

# Hedge Funds: Outline

- ▶ What are they?
- ▶ Hedge fund styles and examples of strategies
- ▶ Assessing track records
- ▶ Issues in risk measurement
- ▶ Liquidity and contagion of shocks - 2007 Quant Crisis
- ▶ Systematic liquidity risk
  - ▶ Stocks
  - ▶ Hedge funds
  - ▶ Private equity
- ▶ Additional long-short strategies
  - ▶ Carry trades
  - ▶ Pairs trading
  - ▶ Customer-supplier links
  - ▶ Intangible return

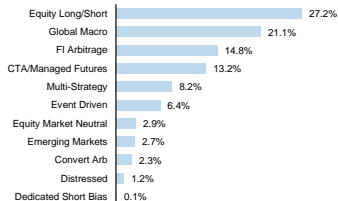
# What are they?

- ▶ Typically limited partnership, general partner manages investment pool
- ▶ Investors:
  - ▶ generally (if more than 100) with invested wealth of at least \$5 mil. individuals (\$25 mil. if other entities)
  - ▶ typically not obtained through public offering
- ▶ Investor restrictions
  - ▶ allow exemption from 1940 Investment Company Act under sections 3(c)(1) or 3(c)(7)
  - ▶ enable an incentive fee (e.g., 20% of profits) under rule 205-3 of the 1940 Investment Advisor Act
    - ▶ generally paid after earlier losses are recouped ( “high-water mark” )
    - ▶ in addition to a fixed fee, e.g., 2% of assets
- ▶ Rough estimates worldwide:
  - ▶ 8,000 funds with \$3 tril. in capital (versus \$30 tril. in mutual funds)
  - ▶ 60/40 split between capital from institutions versus individuals

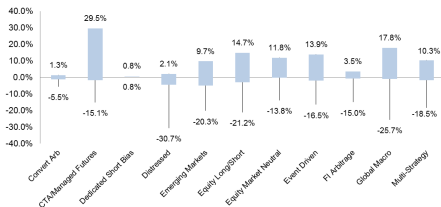
# Hedge Fund Styles and Examples of Strategies

- ▶ Global macro
  - ▶ long/short currencies
- ▶ Fixed-income arbitrage
  - ▶ buy (short) less (more) liquid bonds
- ▶ Long/short equity
  - ▶ discretionary/quantitative stock-picking
- ▶ Managed futures (Commodity Trading Advisors)
  - ▶ technical strategies (e.g., trend-based)
- ▶ Event driven/multi-strategy
  - ▶ merger arbitrage (long target and short acquirer)
- ▶ Equity market-neutral
  - ▶ quantitative zero-beta strategies
- ▶ Convertible arbitrage
  - ▶ long convertible bond and short stock
- ▶ Distressed securities
  - ▶ buy securities of firm in/near bankruptcy

## Hedge Fund Strategy Breakdown by Assets



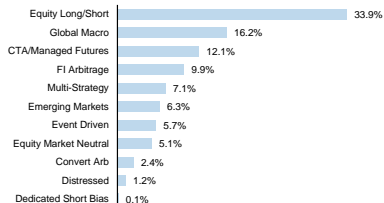
## Hedge Fund Performance by Strategy – Monthly Dispersion



Source: Citi Prime Finance.

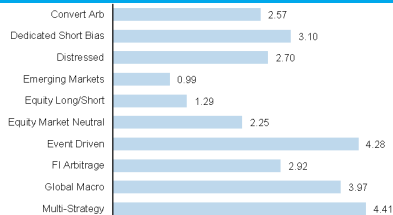
Note: Hedge fund data is self-reported; each calculation is based on the respective data from funds who have reported for the current period. Asset and Strategy breakdowns update quarterly.

## Hedge Fund Strategy Breakdown by Number of Funds

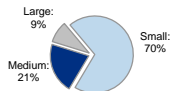


## Hedge Fund Leverage Ratios by Strategy

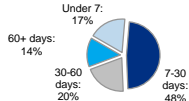
Gross Leverage (Mean): Defined as the sum of (LMV + abs SMV)/Net Equity



## By Fund Size—No. of Funds



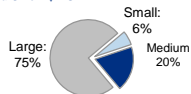
## Redemption Notice Period



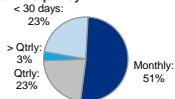
## On-shore/Off-shore



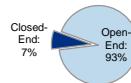
## By Fund Size—\$ AUM



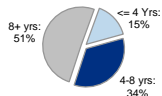
## Redemption Frequency



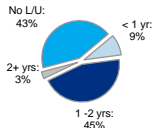
## Legal Status



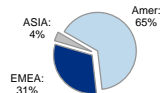
## By Fund Age—No. of Funds



## Lock-Up



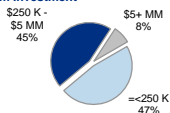
## Domicile (by \$ AUM)



