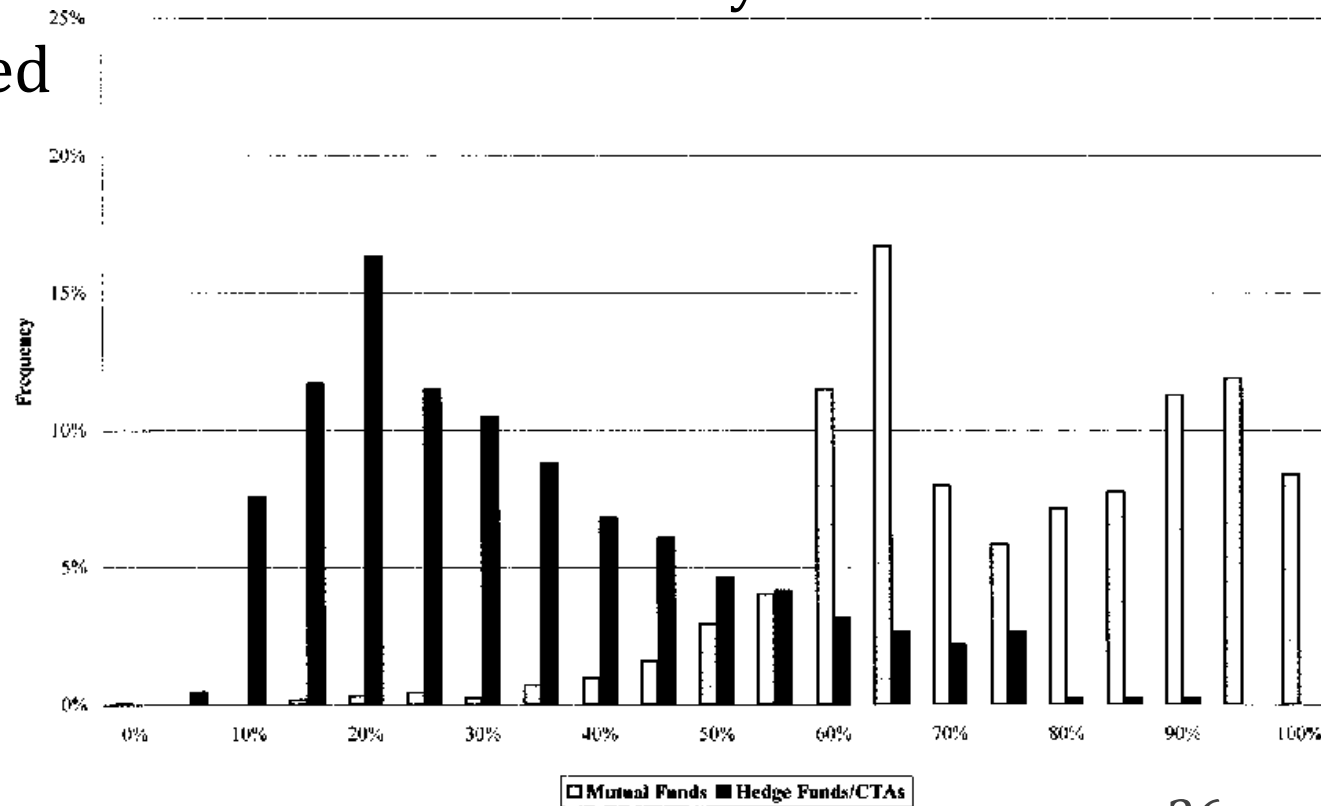
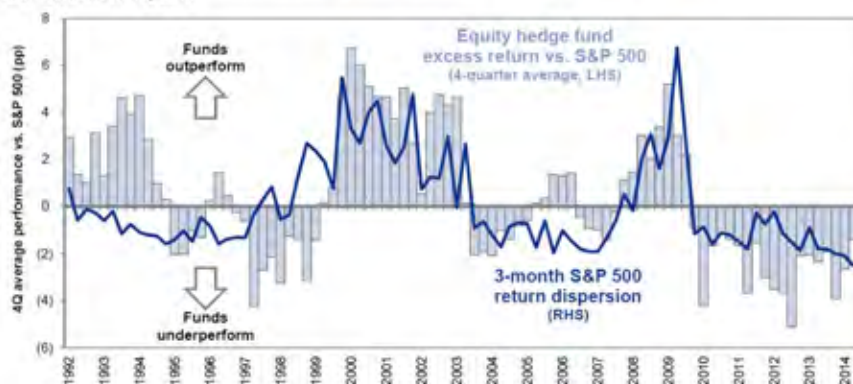# How Do HFs Generate Performance? Do They Hedge?

- Recent studies have revisited HFs' claims of market neutrality: Patton (2009, RFS) extends the linear notion of correlation to more broadly define neutrality
  - He uses 5 measures of neutrality: mean neutrality, variance neutrality, VaR neutrality, tail neutrality, and complete neutrality
- Only about 25% of so-called market neutral funds are truly neutral
  - However, the percentage of funds that are truly neutral is the highest for the group of funds claiming to follow a market neutral strategy

Chart 2: A wide range of correlation with S&P 500 across HF strategies
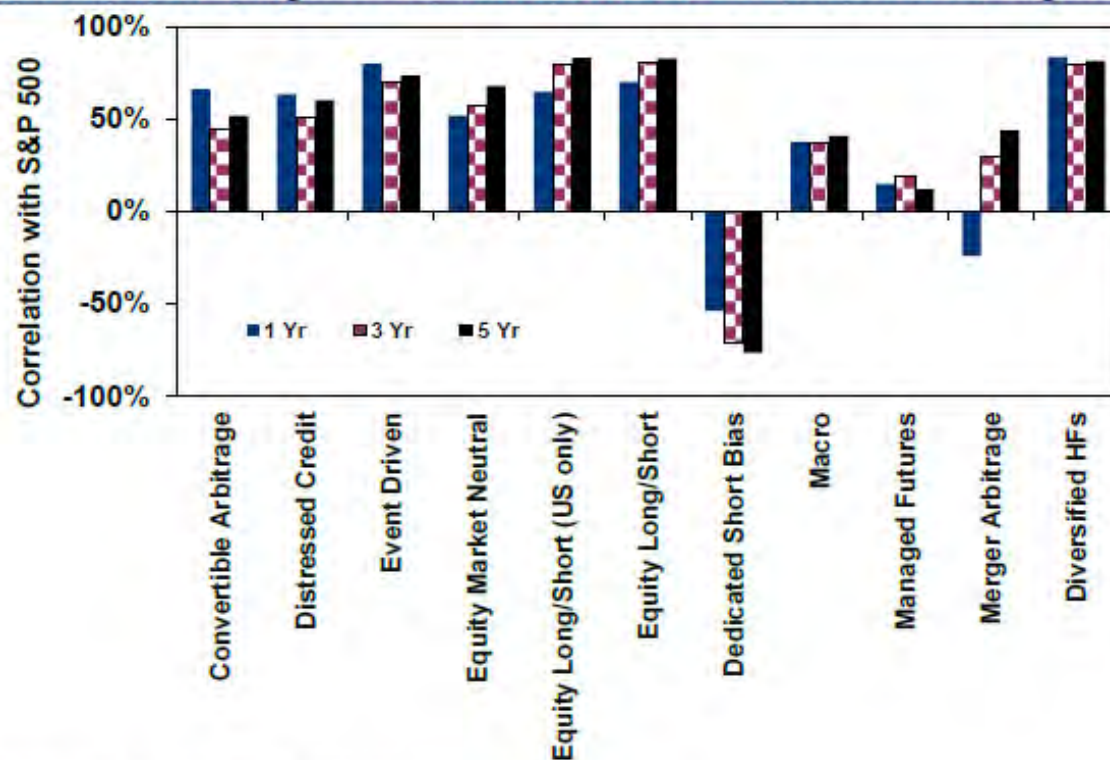
Source: BofA Merrill Lynch Global Research, Bloomberg

Exhibit 2: Low dispersion environments present challenges for hedge fund performance
As of November 14, 2014

Source: HFR and Goldman Sachs Global Investment Research.

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How Do HFs Generate Performance? Do They Hedge?

