Liquidity and Short-term Return Reversals II

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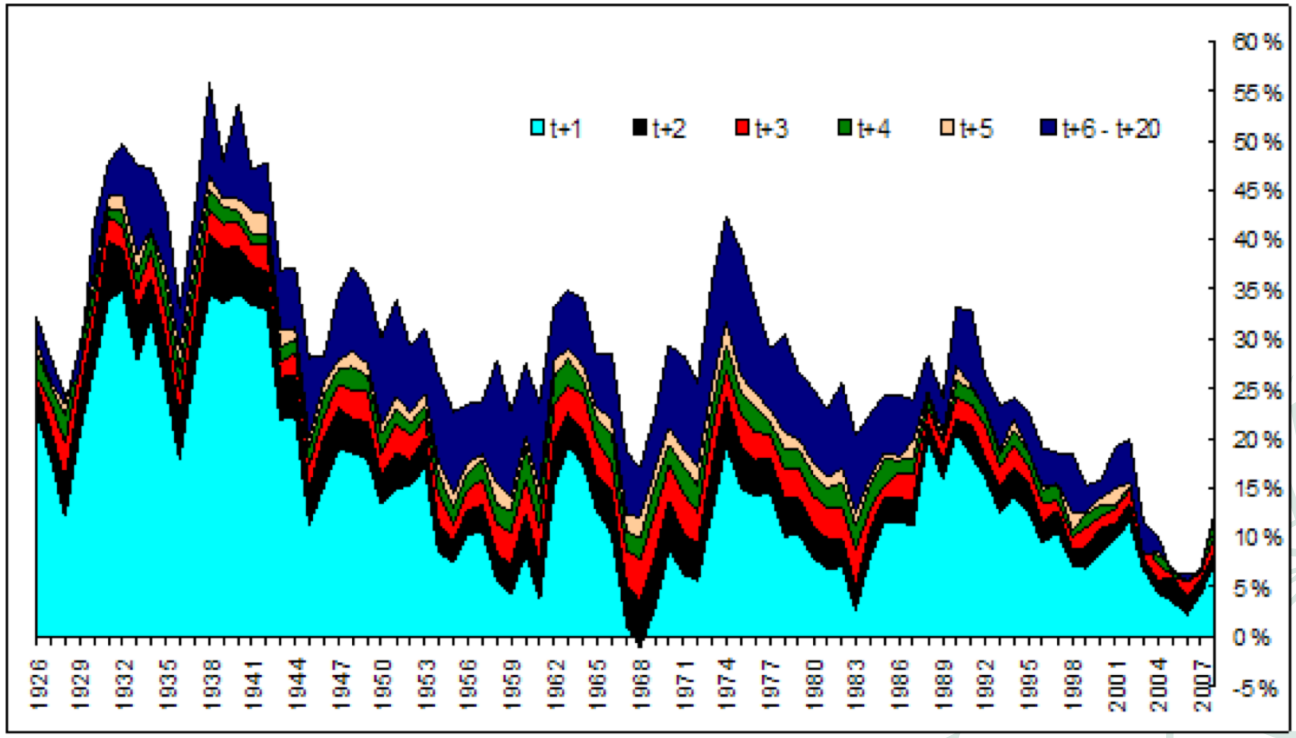
Outline

- More on Short-term reversals
- Returns from providing liquidity
- Hedge Fund Trading, Mutual Fund Trading
- Financial crisis
- Pair-trading, reversals in commodities
- Conclusions

Monthly Return Reversals at NYSE 1926-2008



On average 28% of daily returns revert within a month (24% within a week).

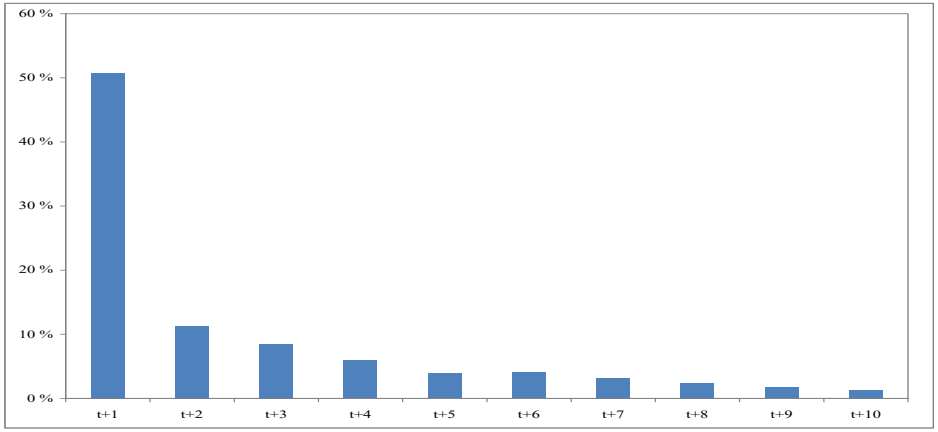
Temporary price movements associated with these return reversals have increased daily return volatility by 20%

Peaks often associated with recessions

Figure 1: Exponential pattern of return reversal and autocorrelations

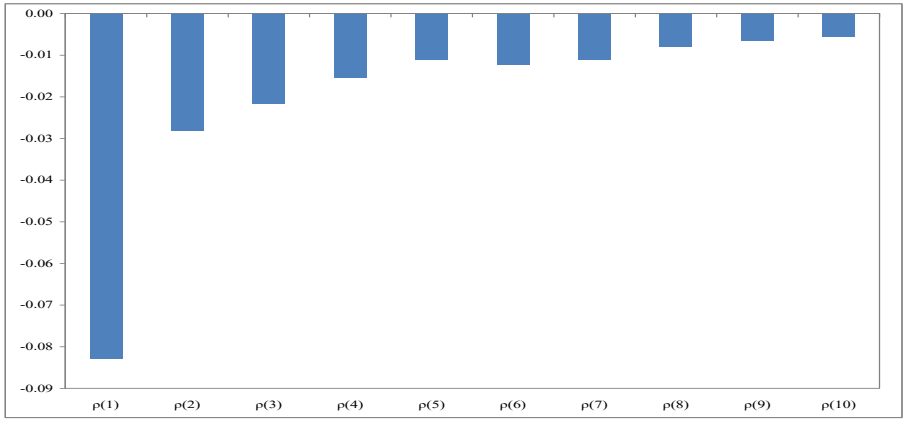
Panel A: Proportion of the predictable mean reversion for R_t, that occurs on day $t+Z$ (calculated from data in Table 1).[1]

t+1	t+2	t+3	t+4	t+5	t+6	t+7	t+8	t+9	t+10
50.8 %	11.3 %	8.5 %	5.9 %	3.9 %	4.0 %	3.2 %	2.4 %	1.7 %	1.3 %



Panel B: Estimated autocorrelation coefficients

ρ(1)	ρ(2)	ρ(3)	ρ(4)	ρ(5)	ρ(6)	ρ(7)	ρ(8)	ρ(9)	ρ(10)
-0.083 ***	-0.028 ***	-0.022 ***	-0.015 ***	-0.011 ***	-0.012 ***	-0.011 ***	-0.008 ***	-0.007 ***	-0.006 ***



*** Denotes statistical significance at the 1% level

Some empirical research on trading behavior

Market makers

Evidence that market makers, hedge funds and algoritmic traders engage in reversal trades, reduce volatility and improve liquidity; Hendershott and Seasholes (2007), Andrade, Chang and Seasholes (2008), Comerton-Forde *et al*. (2010), Aragon and Strahan (2011), Jylhä, Rinne and Suominen (2011), Brogaard (2011) and Hendershott and Menkveld (2011).

Other

Foucault, Sraer and Thesmar (2011) find that retail investors create noise in the stock market and that a reduction in the retail investors' trading activity improves liquidity and reduces short-term return reversals and volatility. Coval and Stafford (2007) and Rinne and Suominen (2011) find that mutual funds demand liquidity (their trading causes short-term return reversals).

The evidence above supports the idea that different investor groups as an aggregate systematically either demand or supply liquidity in the stock market and the composition of investors affects liquidity, short-term reversals and volatility.

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Returns from providing liquidity

- Some investors demand liquidity by requiring rapid execution of their orders (as in Grossman & Miller, 1988)
- Others supply liquidity by agreeing to be counterparties to these trades at favourable prices
- Short-term contrarian trading returns = returns from providing liquidity
- Who demands and who supplies liquidity (immediacy) in financial markets?