## By Fund Age—\$ AUM



## Minimum Investment



# Assessing Track Records

- ▶ Components of total return:
  - ▶ average non-skilled return
    - ▶ e.g., merger arb: always going long target and short acquirer provides positive average risk-adjusted return of 4% per year (after transaction costs, 10% before costs)
  - ▶ added return due to skill
- ▶ Measuring risk is often difficult
  - ▶ returns can be skewed, with non-linear relations to other asset returns
  - ▶ e.g., in merger arb, the systematic risk appears similar to writing put options on the market index
  - ▶ difficult to identify relevant benchmark factors
- ▶ Other complications
  - ▶ reporting returns is voluntary, with backfilling of “instant histories”
  - ▶ track records are often short

# Risk Measurement Issues

- ▶ Exposure to systematic risk can be nonlinear, e.g.,

$$R_{A,t} = \alpha_A + \beta_A^+ R_{M,t}^+ + \beta_A^- R_{M,t}^- + \epsilon_{A,t}$$

- ▶ often  $\beta_A^- > \beta_A^+$  [Lo, 2001]
  - ▶ opposite pattern of a market timer (more like put writing)
- ▶ Hedge funds can hold illiquid assets
  - ▶ Difficult to value - recorded prices can be artificially “smoothed”
  - ▶ Transaction prices reflect old market changes
  - ▶ Example (Asness):

	Month			
	T	T+1	T+2	T+3
S&P 500	-20%	0%	0%	0%
Liquid Security	-20%	0%	0%	0%
Illiquid Security	0%	0%	0%	-20%
“Smoothed” Security	-8%	-6%	-4%	-2%

- ▶ Traditional beta estimate understates true beta

(“Do Hedge Funds Hedge?” by Clifford Asness, Robert Krail, and John Liew, *Financial Analysts Journal*

Fall 2001.)

**EXHIBIT 1****HEDGE FUND RETURNS—MONTHLY DATA JANUARY 1994–SEPTEMBER 2000**

Portfolio	Annualized Excess Return	Annualized Standard Deviation	Annualized Sharpe Ratio	Correlation With S&P 500	Maximum Monthly Return	Month of Maximum Return	Minimum Monthly Return	Month of Minimum Return
Aggregate Hedge Fund Index	8.0%	10.0%	0.80	0.52	8.1%	12/99	-8.0%	08/98
Convertible Arbitrage	5.4%	5.1%	1.07	0.13	3.1%	04/00	-5.1%	08/98
Event-Driven	7.0%	6.7%	1.05	0.60	3.4%	01/94	-12.2%	08/98
Equity Market-Neutral	6.4%	3.5%	1.85	0.48	2.8%	07/97	-1.6%	03/97
Fixed-Income Arbitrage	1.6%	4.4%	0.36	0.08	1.5%	04/95	-7.3%	10/98
Long/Short Equity	11.8%	12.6%	0.94	0.62	12.6%	12/99	-11.9%	08/98
Emerging Markets	2.3%	20.8%	0.11	0.50	16.1%	08/94	-23.4%	08/98
Global Macro	7.7%	14.4%	0.54	0.36	10.1%	08/95	-11.9%	10/98
Managed Futures	-1.2%	11.1%	-0.10	0.01	9.5%	08/98	-9.8%	09/95
Dedicated Short Bias	-7.1%	18.6%	-0.38	-0.76	22.3%	08/98	-9.1%	02/00
S&P 500	14.6%	14.2%	1.03	1.00	9.3%	03/00	-14.9%	08/98

*All returns are excess of the one-month T-bill return. Annualized excess return calculated by multiplying monthly excess returns by 12. Annualized Sharpe ratio equals ratio of annualized excess return and annualized standard deviation.*

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**EXHIBIT 2****MONTHLY REGRESSIONS OF EXCESS HEDGE FUND RETURNS ON  
CONTEMPORANEOUS S&P 500 EXCESS RETURNS  
JANUARY 1994–SEPTEMBER 2000**

Portfolio	Monthly Regressions		
	Alpha (Annualized %)	Beta vs. S&P 500	Adjusted R <sup>2</sup>
Aggregate Hedge Fund Index	2.63 (0.76)	0.37 (5.46)	26.5%
Convertible Arbitrage	4.78 (2.35)	0.04 (1.12)	0.3%
Event-Driven	2.93 (1.35)	0.28 (6.62)	34.9%
Equity Market-Neutral	4.69 (3.84)	0.12 (4.89)	22.2%
Fixed-Income Arbitrage	1.24 (0.70)	0.02 (0.71)	-0.6%
Long/Short Equity	3.82 (0.95)	0.55 (6.98)	37.4%
Emerging Markets	-8.38 (-1.15)	0.74 (5.15)	24.2%
Global Macro	2.41 (0.44)	0.37 (3.43)	11.8%
Managed Futures	-1.30 (-0.29)	0.01 (0.12)	-1.2%
Dedicated Short Bias	7.34 (1.50)	-0.99 (-10.34)	57.0%

*T-statistics in parentheses. Annualized alpha calculated by multiplying regression intercept by 12. Hedge fund and S&P 500 returns in the regressions are excess of one-month T-bill return.*

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# EXHIBIT 4A

## MONTHLY REGRESSIONS OF EXCESS HEDGE FUND RETURNS ON CONTEMPORANEOUS AND LAGGED EXCESS S&P 500 RETURNS JANUARY 1994–SEPTEMBER 2000