Graph A. 7-Factor Model
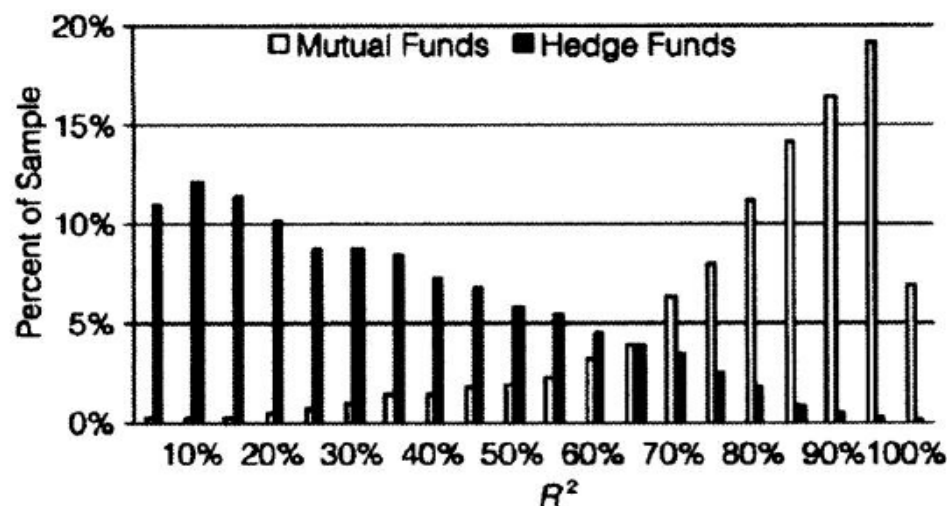
Graph B. 14-Factor Model
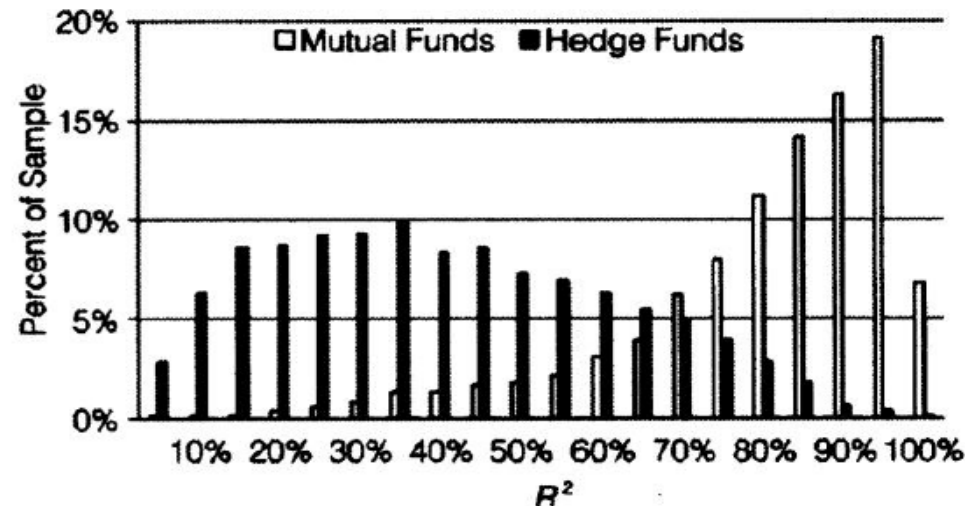
Graph C. 7-Factor Switching Model
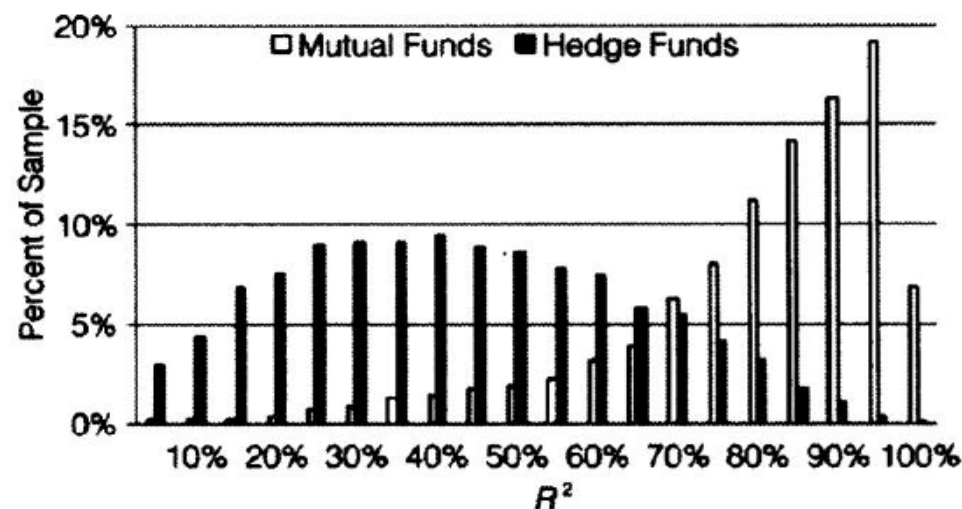
Graph D. 14-Factor Switching Model

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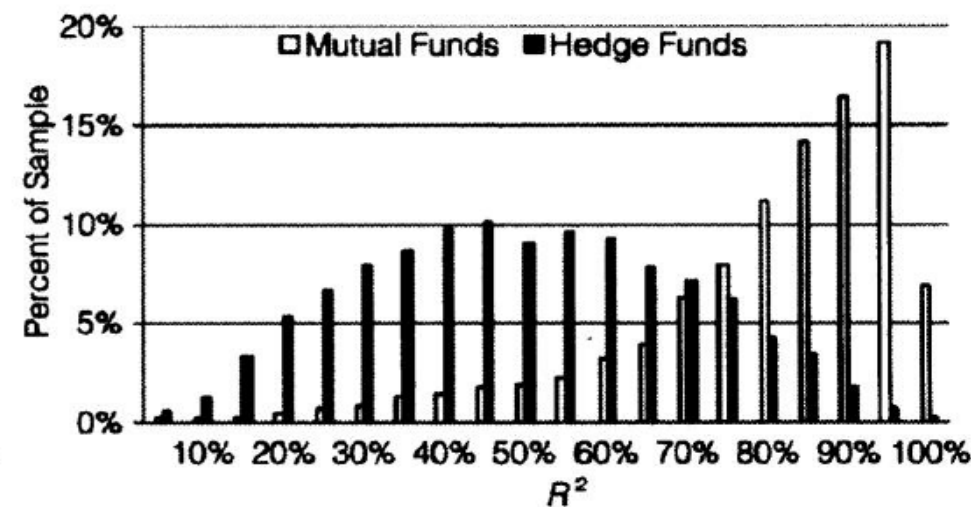
How Do HFs Generate Performance? Do They Hedge?

- Bali, Brown and Caglayan (2012, JFE) stress that if HFs are not neutral, they are exposed to systematic risks (default premium and inflation shocks) that must predict performance

- Funds in the highest SR quintile generate 6% more average annual returns compared with funds in the lowest SR quintile

- Systematic risk is able to predict future fund returns

- Given the evidence that HFs are exposed to significant systematic risk, the literature has used 2 different approaches to attribute HFs' performance to risk:

1 Identify pre-specified factors explaining HF performance in a "top-down" way, from returns to generating process

R² For Risk Factor Regressions Of Hedge Fund Strategies

Source: eVestment

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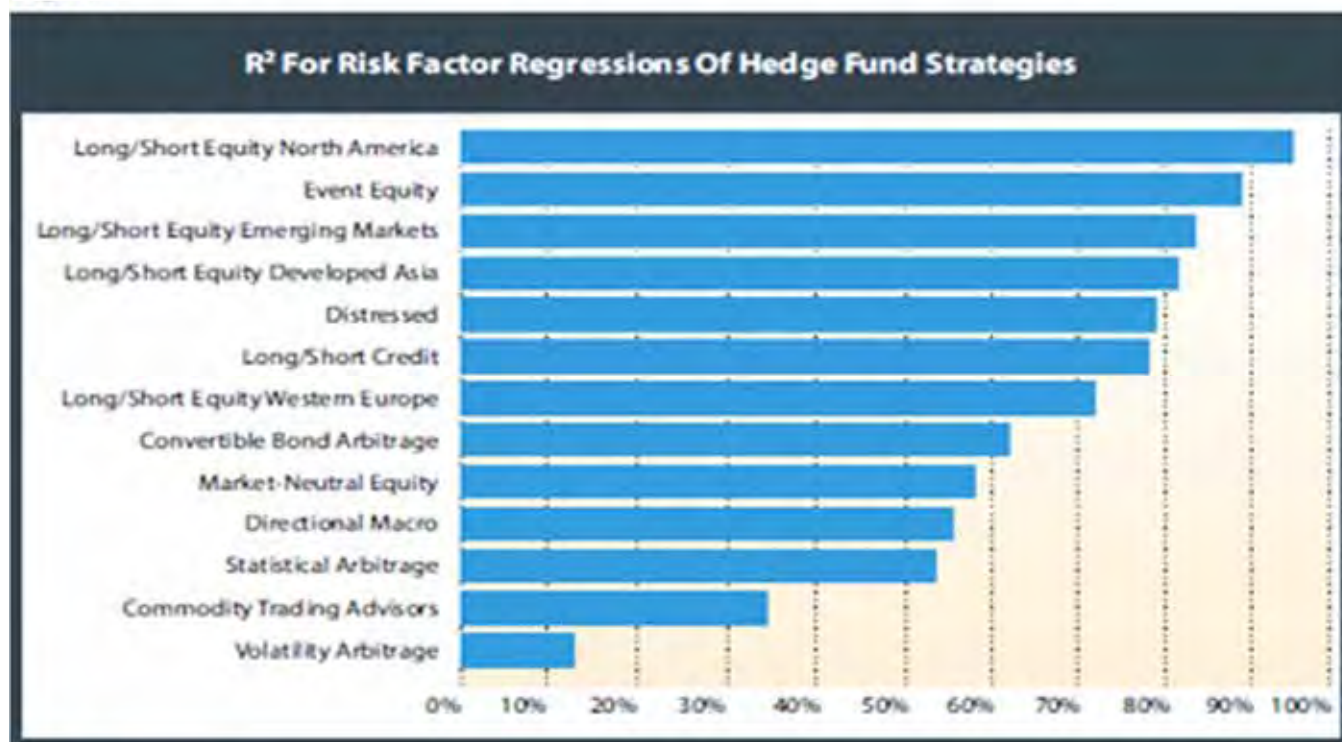
How Do HFs Generate Performance? Do They Hedge?

- Ang (2014) claims that HF are just ptfs. of exposures to equity and volatility risk, that they would simply «re-package»

- The HF index is the key HFR index and the volatility factor is compiled by Merrill Lynch and is a return series from a short volatility strategy (selling VIX insurance)

- Partial correlations are estimated from monthly data from Jan. 2000 to Sept. 2012 and they control for the effect of other vars

- Only for the long-short HFs, of which a large number are quant funds, is the partial correlation with equity market risk low at 0.11 and statistically insignificant

- The partial correlations of HF returns with the volatility risk factor are somewhat smaller but still quite large

Hedge Fund Partial Correlations	*Equity*	Volatility
HF Index	0.664	0.262
p-value	0.00	0.00
Distress	0.411	0.440
p-value	0.00	0.00
Merger Arbitrage	0.453	0.195
p-value	0.00	0.02
Equity Long/Short	0.106	0.175
p-value	0.19	0.03
Emerging Markets	0.616	0.297
p-value	0.00	0.00
Event Driven	0.624	0.384
p-value	0.00	0.00
Macro	0.399	−0.340
p-value	0.00	0.00
Relative Value	0.330	0.646
p-value	0.00	0.00
Convertible Arbitrage	0.180	0.657
p-value	0.03	0.00

Lecture 7: What Do We Know About Hedge Funds? – Prof. Guidolin

How Do HFs Generate Performance? Do They Hedge?

- We picture a short volatility payoff
- Most of the time, HFs collect small and steady premiums equal to the put price; these profits seem "alpha"
- This premium does not come for free: there are occasional large losses when the assets fall sharply in price

- The losses are higher vs. just put-selling because HFs use leverage
- As losses are rare, for long periods it may be confused with alpha from long-only positions in plain-vanilla fixed income and equities
  - This is actually the payoff of a rebalancing strategy, see Appendix A
  - Only some HFs are put buyers, generating small losses most of the time but making a killing when markets tank: these funds (e.g., http:// www.universa.net/home.html) lose money in the long run as they fail to short volatility and do not earn a volatility risk premium
- If most individual HF styles are short volatility, then the entire HF industry is just a short put, see Jurek and Stafford (2015, JF)

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How Do HFs Generate Performance? Do They Hedge?

Estimated proportion of manager risk explained by equity beta
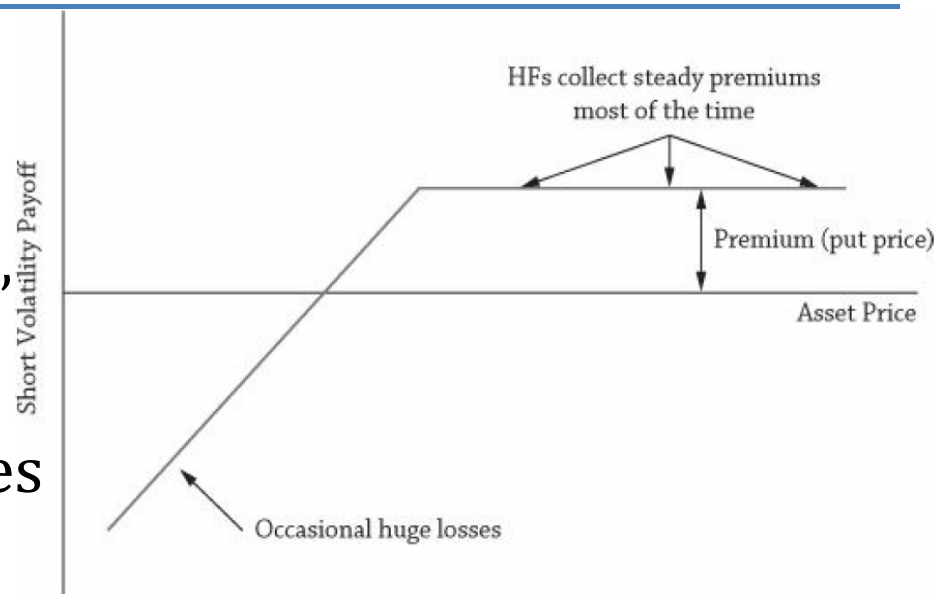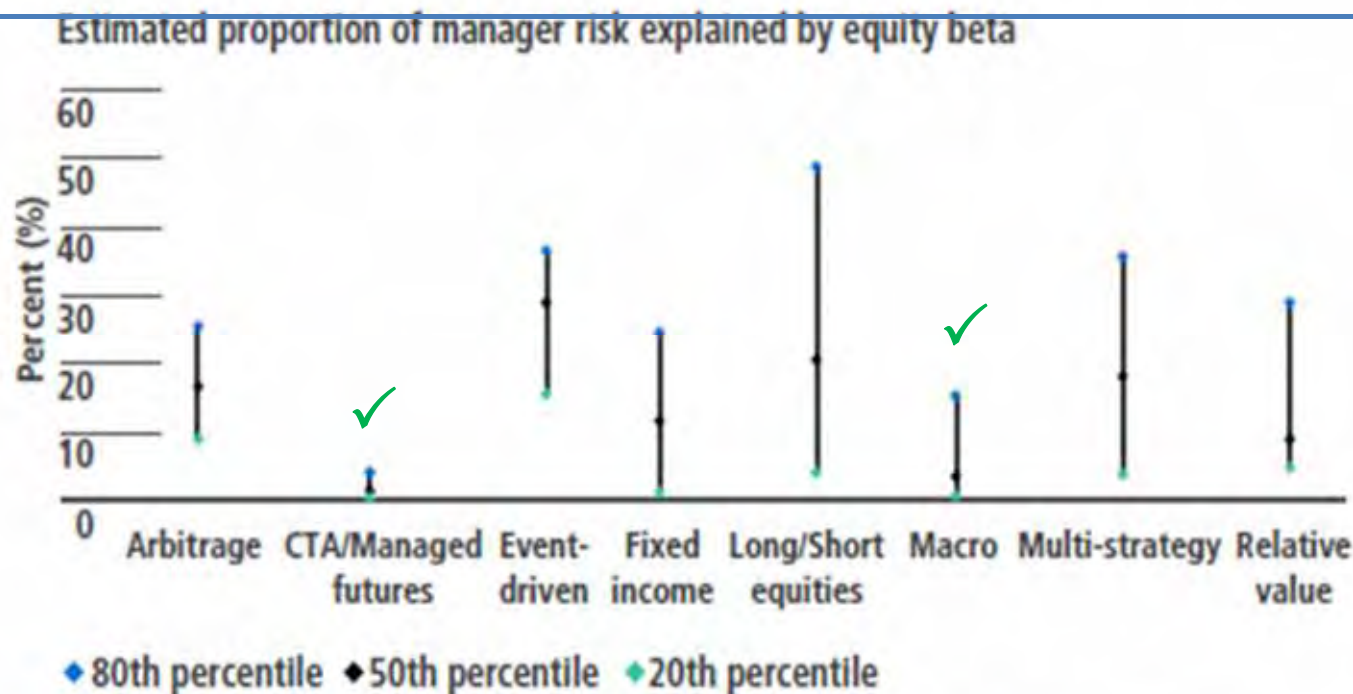
Source: Eurekahedge and PIMCO. Based on returns from 30 September 2009 through 30 June 2016.