Jylhä, Rinne, and Suominen (2014) measure of the Returns from Providing Liquidity

Data: US common stocks listed in the NYSE and the Amex

1. **Estimate return reversal patterns in stocks' excess returns relative to Fama-French 48 - industry indexes**
   - Daily cross-sectional regressions in which 5-day future excess returns are regressed on 20 past daily excess returns

2. **Calculate expected 5-day excess returns using**

- Estimates of return reversal patterns based on 6-month moving averages of the return reversal coefficients up to time t-6
- Stock's past 20 daily returns

3. **Form a zero investment long-short portfolio with expected excess return weights in both the long and the short portfolios**

4. **Calculate returns of this portfolio with a 5-day holding period**

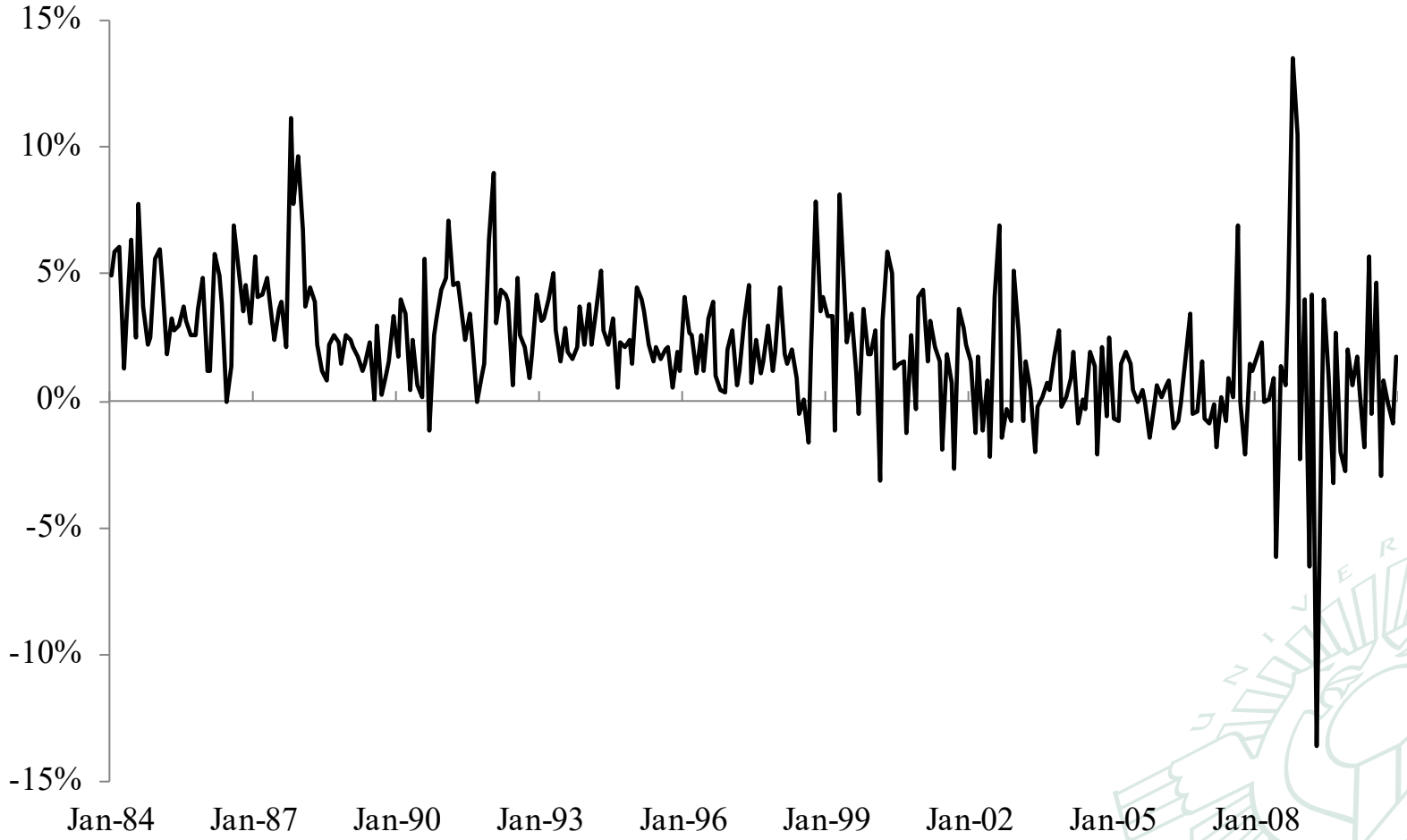
Returns statistics (monthly returns)

Table 2: Return statistics for the liquidity providing trading strategy

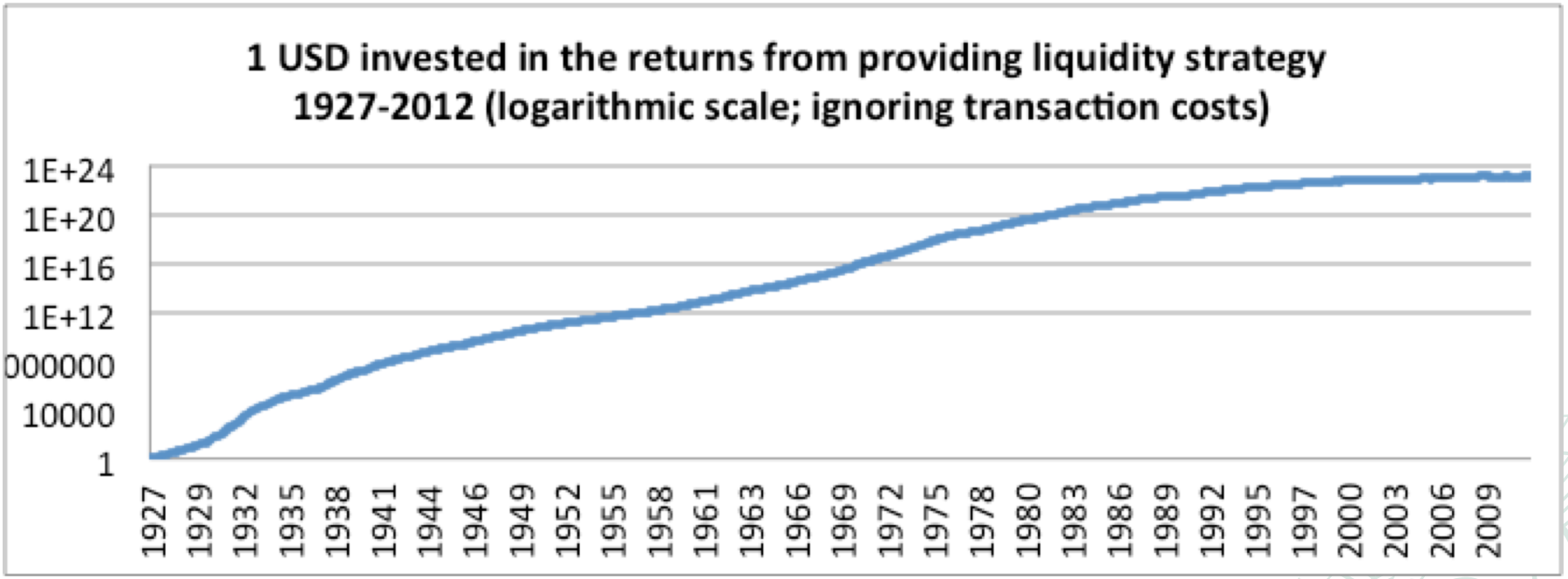
This table shows the statistics of the monthly returns from providing liquidity with a 5-day holding period. Sample period is from January 1984 through December 2010. The returns from providing liquidity are the pre-transaction cost returns on a zero-investment long-short trading strategy in which 5-day expected excess returns are used as portfolio weights when forming the long and the short portfolios and positions are held the corresponding period of time. The expected returns are calculated using six-month moving averages of coefficients for return reversal until six days prior to taking positions. Return statistics are based on averages of the returns of all open positions. Carhart 4-factor alpha is calculated using data from Kenneth French's website.

Mean (%) per month	2.08 %
25th percentile	0.58 %
Median	1.99 %
75th percentile	3.56 %
Volatility	2.63 %
Positive return %	82.4 %
Sharpe ratio	0.79
4-factor alpha	1.79 %
t-statistics for alpha	(8.00)

Time series variation in returns



Jylhä, Rinne, and Suominen (2014) measure of the Returns from Providing Liquidity



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Role of hedge funds ?