Portfolio	Regression Coefficients and t-Statistics					Adjusted R <sup>2</sup>	Hypothesis Testing	
	Alpha (annualized %)	Beta with S&P 500 (t)	Beta with S&P 500 (t - 1)	Beta with S&P 500 (t - 2)	Beta with S&P 500 (t - 3)		Sum All Betas (= 0)	Sum Lagged Betas (= 0)
Aggregate Hedge Fund Index	-4.45 (-1.16)	0.40 (6.21)	0.12 (1.85)	0.22 (3.37)	0.10 (1.45)	35.3%	0.84 (0.0%)	0.44 (0.1%)
Convertible Arbitrage	-0.98 (-0.46)	0.08 (2.16)	0.16 (4.31)	0.13 (3.46)	0.07 (1.82)	23.8%	0.43 (0.0%)	0.35 (0.0%)
Event-Driven	-2.12 (-0.91)	0.31 (8.04)	0.18 (4.39)	0.08 (1.89)	0.05 (1.19)	47.0%	0.61 (0.0%)	0.30 (0.0%)
Equity Market-Neutral	3.36 (2.32)	0.13 (5.18)	0.05 (1.95)	0.01 (0.39)	0.02 (0.84)	23.4%	0.20 (0.1%)	0.08 (10.8%)
Fixed-Income Arbitrage	-3.78 (-2.08)	0.05 (1.61)	0.10 (3.23)	0.15 (4.84)	0.06 (1.83)	25.2%	0.36 (0.0%)	0.31 (0.0%)
Long/Short Equity	-2.83 (-0.61)	0.57 (7.39)	0.10 (1.25)	0.18 (2.24)	0.14 (1.76)	40.9%	0.99 (0.0%)	0.42 (0.9%)
Emerging Markets	-16.20 (-1.88)	0.79 (5.47)	0.30 (2.02)	0.10 (0.68)	0.06 (0.39)	25.3%	1.25 (0.0%)	0.46 (11.8%)
Global Macro	-6.64 (-1.08)	0.41 (3.94)	0.12 (1.12)	0.37 (3.45)	0.09 (0.83)	21.1%	0.98 (0.0%)	0.57 (0.7%)
Managed Futures	1.72 (0.32)	-0.01 (-0.15)	-0.15 (-1.58)	-0.01 (-0.10)	-0.02 (-0.19)	-1.9%	-0.19 (38.3%)	-0.17 (34.1%)
Dedicated Short Bias	11.59 (2.00)	-1.01 (-10.45)	-0.15 (-1.51)	0.02 (0.22)	-0.13 (-1.26)	57.5%	-1.27 (0.0%)	-0.25 (19.7%)

*T-statistics in parentheses. The last two columns report the sum of the contemporaneous and lagged betas (Sum All Betas) and the separate sum of the lagged betas (Sum Lagged Betas); p-values for the F-test versus zero shown in parentheses. Hedge fund and S&P 500 returns used in the regressions are excess of the one-month T-bill return.*

**EXHIBIT 4B**
**SUMMARY OF MONTHLY REGRESSIONS OF EXCESS HEDGE FUND RETURNS ON S&P 500 RETURNS  
JANUARY 1994–SEPTEMBER 2000**

Portfolio	(1)	(2)	(3)	(4)	(4) – (1)
	Simple Monthly Regression Beta (Exhibit 2)	Betas from Lagged S&P 500 Regressions (Exhibit 4A)			Difference in Beta
		Betas from Contemporaneous Beta ( $\beta_0$ )	Sum of Lagged Betas ( $\beta_1 + \beta_2 + \beta_3$ )	Total Summed Beta ( $\beta_0 + \beta_1 + \beta_2 + \beta_3$ )	
Aggregate Hedge Fund Index	0.37	0.40	0.44	0.84	0.47
Convertible Arbitrage	0.04	0.08	0.35	0.43	0.38
Event-Driven	0.28	0.31	0.30	0.61	0.33
Equity Market-Neutral	0.12	0.13	0.08	0.20	0.09
Fixed-Income Arbitrage	0.02	0.05	0.31	0.36	0.33
Long/Short Equity	0.55	0.57	0.42	0.99	0.45
Emerging Markets	0.74	0.79	0.46	1.25	0.51
Global Macro	0.37	0.41	0.57	0.98	0.61
Managed Futures	0.01	-0.01	-0.17	-0.19	-0.20
Dedicated Short Bias	-0.99	-1.01	-0.25	-1.27	-0.28

**EXHIBIT 5****MONTHLY REGRESSIONS OF EXCESS HEDGE FUND RETURNS ON CONTEMPORANEOUS AND LAGGED EXCESS S&P 500 RETURNS IN UP AND DOWN MARKETS—JANUARY 1994–SEPTEMBER 2000**