❷ Replicate ptfs. by trading in the underlying securities obtaining the asset-based style factors, see Fung and Hsieh (2002, FAJ), in a "bottom-up" fashion, from the characteristics of securities to styles

- While the strategies analyzed and the securities used to construct factors differ, the finding is that HFs have nonlinear risk exposure
  - E.g., Duarte, Longstaff, and Yu (2007, RFS) apply ABS approach to fixed income strategies to find that a range of them generate positive alpha, after accounting for bond and equity market risks and fees

How Do HFs Generate Performance? Do They Hedge?

- o They suggest that alpha comes from the need of "intellectual capital"
- However, HF alpha is often significantly lower after accounting for the risks spanned by the benchmarks, transaction costs, and fees
- Researchers have typically augmented the multifactor models used for MFs with risk factors constructed from options to capture the significant nonlinearities in HF returns

$$r_t^i = \alpha^i + \beta^{1,i} \text{SNPMRF}_t + \beta^{2,i} \text{SCMLC}_t + \beta^{3,i} \text{BD10RET}_t + \beta^{4,i} \text{BAAMTSY}_t$$

$$+ \beta^{5,i} \text{PTFSBD}_t + \beta^{6,i} \text{PTFSFX}_t + \beta^{7,i} \text{PTFSCOM}_t + \varepsilon_t^i,$$

See Appendix for details
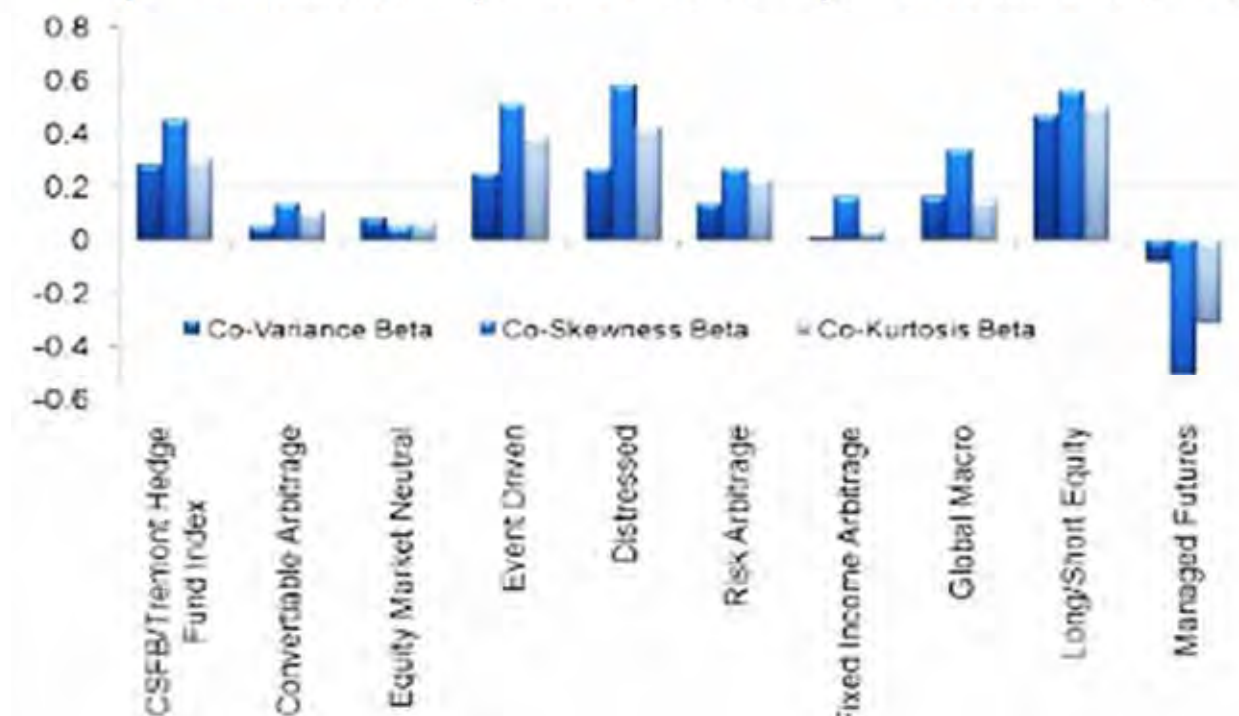
Are Hedge Fund Managers Skilled?

- Early literature typically concluded that HF managers generate positive, statistically significant risk-adjusted performance (Ackermann, McEnally and Ravenscraft, 1999, JF; Liang, 1999, FAJ)

- However Fung and Hsieh (2001, RFS) expressed doubts as, when compared to MFs, HFs prefer smaller, opaque value securities, and have higher turnover and more active share bets; decomposing returns into three components, HFs are better than mutual funds at stock picking by only 1.32% per year on a value-weighted basis

  - This result is insignificant on an equal-weighted basis or with price-to-sales benchmarks

- HFs exhibit no ability to time sectors or pick better stock styles and there is only weak evidence of differential ability between hedge funds
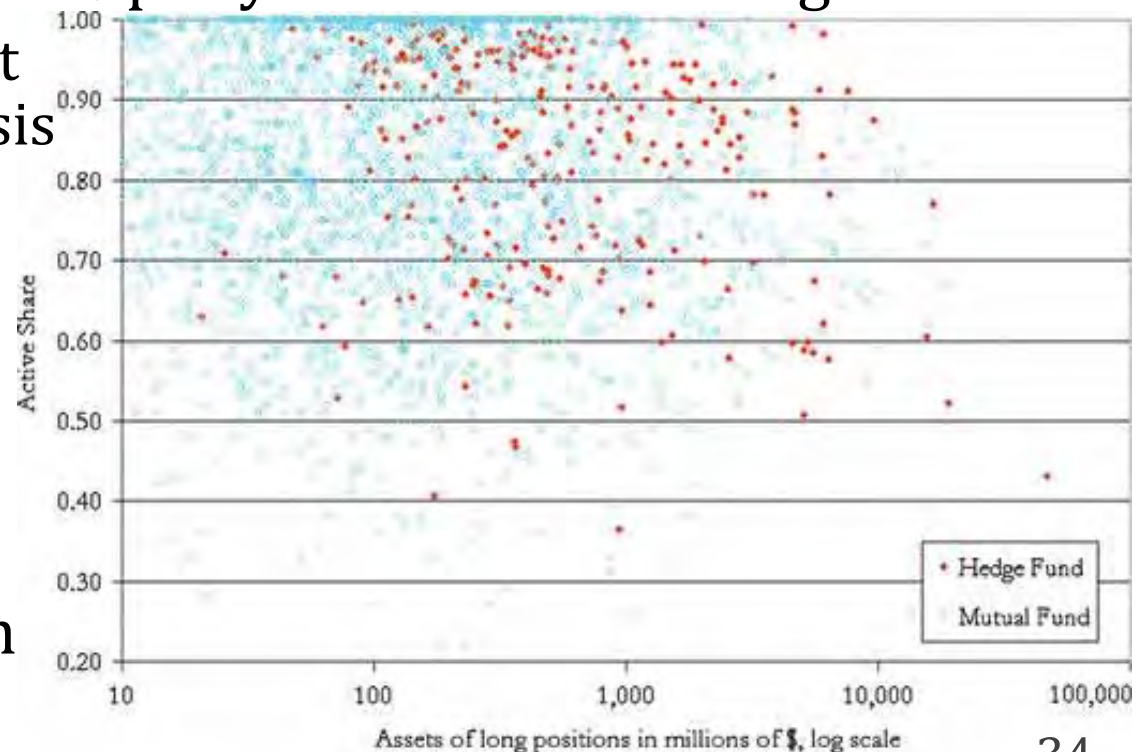
Are Hedge Fund Managers Skilled?