- Market participants either supply or demand liquidity (Grossman & Miller, 1988 JF)
- Some investors demand liquidity by requiring rapid execution of their orders
- Market makers supply liquidity by agreeing to be counterparties to these trades at favourable prices

  - *"What is the role of hedge funds?"*
  - *"What effect do hedge funds' liquidity supply/demand have on the markets?"*

Results in a nutshell

- On average, hedge funds supply liquidity
- There are cross-sectional differences across and within fund categories
- Time series variation according to market condition
- Hedge funds have an effect on market liquidity, short term reversals, and volatility

Methodology to see the hedge funds role

- Regress hedge fund returns on the returns from providing liquidity (as defined previously and below)
  - Positive coefficient → liquidity provider
  - Negative coefficient → liquidity demander
- Need:
  - Data on individual hedge funds, TASS (5,800 funds, 1/94-12/11)
  - Returns from providing liquidity (see previous section)
  - Other relevant risk factors (Fung & Hsieh 2004, FAJ)
  - Measure for liquidity shocks (Sadka 2010 JFE, Sadka 2006 JFE)

Returns from providing liquidity and controls

- NYSE and Amex stocks
- As before, estimate of 5-day reversal based on past 20 days' returns
- Exclude top and bottom 1% (information driven, no reversal)
- **Long** position in stocks with **positive** expected reversal
- **Short** position in stocks with **negative** expected reversal
- Positions weighted by the size of expected reversal
- Returns to this portfolio = "returns from providing liquidity"

- Controls: Fung-Hsieh factors, Sadka liquidity shock

Results: Hedge funds supply liquidity

- Regress hedge fund returns on immediacy provision returns, Fung-Hsieh factors, and Sadka liquidity shock
- Coefficient of liquidity provision returns:

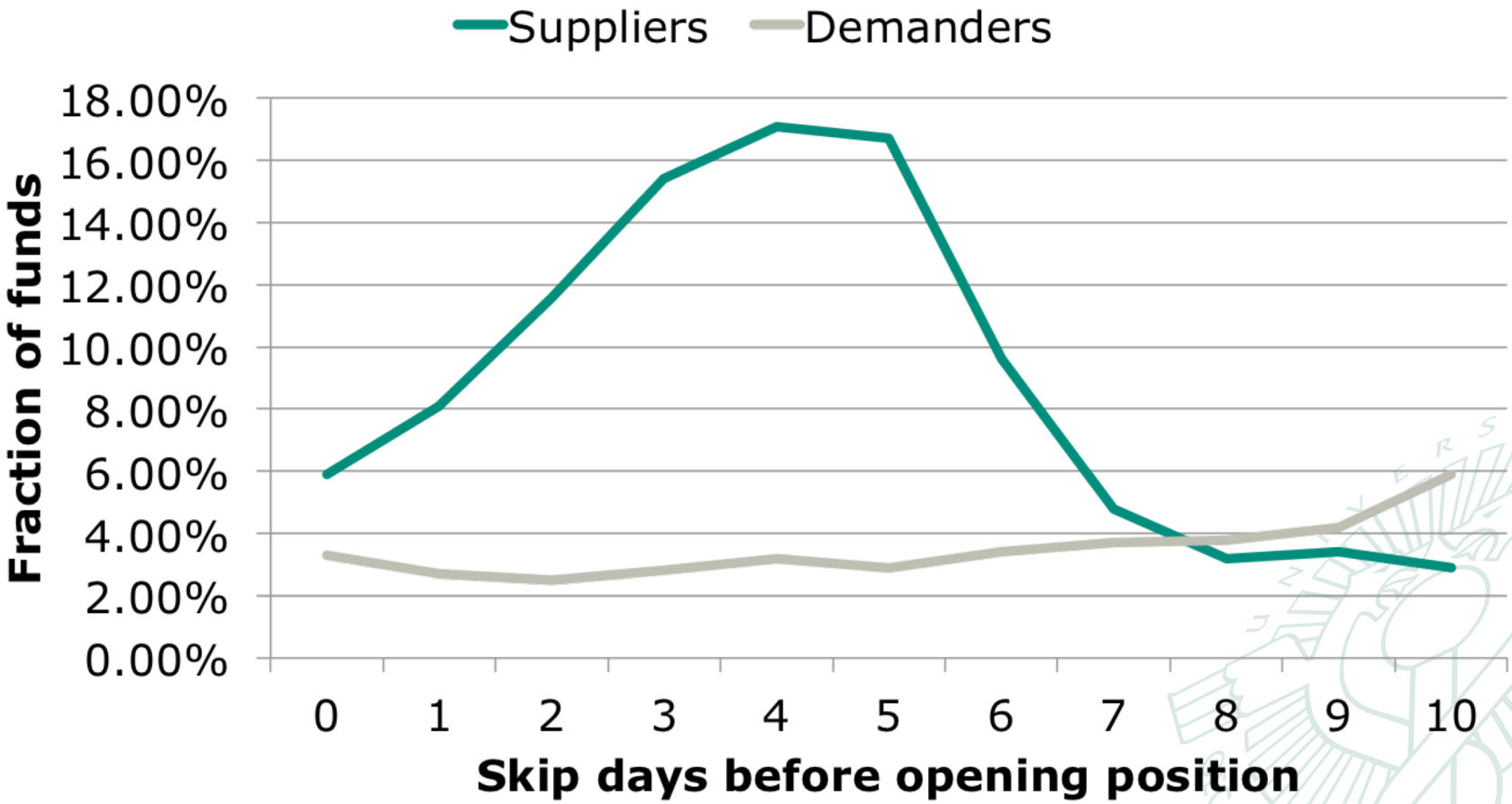
Mean	Significant < 0	Significant > 0
0.047	**3.3%**	**5.9%**
(10.98)	(3.87)	(16.74)

Significant positive average loading

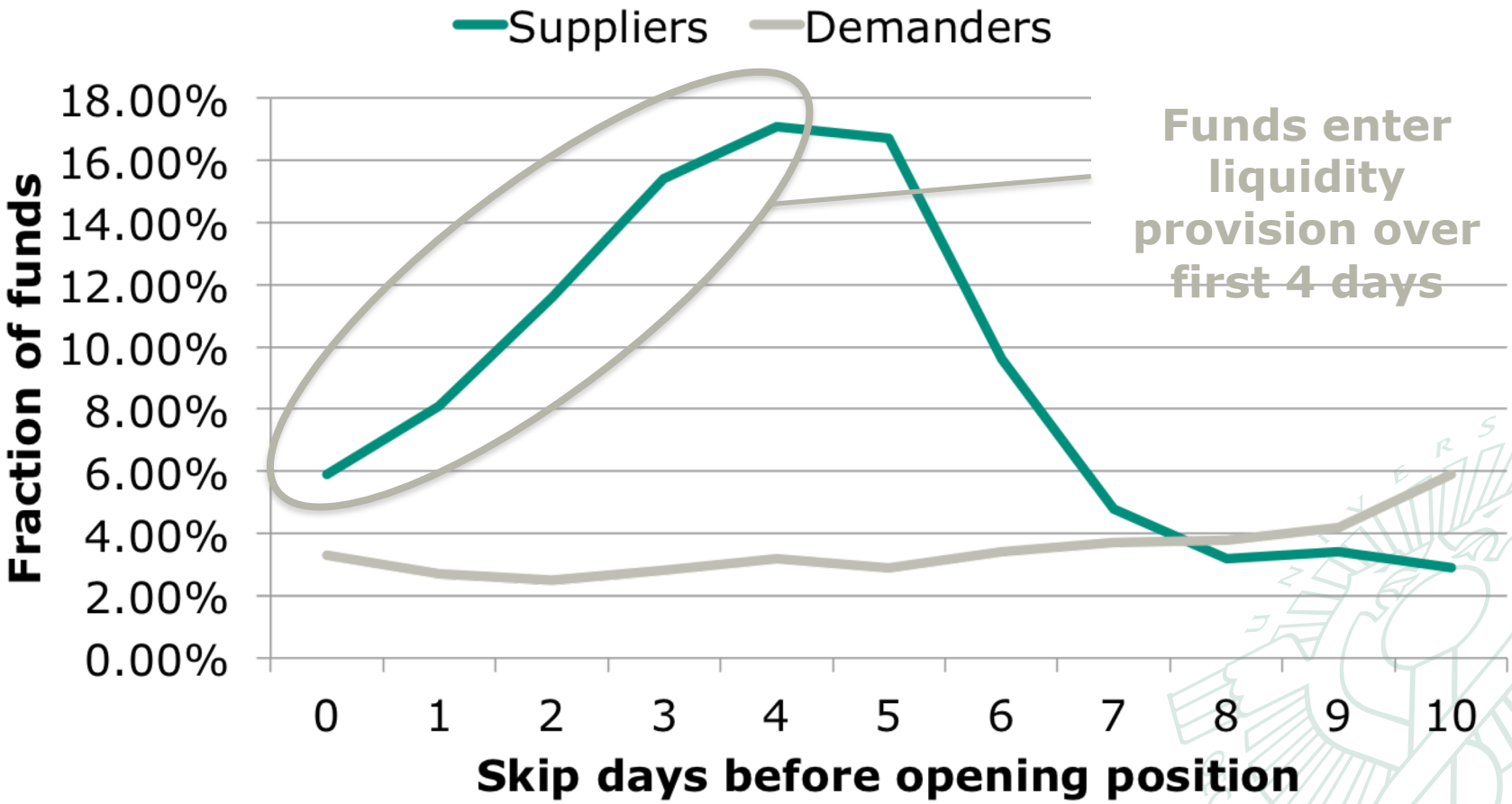
Few funds with negative loadings

Many funds with positive loadings

Results: Hedge funds enter liquidity provision slowly



Results: Hedge funds enter liquidity provision slowly



Results: Fund characteristics

- Dummy = 1 if fund has significant positive exposure to liquidity provision returns during first week
  - 24% of funds
- Regress dummy on fund characteristics, probit model