Portfolio	Betas in Up Markets			Betas in Down Markets		
	Contemporaneous	Sum of Lagged	Total Summed	Contemporaneous	Sum of Lagged	Total Summed
	Beta ( $\beta_0$ )	Betas ( $\beta_1 + \beta_2 + \beta_3$ )	Beta ( $\beta_0 + \beta_1 + \beta_2 + \beta_3$ )	Beta ( $\beta_0$ )	Betas ( $\beta_1 + \beta_2 + \beta_3$ )	Beta ( $\beta_0 + \beta_1 + \beta_2 + \beta_3$ )
Aggregate Hedge Fund Index	0.27	0.17	0.44	0.59	0.79	1.38
Convertible Arbitrage	0.02	0.22	0.24	0.17	0.47	0.64
Event-Driven	0.03	0.24	0.27	0.61	0.32	0.93
Equity Market-Neutral	0.13	0.18	0.31	0.11	-0.05	0.06
Fixed-Income Arbitrage	0.02	0.06	0.08	0.13	0.57	0.70
Long/Short Equity	0.41	0.51	0.92	0.75	0.36	1.11
Emerging Markets	0.45	0.01	0.46	1.21	1.01	2.22
Global Macro	0.33	-0.06	0.27	0.60	1.38	1.98
Managed Futures	0.29	-0.20	0.09	-0.34	-0.06	-0.40
Dedicated Short Bias	-0.72	-0.60	-1.32	-1.28	0.15	-1.13

## EXHIBIT 6

### ANNUAL SHARPE RATIOS OF UNHEDGED AND HEDGED HEDGE FUND RETURNS JANUARY 1994–SEPTEMBER 2000

Portfolio	Unhedged and Hedged Performance		
	Monthly Unhedged Sharpe Ratio	Monthly Beta- Hedged Sharpe Ratio	Summed Beta- Hedged Sharpe Ratio
Aggregate Hedge Fund Index	0.80	0.31	-0.40
Convertible Arbitrage	1.07	0.95	-0.11
Event-Driven	1.05	0.55	-0.27
Equity Market-Neutral	1.85	1.55	1.05
Fixed-Income Arbitrage	0.36	0.28	-0.56
Long/Short Equity	0.94	0.39	-0.23
Emerging Markets	0.11	-0.47	-0.82
Global Macro	0.54	0.18	-0.40
Managed Futures	-0.10	-0.12	0.14
Dedicated Short Bias	-0.38	0.61	0.89

# Liquidity and Contagion of Shocks

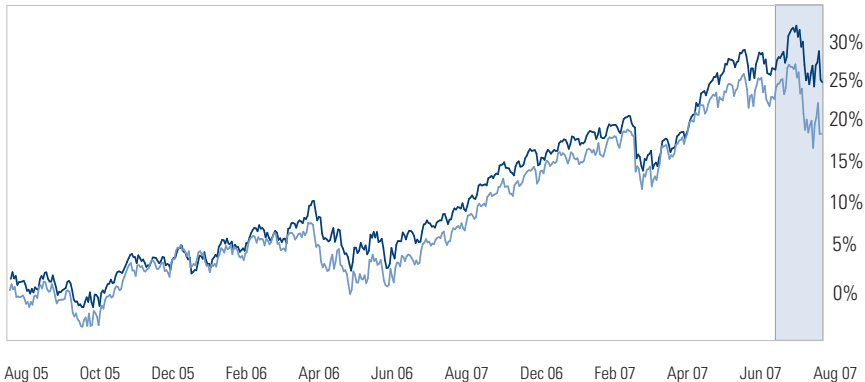
- ▶ Liquidity shocks can spread across unrelated strategies
- ▶ Consider two large hedge funds, Fund A and Fund B
- ▶ Fund A holds assets 1 and 2; Fund B holds assets 2 and 3
- ▶ Chain of events:
  - ▶ Price drop on asset 1 due to fundamental news about that asset
  - ▶ Fund A must then liquidate some assets to decrease its leverage
  - ▶ Fund A sells asset 1 and, especially, asset 2 (whose price hasn't yet dropped)
  - ▶ Asset 2 experiences price drop (no news about its fundamentals)
  - ▶ Fund B must then liquidate some assets to decrease its leverage
  - ▶ Fund B sells asset 2 and, especially, asset 3 (whose price hasn't yet dropped)
  - ▶ Asset 3 experiences price drop (no news about its fundamentals), . . .

(E.g., Goldman Sachs, "The Quant Liquidity Crunch")

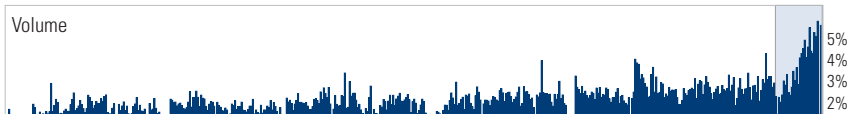
## Exhibit 1: Market Volatility and Trading Volume Were Up Only Slightly Last Week