- Avramov, Kosowski, Naik, and Teo (2011, RFS) observe that some strategies, such as global macro, perform better in times of crisis than others, such as equity long/short

- They show that HF strategies that allow for predictability based on business cycles outperform those that do not by 13% per annum
  - Conditioning on macroeconomic variables is particularly important in directional and security selection strategies

- Chen, Cliff, and Zhao (2017, JFQA) use the Expectation-Maximization algorithm to infer managerial skill
  - Their method assumes managers fall into a discrete number of skill categories and controls for both type-I (false discovery) and type-II (false non-discoveries) errors

From Fung and Hsieh's 7-factor model
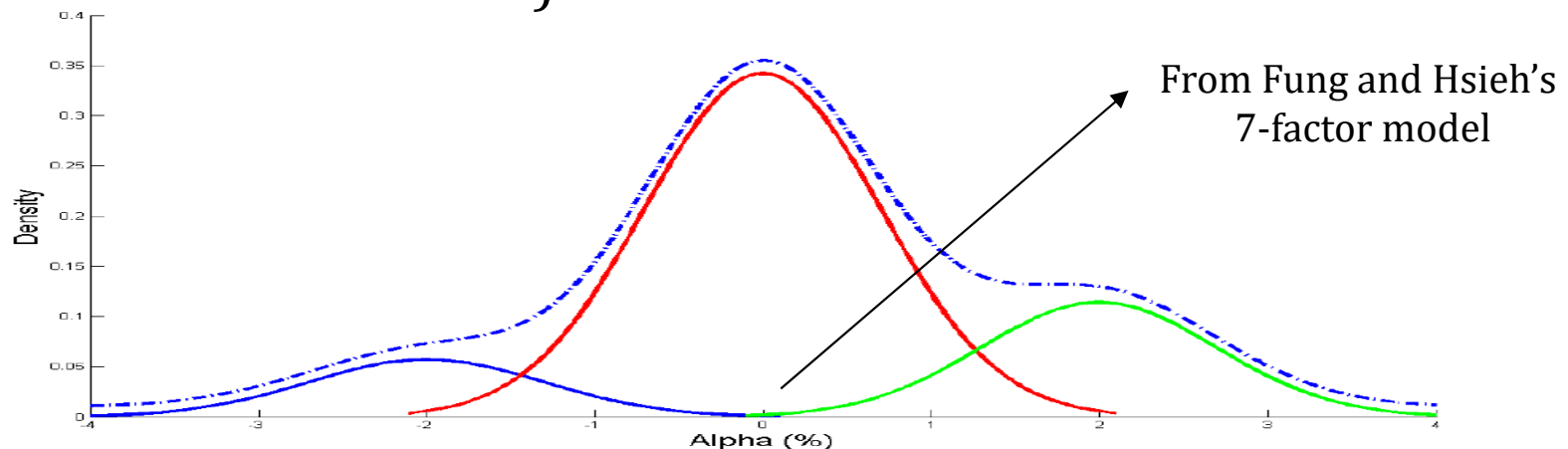
Are Hedge Fund Managers Skilled?

- o At individual fund level, they construct a new performance measure —the conditional prob. a fund comes from the highest-skilled group
- o This performance measure incorporates both a fund's estimated alpha and the information about the cross-sectional fund skill
- o When estimated alpha is very noisy with large estimation error, the measure relies more on cross-sectional information
- Empirically, a mixture of 4 skill groups best fits the empirical distribution of actual fund performance
  - o The first two groups have positive alpha, including 9% top funds with 0.72%/month and 38% good funds with alpha of 0.35%/month
  - o 43% of the funds are neutral with zero-alpha after fees and 9% are deemed as bad funds with alpha of −0.80%/month
- They report that ca. 50% of hedge fund managers possess skill
- Another way to distinguish between luck and managerial skill is to examine whether a manager's abnormal performance is persistent
- The general conclusion of early studies was that performance persistence is scarce and, if present, only lasts for short horizons

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Are Hedge Fund Managers Skilled?

Transition probabilities

This table reports transition probabilities across the four skill groups from the current month to the next 3, 6 and 12 months. In each month from January 1996 through December 2011, we use a rolling window of the previous 24 months to evaluate fund skill and form four groups based on funds' conditional probabilities of being Excellent, Good, Neutral, and Bad. Then, for each skill group we report the portion of its funds that are Excellent, Good, Neutral, or Bad in the next 3, 6, and 12 months.

	Excellent	Good	Neutral	Bad
		Panel A: Next 3 months		
Excellent	58.64%	38.54%	2.59%	0.23%
Good	9.92%	70.77%	18.60%	0.70%
Neutral	0.81%	18.63%	69.23%	11.33%
Bad	0.33%	3.29%	37.20%	59.18%
		Panel B: Next 6 months		
Excellent	45.29%	47.32%	6.65%	0.73%
Good	11.70%	60.45%	25.62%	2.23%
Neutral	2.13%	25.29%	58.89%	13.69%
Bad	0.85%	8.99%	45.17%	44.99%
		Panel C: Next 12 months		
Excellent	30.23%	50.84%	16.60%	2.34%
Good	12.12%	50.32%	32.10%	5.45%
Neutral	4.90%	31.88%	49.06%	14.16%
Bad	2.88%	19.75%	49.37%	28.00%

Chen, Y., Cliff, M., & Zhao, H. (2017). Hedge funds: The good, the bad, and the lucky. *Journal of Financial and Quantitative Analysis, 52*(3), 1081-1109.

Lecture 7: What Do We Know About Hedge Funds? – Prof. Guidolin

How Can Hedge Funds Be?

- One of the most enduring challenges to the very existence of the HF industry is the Efficient Markets Hypothesis (EMH), the idea that market prices fully reflect all available information

- If the EMH holds, how can HFs earn "excess" expected returns

- One possible answer is that the EMH is false and HFs routinely exploit the departures from efficiency
  - This explanation does not account for the high failure rate in the HF industry, the capacity constraints that the most successful funds face, and the occasional periods of significant underperformance

- The other extreme is that EMH is true and HFs are simply taking on additional risk that have positive risk premia associated with them
  - Some empirical evidence for this view based on estimates of linear factor models for HF returns in which liquidity, credit, and volatility are statistically significant factors driving industry returns
  - HFs are «expensive», exotic beta (see Ang, 2014)
  - However, there are a number of inordinately successful managers that earn risk-adjusted returns even after controlling for such factors, including icons such as W. Buffett, D. Shaw, and G. Soros

How Can Hedge Funds Be?