Characteristic	Coefficient
Redemption frequency	**-0.002**
	(-2.31)
Lock-up period	0.030
	(0.75)
Size	**0.043**
	(2.69)

More stable asset base → large outflows less likely → supply liquidity to other investors

Results: Time variation

- Interact immediacy provision return (r_{LP}) with market condition variables

	Coefficient
r_{LP}	**0.048**
	(10.72)
r_{LP} × Change in TED spread	**-0.605**
	(9.33)
r_{LP} × Pastor-Stambaugh liquidity	**-12.410**
	(-5.84)

Tighter credit conditions → less capital allocated to liquidity provision (Brunnermeier & Pedersen, 2009 RFS; Gromb & Vayanos, 2012 JEEA)

Illiquid markets → provide more liquidity

Results: Effects on market

- Hedge funds provide immediacy, what effects does this have on the market?
- Study effects of changes in hedge funds investable capital (equity and debt) on liquidity and volatility

- Change in equity: net flow
- Change in debt: change in cost of leverage (TED spread), cost ↑ → debt ↓

Increase in hedge fund capital improves market liquidity

Effects on markets

Effect on	Net flow	Δ Cost of debt
Δ Liqduidity (Sadka)	**1.242**	**-5.689**
	(5.10)	(-7.84)
Δ Liquidity (Pastor-Stambaugh)	**9.786**	**-33.347**
	(3.30)	(-5.67)
Return reversals	**-6.940**	-0.094
	(-2.38)	(-0.01)
Δ Volatility	0.154	**2.983**
	(0.42)	(3.88)

Some evidence of volatility-decreasing effect

Time variation in the supply of liquidity

Figure 3. Time-varying proportions of liquidity suppliers and demanders

This figure shows the time-varying proportion of funds with statistically significant (at the 5% level) positive and negative loadings on the returns from providing liquidity, R_{LP}. The proportions are estimated using rolling 36-month windows. The horizontal lines mark the following events: 1. Asian crisis begins in 7/1997, 2. the collapse of Long-Term Capital Management in 9/1998, 3. beginning of automated trading in the NYSE in 1/2003, 4. quant crisis in 8/2007, 5. the bankruptcy of Lehman Brothers in 9/2008, and 6. the collapse of MF Global in 10/2011.

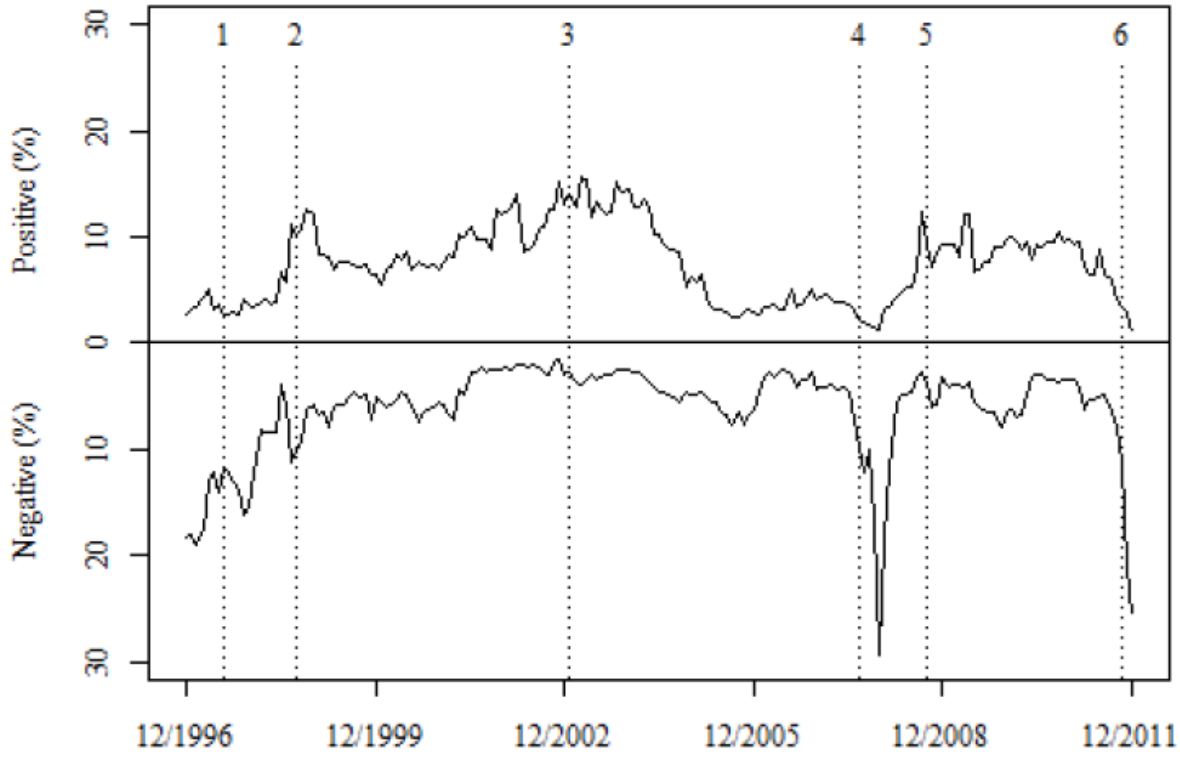
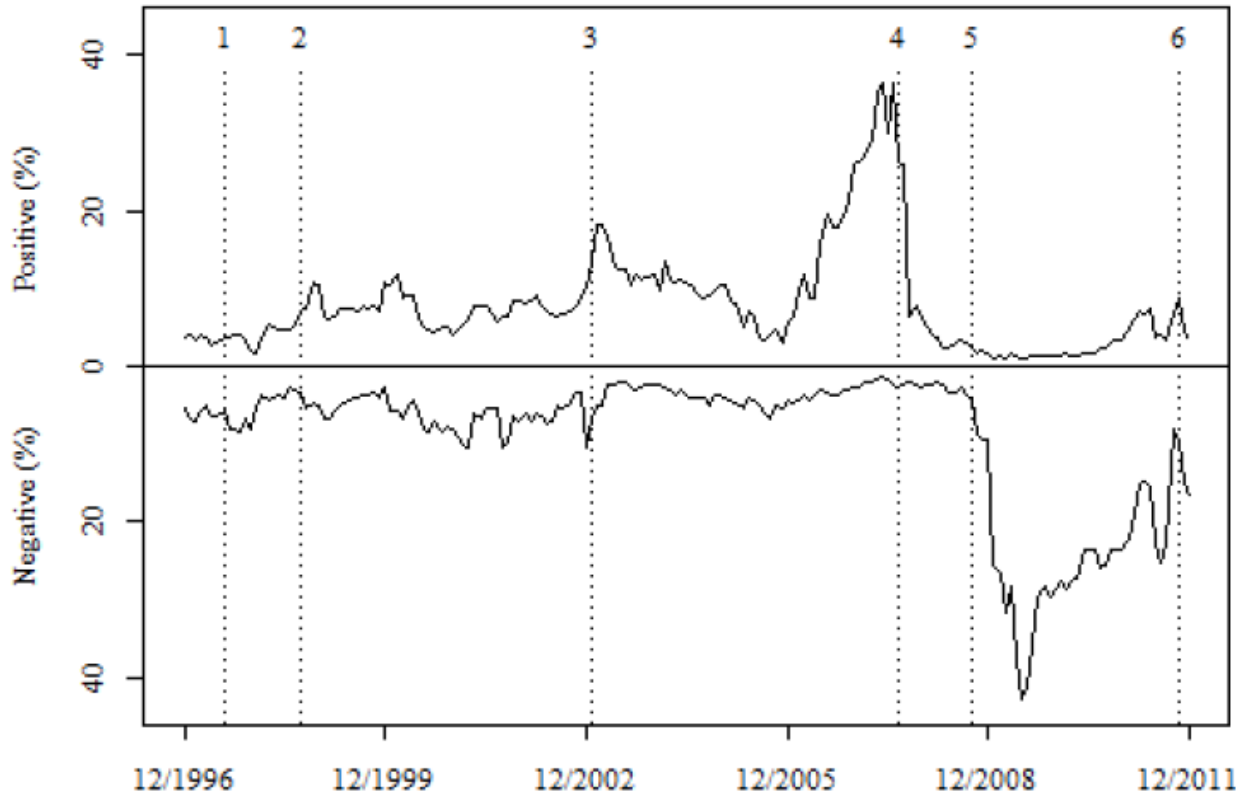


Figure 5. Time-varying proportions of liquidity suppliers and demanders in the extreme return stocks

This figure shows the time-varying proportion of funds with statistically significant (at the 5% level) positive and negative loadings on the returns from providing liquidity to the extreme return stocks. The proportions are estimated using rolling 36-month windows. The horizontal lines mark the following events: 1. Asian crisis begins in 7/1997, 2. the collapse of Long-Term Capital Management in 9/1998, 3. beginning of automated trading in the NYSE in 1/2003, 4. quant crisis in 8/2007, 5. the bankruptcy of Lehman Brothers in 9/2008, and 6. the collapse of MF Global in 10/2011.