Cumulative DJIA and S&P500 Returns, August 10, 2005 – August 10, 2007

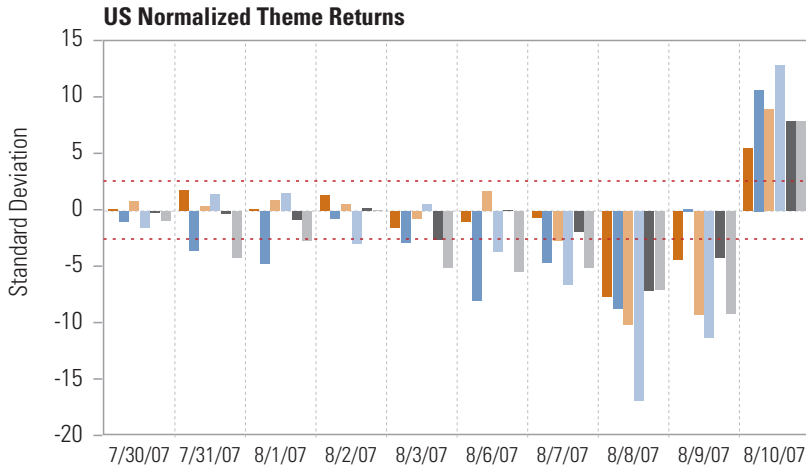
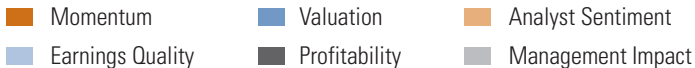
DJI — S&P 500 —



Volume

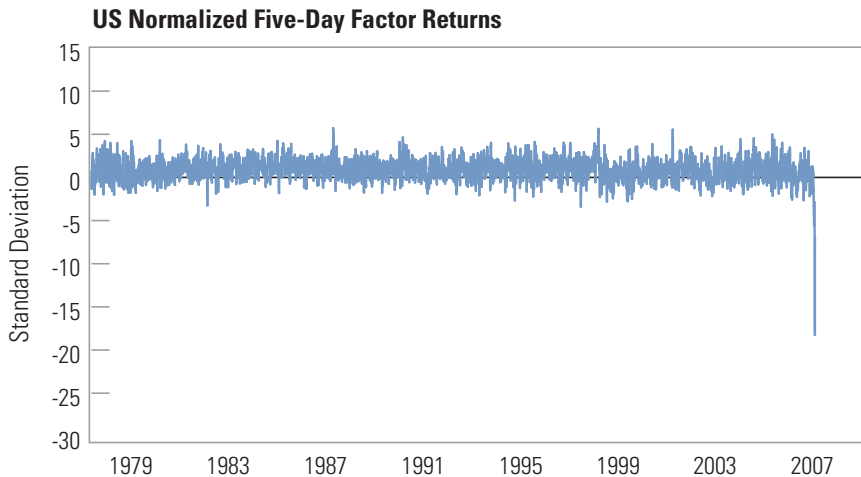


## Normalized Theme Returns, July 30, 2007 – August 10, 2007





# Normalized Five-Day Factor Returns



# Measuring Market-Wide Liquidity

- ▶ For each NYSE-AMEX stock, compute the slope coefficient  $\gamma_{i,t}$  in the regression<sup>1</sup>

$$r_{i,d+1,t}^e = \theta_{i,t} + \phi_{i,t} r_{i,d,t} + \gamma_{i,t} \text{sign}(r_{i,d,t}^e) \cdot v_{i,d,t} + \epsilon_{i,d+1,t}, \quad d = 1, \dots, D,$$

where

- $r_{i,d,t}$ : the return on stock  $i$  on day  $d$  in month  $t$
- $r_{i,d,t}^e$ :  $r_{i,d,t} - r_{m,d,t}$ , where  $r_{m,d,t}$  is the return on the CRSP value-weighted market return on day  $d$  in month  $t$
- $v_{i,d,t}$ : the dollar volume for stock  $i$  on day  $d$  in month  $t$

- ▶ Interpretation:
  - ▶ Signed volume ( $\text{sign}(r_{i,d,t}^e) \cdot v_{i,d,t}$ ) as proxy for order flow
  - ▶ risk-averse liquidity providers accommodate liquidity-demanding traders
  - ▶ greater order flow  $\Rightarrow$  greater compensation to liquidity providers (higher expected return)
  - ▶ the stronger this effect, the lower the liquidity
  - ▶ expect typical  $\gamma_{i,t} < 0$ , lower liquidity  $\Rightarrow$  lower  $\gamma_{i,t}$

<sup>1</sup> Ľuboš Pástor and Robert F. Stambaugh, "Liquidity Risk and Expected Stock Returns," *Journal of Political Economy*, 2001.

## Measuring Market-Wide Liquidity (continued)

- ▶ Market-wide liquidity measure for month  $t$ :

$$\mathcal{L}_t = \frac{m_t}{m_1} \left( \frac{1}{N_t} \sum_{i=1}^N \hat{\gamma}_{i,t} \right)$$