- The theoretical foundations of the HF industry can be found in Grossman and Stiglitz (1980, AER): perfectly informationally efficient markets are an impossibility

- If markets are perfectly efficient, there is no profit to gathering information and there would be little reason to trade

- Alternatively, market efficiency is not a binary state but rather a continuum; the degree of market inefficiency determines the effort investors will expend to gather and trade on information

- Therefore, a non-degenerate equilibrium occurs only when there are sufficient profit opportunities, i.e., inefficiencies, to compensate investors for the costs of trading and information-gathering

- The profits earned by these industrious investors, here called HFs, are not free lunches, but the "economic rents"

- Who are paying these rents? Black (1986, JF) provides the answer: "noise traders", individuals who trade for non-informational reasons such as liquidity needs, ptf rebalancing trades, or misin-formation

Lecture 7: What Do We Know About Hedge Funds? – Prof. Guidolin

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How Can Hedge Funds Be?
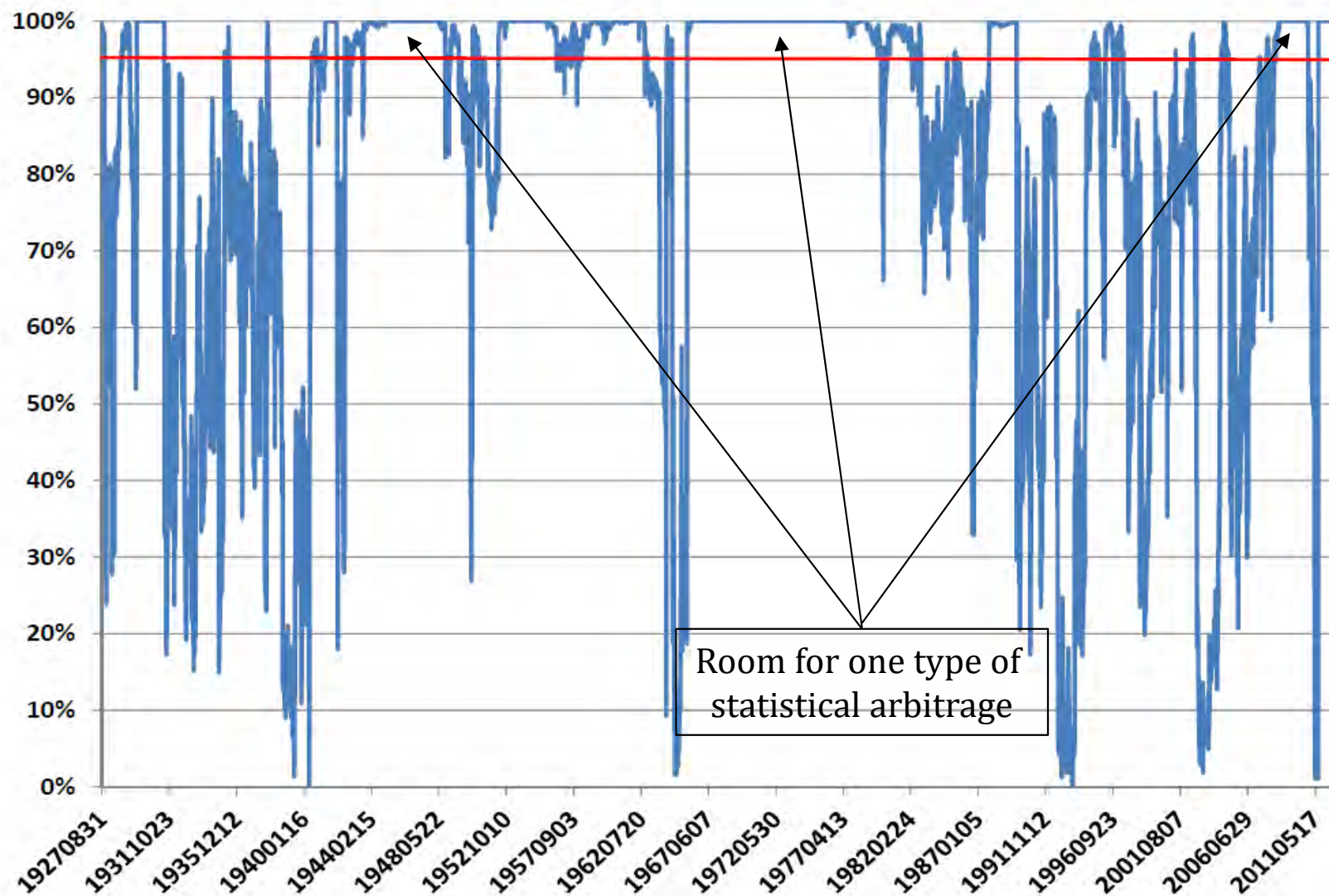
Figure 10: 500-day rolling-window statistical significance ($1-p$-value) of the Ljung-Box Q-statistic for autocorrelation in daily CRSP Value-Weighted Index returns using the first five autocorrelation coefficients, from August 31, 1927 through December 31, 2014. The red line denotes 95% significance, hence all realizations above this line are significant at the 5% level.

How Can Hedge Funds Be?

- There is yet another story for successful HFs and, hence, for the success of the HF industry: a systematic, priced effect of behavioral biases, in particular of overconfidence

- Experiments reveal that individuals are consistently poor asses-sors of probabilities
  - They use a variety of heuristics to estimate probabilities that can lead to biases (Tversky and Kahneman ,1974, Psych Bull) that are not random but instead correlated across subjects
  - People agree which particular player has a "hot hand" (Gilovich, Valone, and Tversky, 1985, Cogn Psycg), and they see the same nonexistent patterns in artificially generated as in real stock prices

- Experts and novices alike are too certain about their predictions given the true odds of being wrong

- Overconfidence in the precision of one's estimate does not arise from lack of concern by subjects for accuracy of their distributions
  - Students were more overconfident when their performance was linked to grades than when it was not
  - Overconfidence gets worse when the difficulty of the task increases

Hedge Funds Through Hard Times?

- The GFC and following pe-riod have been tough on HFs

- Barclays calculates that the avg. monthly alpha has declined to -0.07% from 2011 to May 2016 compared to an average of +0.48% for the period 1993–2016

- Below, we plot the relationship between the 36-month trailing excess returns versus the 36-month st. dev. over various mkt cycles ('93 – '98, '99 – '02, '03 –'07, '08 –'11, '12 –'16)

- Apart from the 1st mkt cycle in the early to mid '90s, avg. returns have been decreasing steadily

FIGURE 2: HF Performance – Excess Returns (I / III)

Cumulative HF Alpha / Excess Returns (1993 – May 2016)[1]

Peak cumulative alpha: 139%

1. HFR, S&P 500, Barclays Strategic Consulting analysis. Performance is calculated net of different exposures. Between 1993 – May 2016 exposures were: 0.21 to S&P 500, (0.08) to Barclays Aggregate and 0.30 to Barclays HY Index

FIGURE 3: HF Performance – Excess Returns (II / III)

HF 36-Month Trailing Excess Returns and Standard Deviation (1993 – May 2016)[1]

Early to mid 1990s

Early to mid 2000s

Dot com bubble

Financial crisis and recovery

Recent 5 years

Average 36-Month Trailing Excess Returns (Monthly)

Standard Deviation of 36-Month Trailing Excess Returns

'93 – '98   '99 – '02   '03 – '07   '08 – '11   '12 – '16

1. HFR, S&P 500, Barclays Strategic Consulting analysis. Performance is calculated net of different exposures. Between 1993 – May 2016 exposures were 0.21 to S&P 500, (0.08) to Barclays Agg and 0.30 to Barclays HY Index. Risk is standard deviation of 36-month rolling Alpha

Hedge Funds Through Hard Times?