1% extremes that were previously excluded

Summary: Key results

- Hedge funds, on average, provide liquidity
- There is variation across fund types and market conditions
- Affects market liquidity and volatility

New research shows provision of liquidity affects hedge funds' returns

- Russell Jame Msci 2017 (paper uses the Jylhä, Rinne and Suominen 2004 "returns from providing liquidity" measure):

"Using transaction data, I examine whether hedge funds profit from liquidity provision. I find hedge funds' equity-trading skill is largest in their contrarian trades over a one-month holding period. This effect is strongest for funds with greater share restrictions and when funding liquidity is low. Further, funds that engage in greater contrarian trading have persistently higher ETS over one-month holdings periods. The results suggest that contrarian hedge funds create short-term value through liquidity provision."

Contrarian hedge funds profit most from their trades with constrained mutual funds that must engage in fire sales.

Evidence on mutual funds

- Also Rinne and Suominen (2015) shows that mutual funds demand liquidity
- Their costs of immediacy can account for a large percentage of the mutual funds' underperformance
- Costs of demanding liquidity especially high for funds that follow "momentum strategy" that requires continuous rebalancing
- Costs of demanding liquidity high for those funds whose flows are correlated with industry flows

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What Happened to the Quants in August 2007?

Amir Khandani

Andrew W. Lo , Journal of Financial Markets, 2011

Abstract:

During the week of August 6, 2007, a number of quantitative long/short equity hedge funds experienced unprecedented losses. Based on TASS hedge-fund data and simulations of a specific long/short equity strategy, we hypothesize that the losses were initiated by the rapid unwind of one or more sizable quantitative equity market-neutral portfolios. Given the speed and price impact with which this occurred, it was likely the result of a forced liquidation by a multi-strategy fund or proprietary-trading desk, possibly due to a margin call or a risk reduction. These initial losses then put pressure on a broader set of long/short and long-only equity portfolios, causing further losses by triggering stop/loss and de-leveraging policies. A significant rebound of these strategies occurred on August 10th, which is also consistent with the unwind hypothesis. This dislocation was apparently caused by forces outside the long/short equity sector - in a completely unrelated set of markets and instruments - suggesting that systemic risk in the hedge-fund industry may have increased in recent years.

Other results:

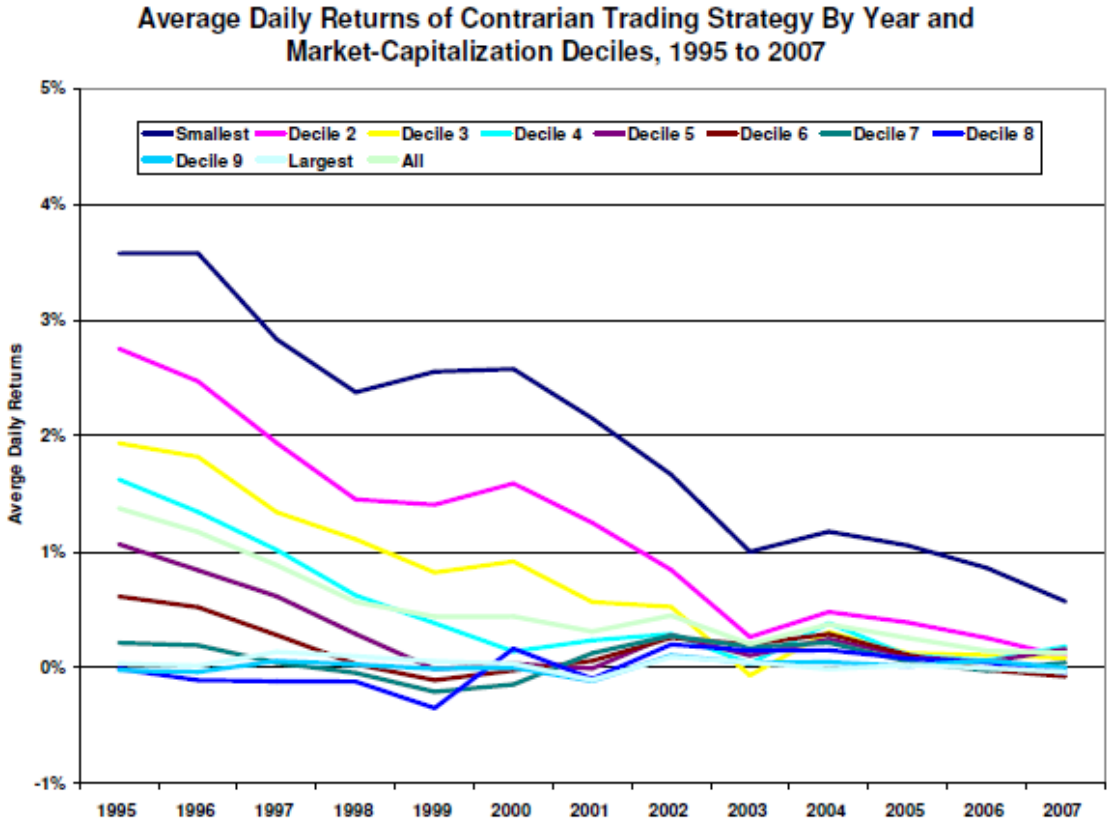


Figure 1: Year-by-year average daily returns of Lo and MacKinlay's (1990) contrarian trading strategy applied to all U.S. common stocks (CRSP share codes 10 and 11) with share prices above \$5 and less than \$2,000, and market-capitalization deciles, from January 3, 1995 to August 31, 2007.

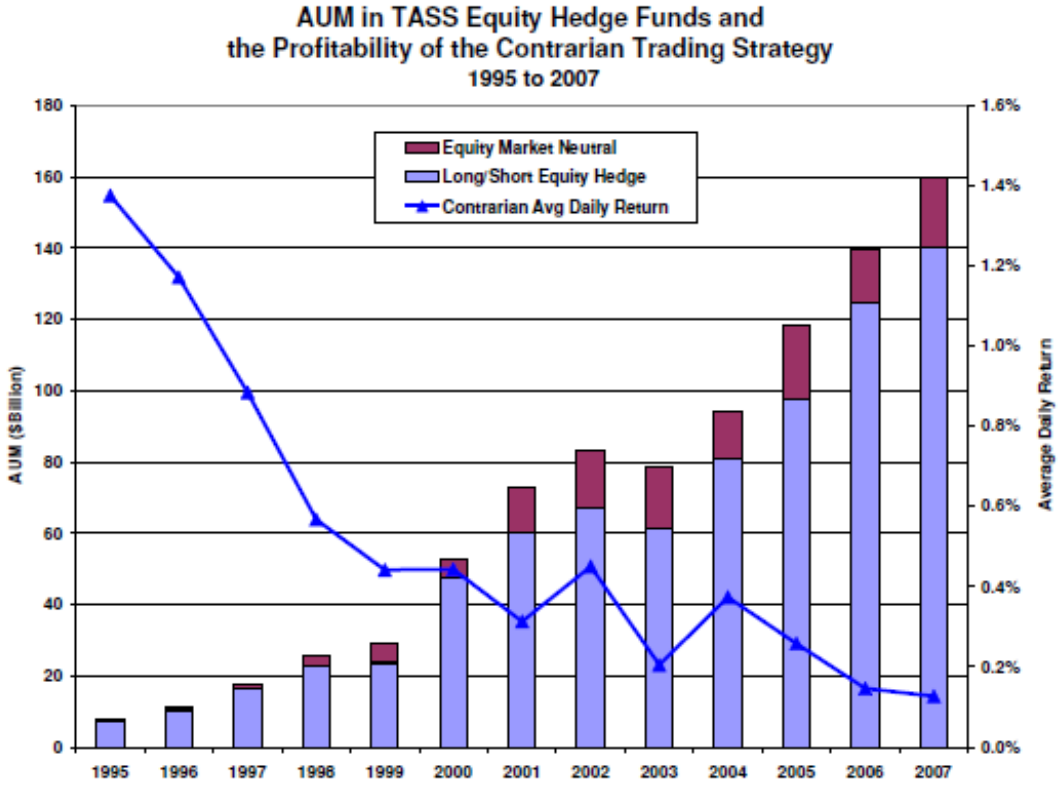
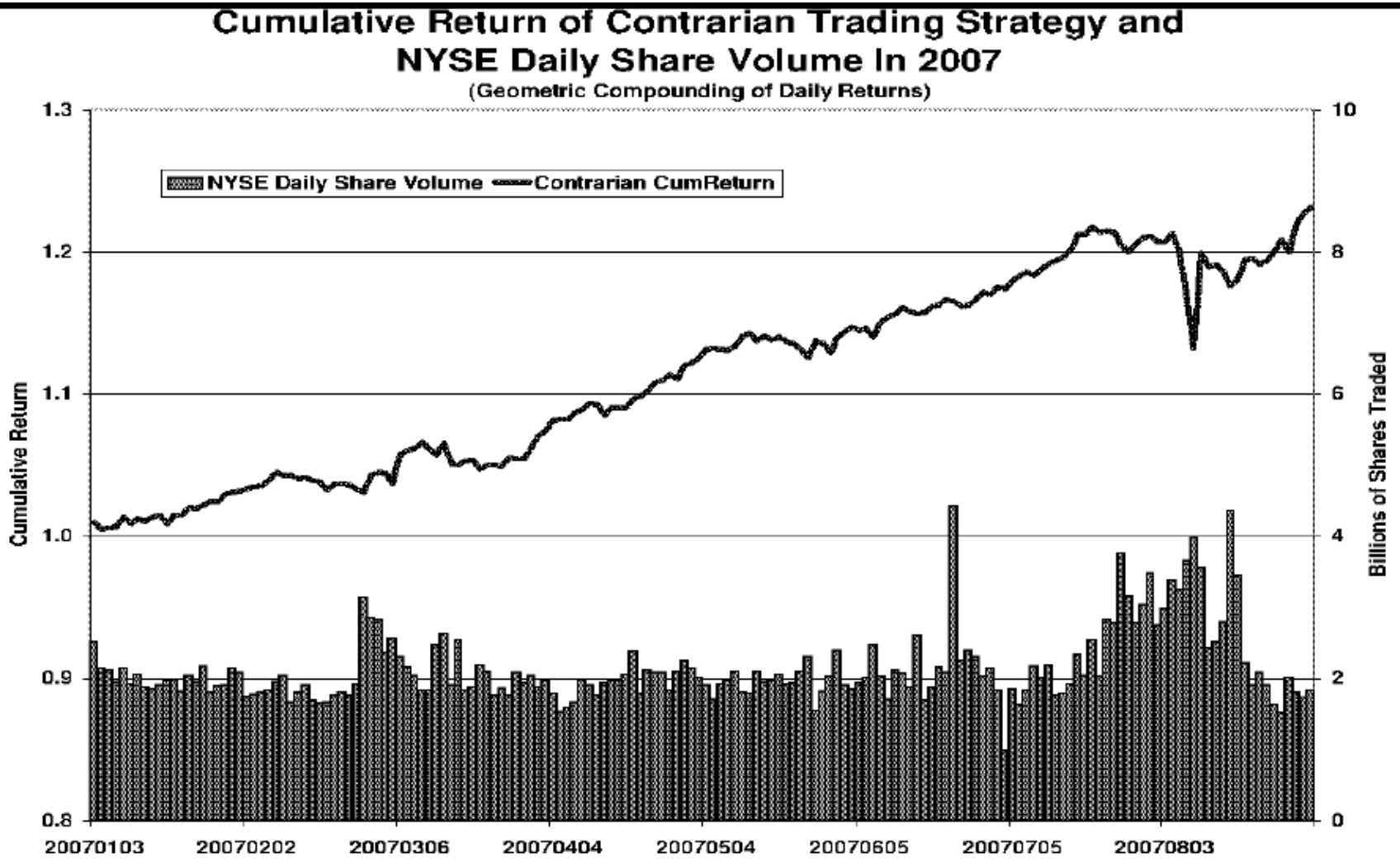