where

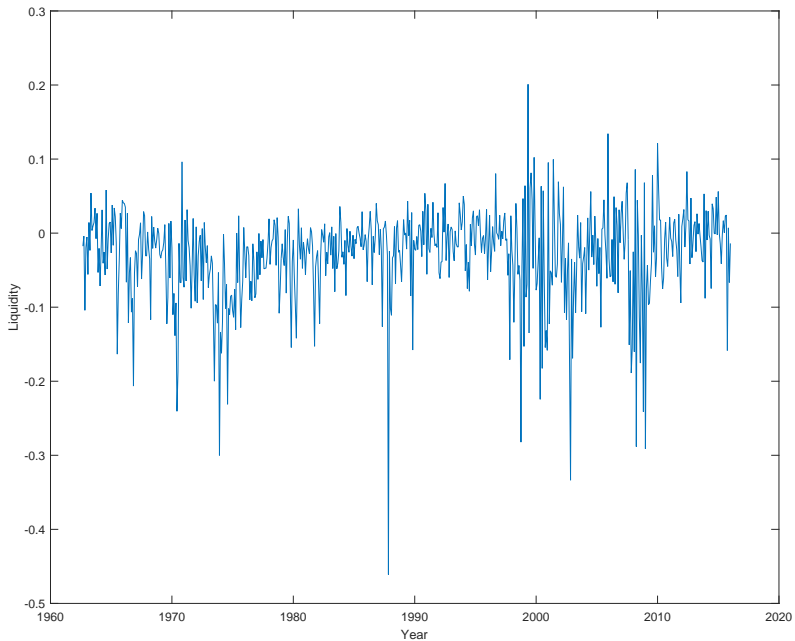
$m_t$ : total value of NYSE-AMEX at the end of month  $t - 1$

$N_t$ : total number of stocks in month  $t$

- ▶ Alternative measures of equity-market liquidity
  - ▶ bid-ask spread
  - ▶ turnover
  - ▶ average across days of  $|\text{stock return}| / \text{stock's dollar volume}$ <sup>2</sup>
  - ▶ use intraday data<sup>3</sup>
    - ▶ allows more precise estimate of order-flow impact
    - ▶ but shorter available history of intraday data

<sup>2</sup>Yakov Amihud, "Illiquidity and Stock Returns: Cross-Section and Time Series Effects," *Journal of Financial*

*Markets*, 2002. <sup>3</sup>Ronnie Sadka, "Momentum and Post-Earnings-Announcement Drift Anomalies: The Role of Liquidity Risk," *Journal of Financial Economics*, 2006.



## Changes in Market-Wide Liquidity

- ▶  $\mathcal{L}_t$ : unexpected change in market-wide liquidity in month  $t$
- ▶ Empirical properties of (estimated)  $\mathcal{L}_t$ 
  - ▶ correlation with  $R_{S,t}$  (stock-market return): 0.03 when  $R_{S,t} > 0$  but 0.52 when  $R_{S,t} < 0$
  - ▶ commonality:  $\mathcal{L}_t$ 's estimated in disjoint subsamples correlated 0.56
  - ▶ flight-to-quality effects:

	Correlation of $R_{S,t}$ with				Number of observations
	$-\Delta R_{f,t}$	$R_{GB,t}$	$R_{CB,t}$	$\text{Vol}_t$	
All months	0.047	0.323	0.372	0.491	449
Low- $\mathcal{L}_t$ months ( $\mathcal{L}_t < 2$ std. dev.'s)	-0.387	-0.197	-0.278	-0.360	14
Other months	0.092	0.362	0.406	0.522	435
P-value	0.087	0.045	0.018	0.002	

$\Delta R_{f,t}$ : change in month  $t$  in the short-term interest rate  
 $R_{GB,t}$ : return in month  $t$  on long-term Treasury bonds  
 $R_{CB,t}$ : return in month  $t$  on long-term corporate bonds  
 $\text{Vol}_t$ : equity market volume in month  $t$

# Liquidity Risk and Expected Stock Returns

- ▶ Liquidity beta: sensitivity of an asset's return to  $\mathcal{L}_t$ , controlling for other systematic risk factors
- ▶ Liquidity beta is the slope coefficient  $\beta_i^{\mathcal{L}}$  in the regression

$$r_{i,t} = \beta_i^0 + \beta_i^{\mathcal{L}} \mathcal{L}_t + \beta_i^M \text{MKT}_t + \beta_i^S \text{SMB}_t + \beta_i^H \text{HML}_t + \epsilon_{i,t}$$

- ▶  $\beta_i^{\mathcal{L}}$ : estimated as a function of seven characteristics of stock  $i$
- ▶ Does expected return contain a premium for liquidity beta?
  - ▶ Each year, rank all stocks on their estimated liquidity betas
  - ▶ Form value-weighted portfolios by liquidity-beta decile
  - ▶ Alphas (annualized):

	1	2	3	4	7	8	9	10	10-1
CAPM alpha	-5.16 (-2.57)	-1.88 (-1.24)	-0.66 (-0.56)	-0.07 (-0.08)	1.22 (1.52)	1.38 (1.72)	1.68 (1.93)	1.24 (1.01)	6.40 (2.54)
Fama-French alpha	-6.05 (-3.77)	-3.36 (-2.47)	-2.15 (-1.93)	-1.23 (-1.37)	0.86 (1.11)	1.41 (1.76)	1.90 (2.22)	3.18 (2.82)	9.23 (4.29)
4-factor alpha	-5.11 (-3.12)	-1.66 (-1.23)	-1.02 (-0.91)	-0.76 (-0.83)	0.76 (0.96)	1.55 (1.88)	1.34 (1.54)	2.36 (2.06)	7.48 (3.42)