Mastered by the universe

Assets under management
Worldwide, $trn — Chart 1

Hedge funds

Exchange-traded funds and products

Source: ETFGI and Hedge Fund Research

Hedge-fund returns*
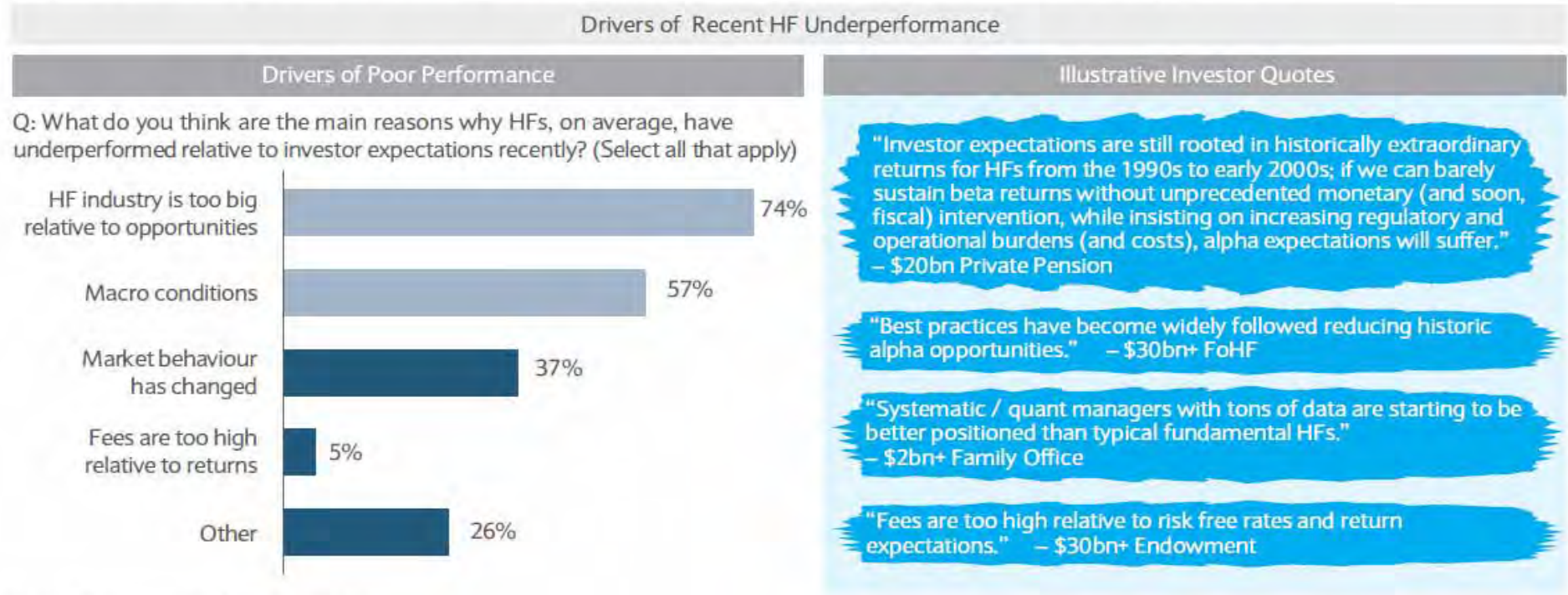Five-year rolling average, % — Chart 2
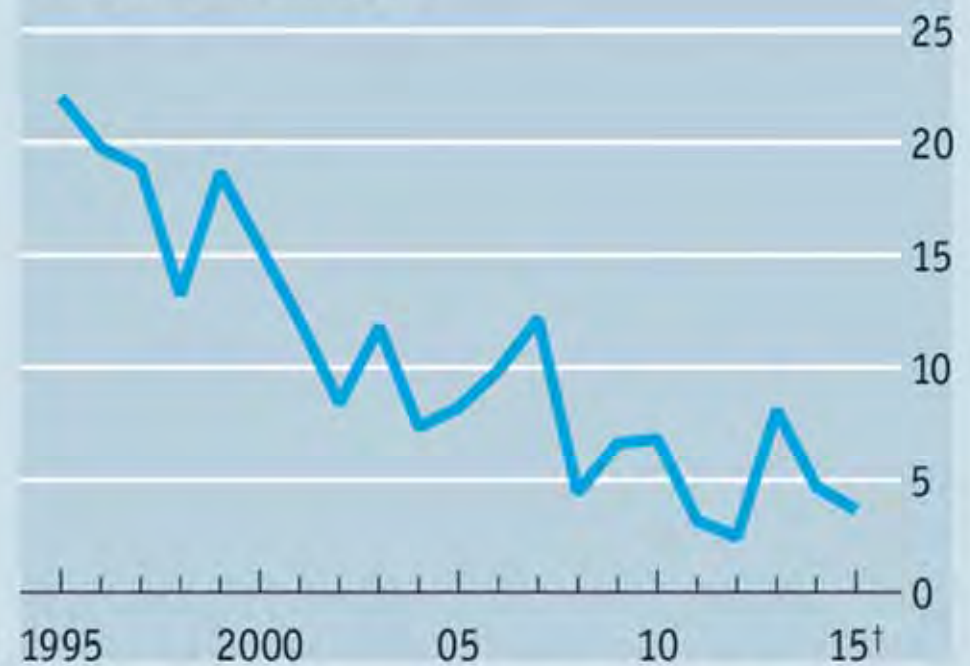
*Hedge Fund Research's weighted index of 2,200 funds   †To June

Economist.com

Hedge Funds Through Hard Times?

- What do HFs blame their own underperformance on?

FIGURE 5: Drivers of Recent HF Underperformance

The size of the industry and macro conditions are the most often-cited reasons by investors for recent HF underperformance

Drivers of Recent HF Underperformance

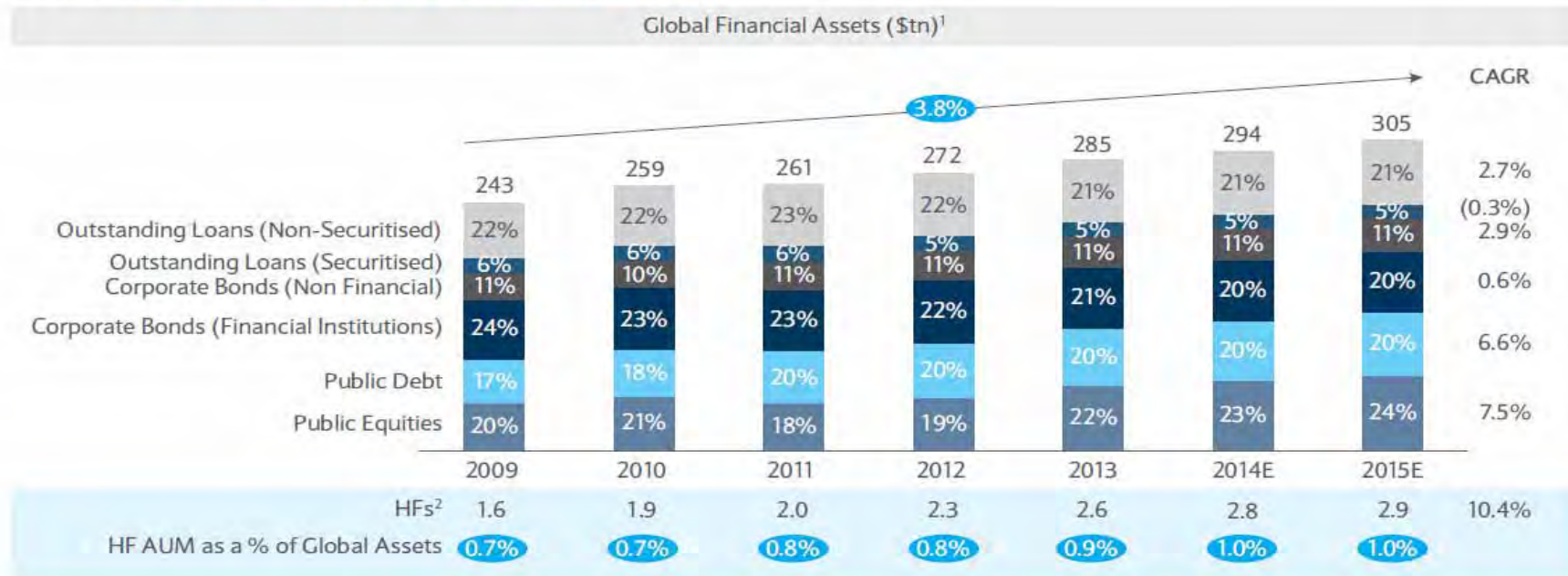| Drivers of Poor Performance	Illustrative Investor Quotes
Q: What do you think are the main reasons why HFs, on average, have underperformed relative to investor expectations recently? (Select all that apply) HF industry is too big relative to opportunities — 74% Macro conditions — 57% Market behaviour has changed — 37% Fees are too high relative to returns — 5% Other — 26%	"Investor expectations are still rooted in historically extraordinary returns for HFs from the 1990s to early 2000s; if we can barely sustain beta returns without unprecedented monetary (and soon, fiscal) intervention, while insisting on increasing regulatory and operational burdens (and costs), alpha expectations will suffer." – $20bn Private Pension "Best practices have become widely followed reducing historic alpha opportunities." – $30bn+ FoHF "Systematic / quant managers with tons of data are starting to be better positioned than typical fundamental HFs." – $2bn+ Family Office "Fees are too high relative to risk free rates and return expectations." – $30bn+ Endowment

Source: Barclays Strategic Consulting analysis

- The overall CAGR for HF AUM of 2009–2015 was 10% and that the individual strategy components each went up by btw. 9% and 12%
- On average, asset growth in the individual funds account for two-thirds of the overall growth by strategy while the number of new funds accounts for only one-third

Hedge Funds Through Hard Times?