Figure 3: Beginning-of-year assets under management for funds in Long/Short Equity Hedge and Equity Market Neutral categories of the TASS database, from 1995 to 2007, and year-by-year average daily returns of Lo and MacKinlay's (1990) contrarian trading strategy applied to all U.S. common stocks (CRSP share codes 10 and 11) with share prices above \$5 and less than \$2,000, from January 3, 1995 to August 31, 2007.


Cumulative Return of Contrarian Trading Strategy and
NYSE Daily Share Volume In 2007
(Geometric Compounding of Daily Returns)
NYSE Daily Share Volume
Contrarian CumReturn
Cumulative Return
Billions of Shares Traded
1.3
1.2
1.1
1.0
0.9
0.8
10
8
6
4
2
0
20070103
20070202
20070306
20070404
20070504
20070605
20070705
20070803

Evaporating Liquidity□

Stefan Nagel†
Stanford University and NBER
January 2011, RFS 2012

Abstract
The returns of short-term reversal strategies in equity markets can be interpreted as a proxy for the returns from liquidity provision. Analysis of reversal strategies shows that the expected return from liquidity provision is strongly time-varying and highly predictable with the VIX index. Expected returns and conditional Sharpe Ratios increase enormously along with the VIX during times of financial market turmoil, such as the financial crisis 2007-09. Even reversal strategies formed from industry portfolios rather than individual stocks (which do not yield high returns unconditionally) produce high rates of return and high Sharpe Ratios during times of high VIX. The results point to withdrawal of liquidity supply, and an associated increase in the expected returns from liquidity provision, as a main driver behind the evaporation of liquidity during times of financial market turmoil, consistent with theories of liquidity provision by financially constrained intermediaries.

□

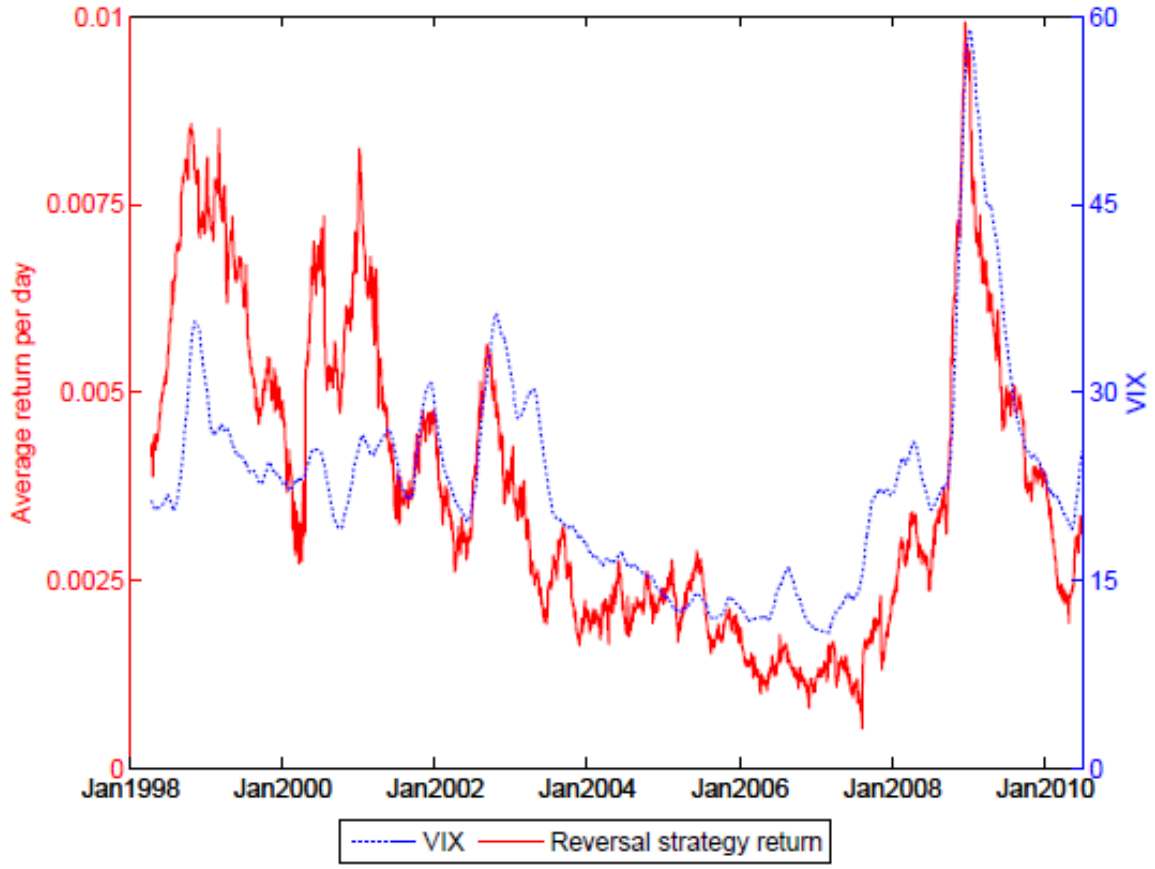


Figure 1: 3-month moving averages of daily return-reversal strategy returns and the CBOE S&P500 implied volatility index (VIX). Each day t, the reversal strategy returns are calculated as the average of returns from five reversal strategies that weight stocks proportional to the negative of market-adjusted returns on days $t-1$, $t-2$, ..., $t-5$, with weights scaled to add up to \$1 short and \$1 long. Returns are calculated from daily CRSP closing transaction prices, and returns are hedged against conditional market factor exposure.

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Pairs Trading: Performance of a Relative-Value Arbitrage Rule

Evan Gatev
Boston College

William N. Goetzmann
Yale University

K. Geert Rouwenhorst
Yale University

We test a Wall Street investment strategy, "pairs trading," with daily data over 1962–2002. Stocks are matched into pairs with minimum distance between normalized historical prices. A simple trading rule yields average annualized excess returns of up to 11% for self-financing portfolios of pairs. The profits typically exceed conservative transaction-cost estimates. Bootstrap results suggest that the "pairs" effect differs from previously documented reversal profits. Robustness of the excess returns indicates that pairs trading profits from temporary mispricing of close substitutes. We link the profitability to the presence of a common factor in the returns, different from conventional risk measures.