## Liquidity Risk and Expected Stock Returns (continued)

- ▶ Let LIQ denote the 10–1 liquidity-beta spread
- ▶ Weights in ex-post (sample) tangent portfolios:

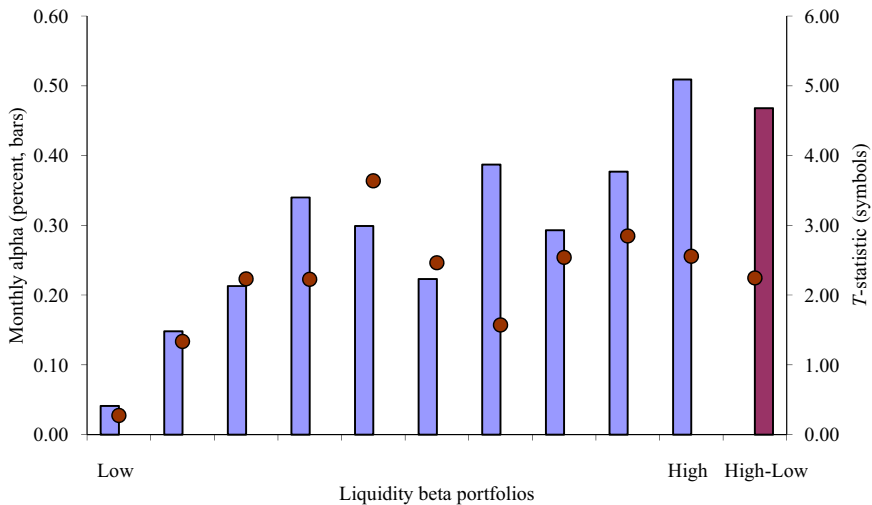
MKT	SMB	HML	MOM	LIQ	Monthly Sharpe ratio
100.00	–	–	–	–	0.12
35.08	5.83	59.10	–	–	0.22
20.05	16.07	43.03	20.85	–	0.33
22.34	18.77	36.41	–	22.49	0.31
17.70	20.62	34.23	11.86	15.59	0.37

# Liquidity Risk and Hedge Fund Returns

- ▶ Monthly net returns for over 12,000 hedge funds, 1994–2008
- ▶ Estimate each fund's liquidity beta using past 2 years
- ▶ Form 10 portfolios of hedge funds ranked by liquidity beta
- ▶ Hedge-fund alphas exhibit positive relation to liquidity beta (see figure)

Source: Ronnie Sadka, "Liquidity Risk and the Cross-Section of Hedge-Fund Returns," *Journal of Financial Economics*, 2010.



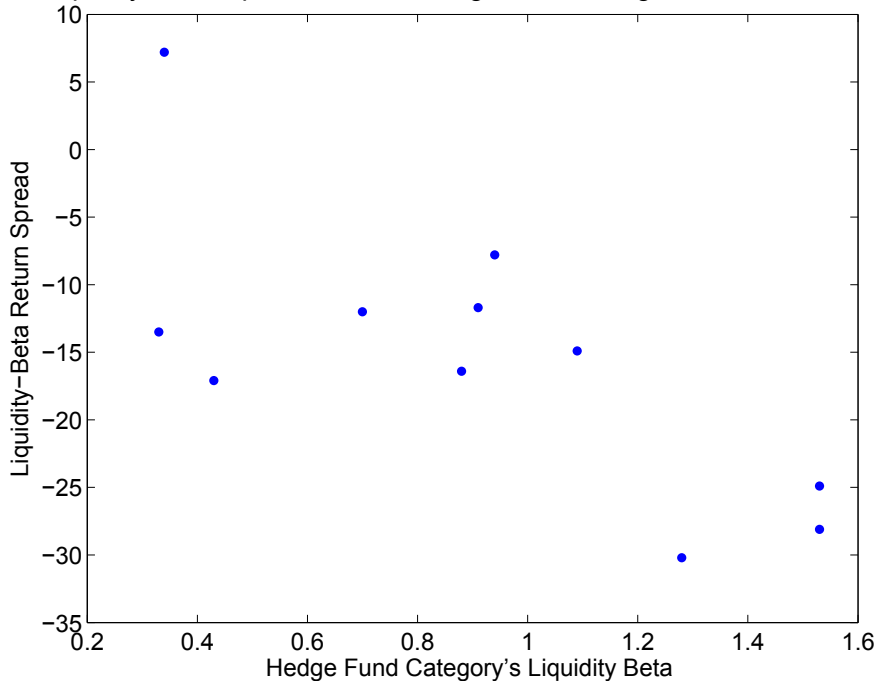


## Fall 2008 crisis: Liquidity Beta and Hedge Fund Returns

- ▶ Estimate each hedge fund's liquidity beta using previous 2 years of monthly data
- ▶ Within each hedge fund category
  - ▶ sort by liquidity beta, forming deciles
  - ▶ compute average returns: top decile minus bottom decile