- Despite the HF industry's significant growth since 2009, it is still very small relative to the pool of global financial assets

FIGURE 7: AUM Growth – Global Financial Assets vs. HFs

Global Financial Assets ($tn)[1]

	2009	2010	2011	2012	2013	2014E	2015E	CAGR
Total	243	259	261	272	285	294	305	3.8%
Outstanding Loans (Non-Securitised)	22%	22%	23%	22%	21%	21%	21%	2.7%
Outstanding Loans (Securitised)	6%	6%	6%	5%	5%	5%	5%	(0.3%)
Corporate Bonds (Non Financial)	11%	10%	11%	11%	11%	11%	11%	2.9%
Corporate Bonds (Financial Institutions)	24%	23%	23%	22%	21%	20%	20%	0.6%
Public Debt	17%	18%	20%	20%	20%	20%	20%	6.6%
Public Equities	20%	21%	18%	19%	22%	23%	24%	7.5%
HFs[2]	1.6	1.9	2.0	2.3	2.6	2.8	2.9	10.4%
HF AUM as a % of Global Assets	0.7%	0.7%	0.8%	0.8%	0.9%	1.0%	1.0%	

1. Business Insider, 'The $64 trillion question, Convergence in asset management,' McKinsey & Company; Barclays Strategic Consulting Analysis; 2. HFR

- The issue may be, however, the growth in size of many individual HFs, which are pursuing similar strategies leading to crowding

- As HFs become larger, their investable universe can often be diminished (e.g., due to position limits) as it is often not 'worth it' to invest in smaller situations that can hardly move the P&L needle
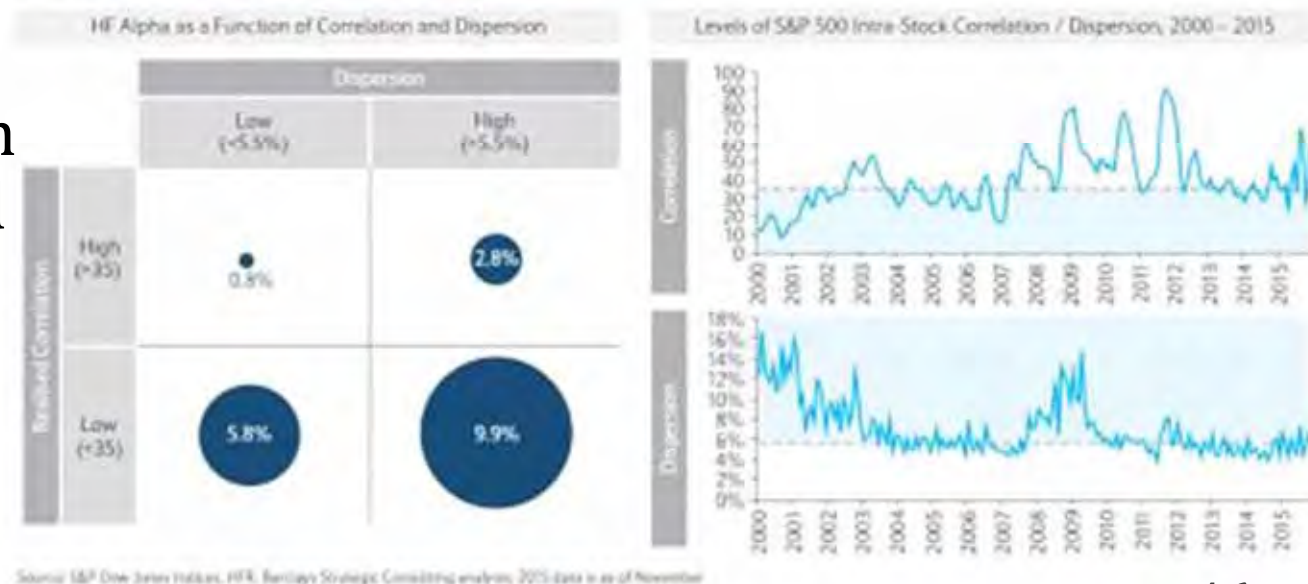
Hedge Funds Through Hard Times?

- The 2nd commonly mentioned driver of underperformance by investors was that macro conditions worked against HFs

- HFs generate almost 10% of alpha when dispersion is high and correlation is low, conversely, when dispersion is low and correlation is high HFs only generate 0.8% of alpha

FIGURE 9: Recent Performance by Hedge Fund Size

FIGURE 10: Equity Alpha as a Function of Macro Conditions

Hedge Funds Through Hard Times?

- Getmansky, Lee, and Lo (2015, ARF) also note that the avg. volatility of HFs' returns was lower in the post-crisis period, damping absolute returns even as risk-adjusted returns remained strong

- The volatility of the cross-sectionally averaged HF returns in Lipper TASS dropped from 6.5% to 4.2% before and after the crisis

- Among the individual categories, only Convertible Arbitrage funds have higher average volatilities in the post-crisis period

- This decline in volatility is likely due to lower amounts of leverage being deployed in the HF industry for several reasons:

  1 a decrease in risk appetite among investors in the aftermath of the financial crisis

  2 more stringent capital requirements on the part of regulators

  3 fewer market opportunities due to central banking interventions that have changed traditional risk/reward relations among assets, including the fact that if HFs earn a portion of their return from cash holdings, their post-crisis returns will definitely be affected by the low-interest-rate policies

Lecture 7: What Do We Know About Hedge Funds? – Prof. Guidolin

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Hedge Funds Through Hard Times?

- Berglund, Guidolin and Pedio (2018) examine the effects of US monetary policy during and after the Financial Crisis on HF alphas for industry as a whole and of a range of hedge strategy indices

- Formal break point tests show that for all but one strategies as well as the overall index, there is evidence of five breakpoints

- For the overall index and most of the sub-indices many of the endogenously determined breaks closely match a list of policy surprise dates that were singled out (by GSAM) as they had strongly affected financial markets

- Esp. for long-short equity, fixed income arb, dedica-ted short-bias, and global macro, there is a signi-ficant tendency for alphas to decline over time, following policy surprises

Bai-Perron's tests of 1 through M globally determined breaks: Hedge fund index

Sample months:	2007-01 to 2016-05
Breaking parameters:	$\alpha_i, \beta_{i,MKT}, \beta_{i,SMB}, \beta_{i,HML}, \beta_{i,MOM}, \beta_{i,\Delta 10y}$, and $\beta_{i,\Delta spread}$

Test	No.
Sequential F-statistic determined breaks	5
Significant F-statistic largest breaks	5

Breaks	F-statistic	Scaled F-statistic	Weighted F-statistic	Critical Value
1 *	8.3887	58.7211	58.7211	22.62
2 *	7.5215	52.6502	59.4286	20.04
3 *	5.0500	35.3502	43.3340	18.45
4 *	4.2585	29.8093	39.2254	17.19
5 *	4.5682	31.9771	44.8155	16.14

* Significant at the 0.05 level.
** Bai-Perron's (Econometric Journal, 2003) critical values.

Estimated break dates

1:	2008-01				
2:	2008-01	2009-02			
3:	2008-01	2009-05	2011-10		
4:	2008-01	2009-05	2011-10	2013-02	
5:	2008-01	2009-05	2011-10	2013-02	2015-06