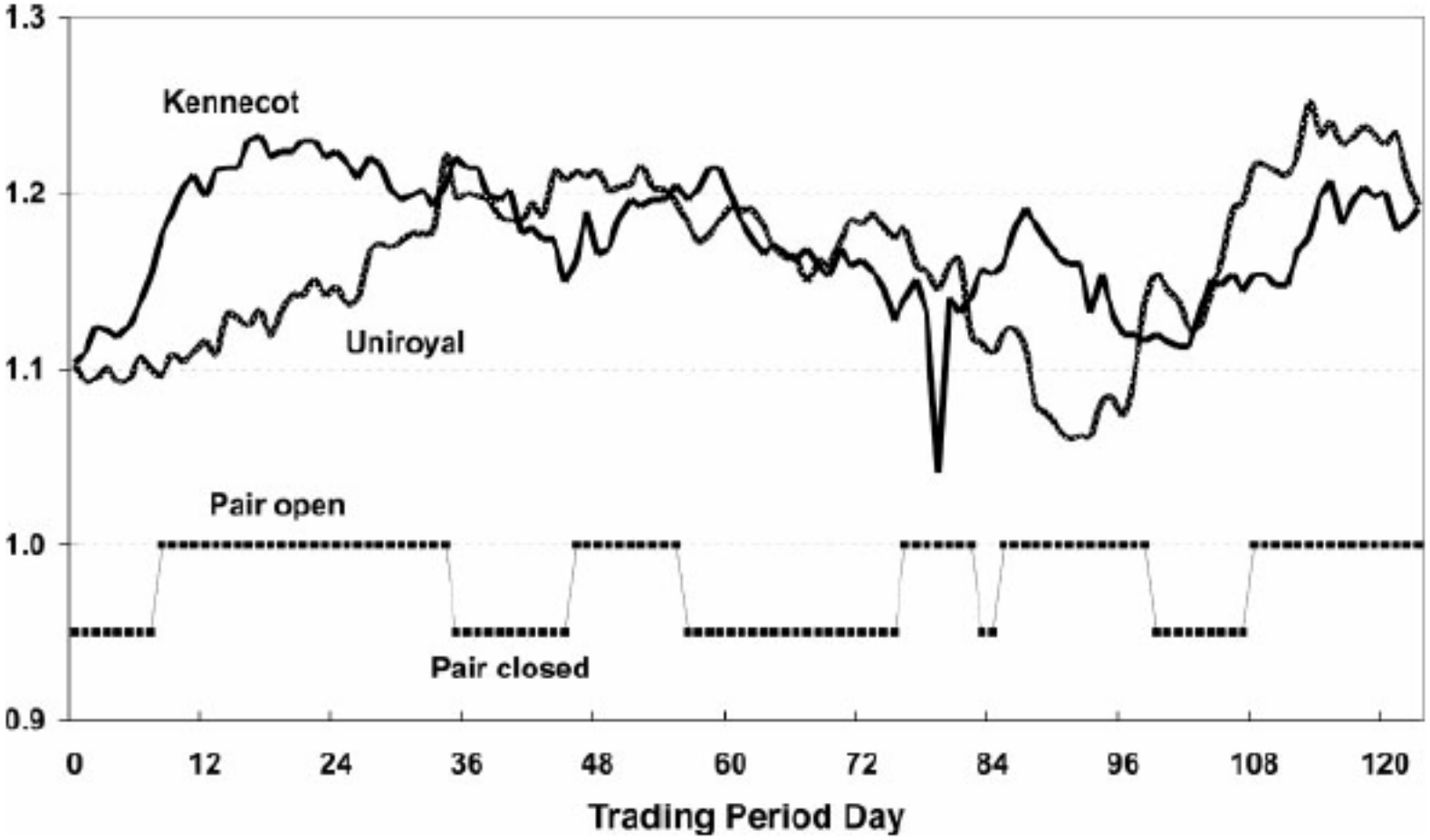


Figure 1
Daily normalized prices: Kennecott and Uniroyal (pair 5)
Trading period August 1963–January 1964.

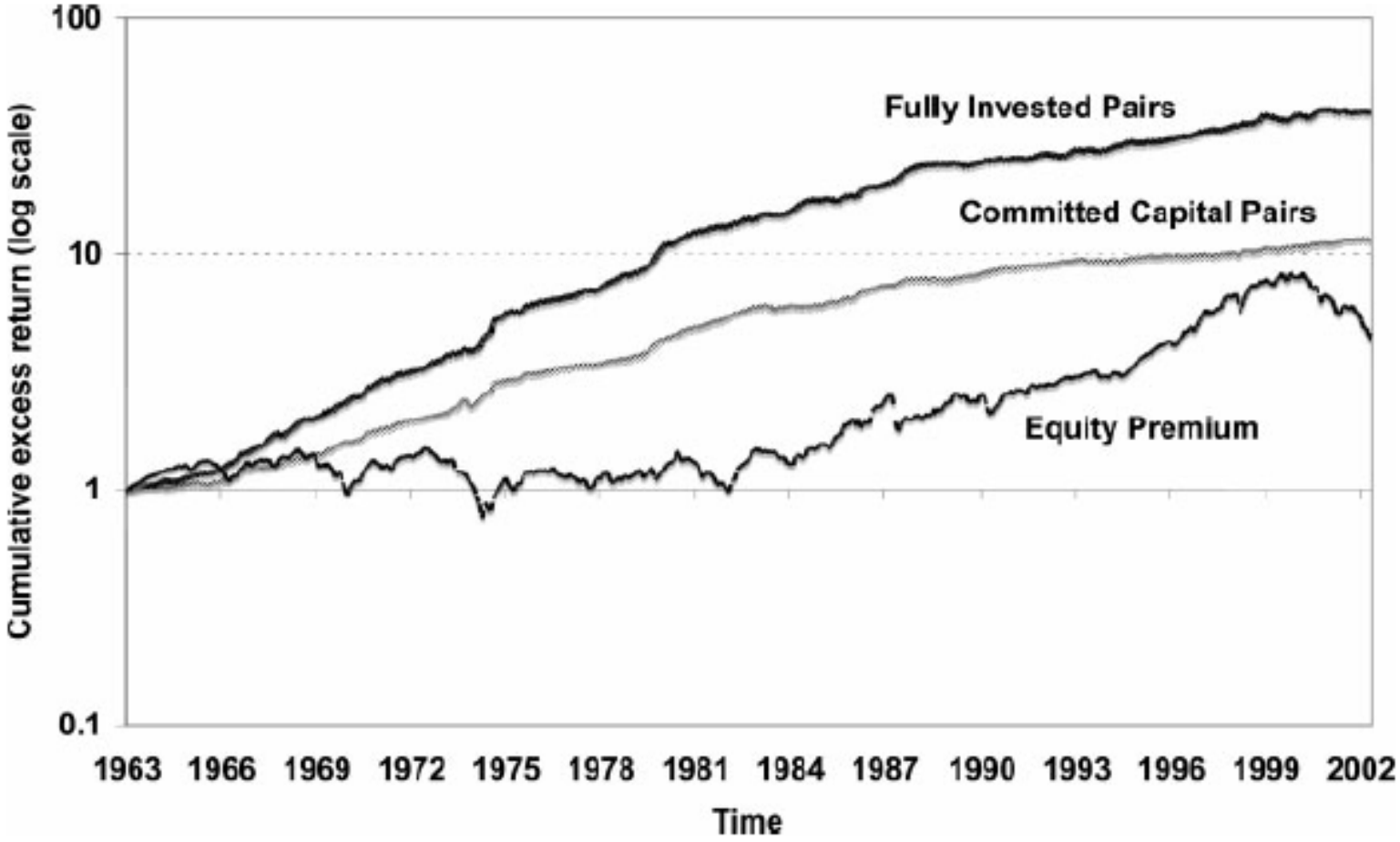
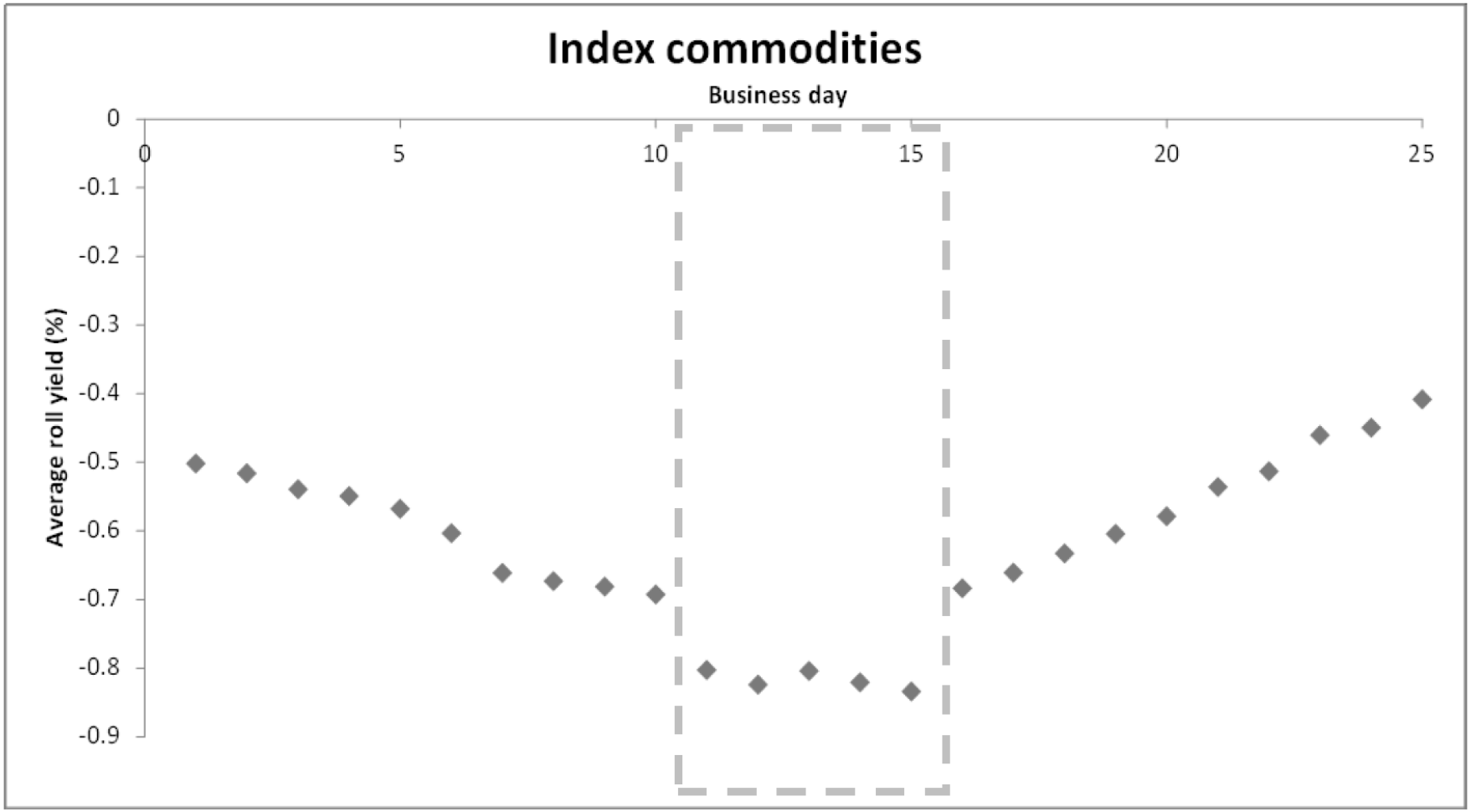