Category	Liquidity Beta	Liquidity-Beta Return Spread, Oct.–Dec. 2008
Convertible Arbitrage	1.28	-30.2
Dedicated Short Bias	0.33	-13.5
Emerging Markets	1.53	-28.1
Equity Market Neutral	0.70	-12.0
Event Driven	0.88	-16.4
Fixed Income Arbitrage	0.94	-7.8
Fund of Funds	1.09	-14.9
Global Macro	0.43	-17.1
Long/Short Equity	0.91	-11.7
Managed Futures	0.34	7.2
Multi-Strategy	1.53	-24.9

Liquidity-Beta Spreads Within Hedge Fund Categories, Oct-Dec 2008

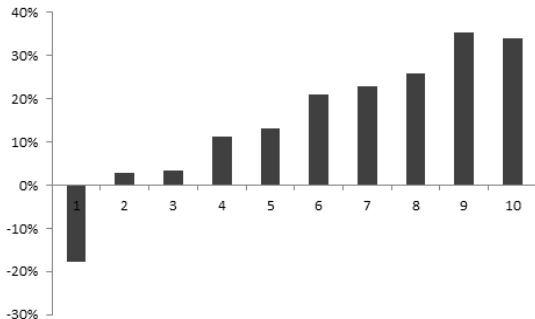


# Liquidity Risk and Private Equity Returns

- ▶ Cash-flows for over 4,400 liquidated private equity investments begun 1975–2006
- ▶ Estimate a liquidity beta for PE using cash flows from this cross-section
- ▶ Find that including LIQ as a factor drives private-equity alpha to zero
- ▶ Effect of liquidity environment on profitability
  - ▶ Sort investments by average of  $\mathcal{L}_t$  over an investment's life
  - ▶ Compute each investment's MIRR (modified internal rate of return)
  - ▶ MIRR positively related to average  $\mathcal{L}_t$  during investment's life (see figure)

Source: Francesco Franzoni, Eric Nowak, and Ludovic Phalippou, "Private Equity Performance and Liquidity Risk," *Journal of Finance*, 2012.

**Figure 3: Annual performance by deciles of liquidity conditions.** The figure plots the average investment MIRR in each decile of the Pástor and Stambaugh (2003) liquidity condition variable.



## Carry Trades

- ▶ Carry: expected return if the price doesn't change
- ▶ Carry trade: long (short) assets with high (low) carry
- ▶ Assets with high carry
  - ▶ Currency: country with a high interest rate
  - ▶ Equity: high dividend yield
  - ▶ Commodity: high "convenience yield" vs. storage costs
  - ▶ Bond: high forward rate (return if yields don't change)
- ▶ Diversified carry strategy: 1.20 Sharpe ratio
- ▶ Risk seems only part of the explanation for profits
- ▶ Controlling for multiple factors in each asset class:

	Alpha(%/month)	t-statistic	Information Ratio
Currencies	0.30	2.31	0.47
Global equities	0.82	4.17	0.95
Commodities	0.64	2.57	0.47
Treasuries	0.02	2.74	0.64

# Pairs Trading

## ► Basic idea

- For each stock, find another stock whose price moves most closely
- Open a long/short position when relative prices diverge

## ► Implementation

- Designate formation period (e.g., past 12 months)
- Form cumulative return index for each stock
- For each stock, find the “pair” stock having the smallest squared deviations in its cumulative return index during the formation period
- In subsequent trading period, open a long-short position if cumulative returns diverge by more than (say) two standard deviations of the historical difference between the cumulative return series
- Hold position until cumulative return series cross, or until the end of a pre-designated period (e.g., 6 months)

## Customer-Supplier-Link Strategies

- ▶ For as many firms as possible, identify other firm(s) that are major customers
  - ▶ Reg. SFAS No. 131 requires disclosure of identity of any customer representing more than 10% of total sales
- ▶ Rank “supplier” firms by the returns on their customers in previous month
- ▶ Long the suppliers with high-past-return customers; short the suppliers with low-past-return customers
- ▶ Rationale: market is slow to incorporate information about customers into the stock prices of suppliers
- ▶ Monthly percent return on long/short spread (quintile 5 minus quintile 1)

	Average	t-stat.
Excess return	1.58	3.8
3-factor alpha	1.56	3.6
4-factor alpha	1.38	3.1
5-factor alpha	1.24	3.0

(1981–2004, value-weighted portfolios)



# Intangible-Return-Reversal Strategies

- ▶ Intangible return: portion of past 5-year stock return that is unrelated to accounting-based measures of firm performance over past 5 years
- ▶ Estimate as the residual  $u_i$  in cross-sectional regression of 5-year stock returns on 5-year growth in accounting measures (book value, sales, cash flow, earnings)
- ▶ Ranks stocks by  $u_i$
- ▶ Long portfolio of lowest  $u_i$ 's; short portfolio of highest  $u_i$ 's
- ▶ Rationale: intangible returns likely to contain pricing errors
- ▶ Monthly percent return on long/short spread

	Average	t-stat.
Excess return	0.36	2.1
1-factor alpha	0.43	2.5
3-factor alpha	-0.20	-2.3

(1968–2003)