Figure 3
Cumulative excess return of top 20 pairs and S&P 500
May 1963–December 2002.

Goldman Roll (Roslander, 2014)

Figure 3: Roll yields of index commodities around the Goldman roll dates

Average roll yield of 19 index commodities during the rolling and post-rolling periods, 1995-2012. Light grey area shows the Goldman roll dates, i.e. 5th to 9th business day of each month.



Commodities

Limits to Arbitrage and Hedging:
Evidence from Commodity Markets
Viral V. Acharya, Lars A. Lochstoer and Tarun Ramadorai

- Equilibrium model of commodity markets in which speculators are capital constrained
- Commodity producers have hedging demands for commodity futures.
- Increases (decreases) in producers' hedging demand (speculators.risk-capacity) increase hedging costs via price-pressure on futures, reduce producers'.inventory holdings, and thus spot prices.
- Consistent with their model, producers' default risk forecasts futures returns, spot prices, and inventories in oil and gas market data from 1980-2006.

Table 4: Forecasting Commodity Futures Returns

The independent variables are excess returns of futures on Crude Oil, Heating Oil, Gasoline, and Natural Gas. The measures of fundamental hedging demand are the average Zmijewski-score (avgZm), the average Naive EDF (avgEDF), and the negative of the average returns the last 3 years (-avg3yr) for the sample of producers in each commodity. These dependent variables are normalized to have unit variance. The data is quarterly and the dependent variables are lagged one quarter relative to the independent variables. The controls are defined in the main text of the paper, and their regression coefficients are reported here with the exception of the regression coefficients for the quarterly dummy variables. Heteroskedasticity and autocorrelation consistent standard errors (using 3 lags) are given in parentheses; *** means p-value < 0.01, ** $p < 0.05$, * $p < 0.1$.

Hedging Demand Measures			**Commodity Specific Variables**			**Standard return predictors**					
avgZm	avgEDF	-avg3yr	Basis	Inventory	Futures Return (-1)	ΔGDP forecast	Term Spread	Risk-free rate	Default Spread	N	R^2
Panel A: Crude Oil											
0.064****			-0.159	0.621	-0.067	0.036**	-5.352****	-1.252	0.049	90	17.3%
(0.022)			(0.652)	(0.453)	(0.078)	(0.014)	(1.796)	(0.950)	(0.065)		
	0.041**		0.092	1.026	-0.113	0.023	-4.544**	-0.485	0.035	76	17.9%
	(0.020)		(0.657)	(0.648)	(0.091)	(0.017)	(2.272)	(1.291)	(0.075)		
		0.061****	0.124	1.043**	-0.090	0.033**	-4.967****	-2.131**	0.072	90	16.8%
		(0.021)	(0.609)	(0.497)	(0.084)	(0.015)	(1.839)	(0.916)	(0.067)		
Panel B: Heating Oil											
0.047**			0.015	-0.149	-0.106	0.015*	-2.793**	-0.107	-0.006	107	12.1%
(0.019)			(0.183)	(0.181)	(0.071)	(0.009)	(1.341)	(0.777)	(0.044)		
	0.040****		0.073	-0.095	-0.116	0.011	-2.179*	0.150	0.059	93	11.0%
	(0.013)		(0.177)	(0.189)	(0.078)	(0.008)	(1.275)	(0.750)	(0.045)		
		0.046****	0.046	-0.037	-0.103	0.015	-2.884**	-0.513	-0.013	107	12.2%
		(0.016)	(0.157)	(0.178)	(0.072)	(0.010)	(1.431)	(0.792)	(0.046)		

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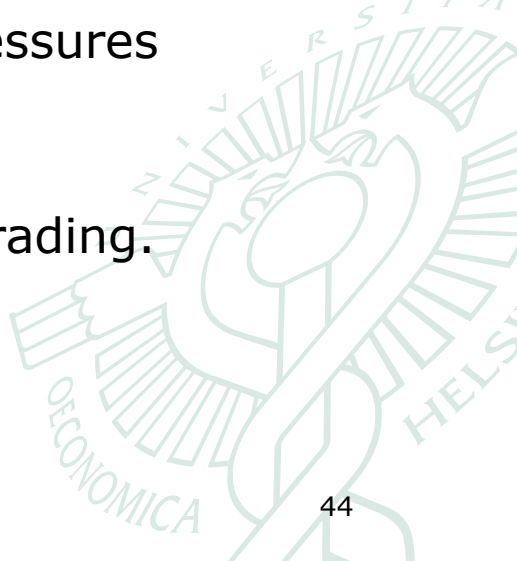
Conclusions

- Different types of returns related to liquidity
  - Liquidity risk premium (reward for holding assets that are illiquid or their liquidity is sensitive to changes in the aggregate level of liquidity).
  - Returns from providing liquidity: returns from acting as a contrarian trader in the market and accommondating the supply and demand pressures from investors.
  - The latter strategy can be exploited in pair-trading.



APPENDIX

Illiquidity premium

NYSE and Amex stocks (1926-2008) – Quartiles ranked by Amihud (2002) Illiquidity measure (Rinne and Suominen, AFA, 2012)

Cross-sectional variations in liquidity and market performance

Liquidity quartiles	ρ(1)	5-day return reversal	20-day return reversal	Persistence of price impact, B	Transitory volatility % $\sigma_p^2/(\sigma_p^2+\sigma_\varepsilon^2)$	Total volatility $\sigma_P^2+\sigma_\varepsilon^2$	Daily Turnover	C_{IMM}	Daily Return
Q1 (= illiquid)	-0.129	30.1 %	36.8 %	0.41	27 %	4.25 %	0.16 %	0.22 %	0.16 %
Q2	-0.082	19.8 %	26.0 %	0.61	20 %	2.64 %	0.21 %	0.30 %	0.07 %
Q3	-0.070	16.5 %	21.6 %	0.65	17 %	2.11 %	0.28 %	0.20 %	0.05 %
Q4 (= liquid)	-0.052	13.7 %	17.6 %	0.66	13 %	1.69 %	0.29 %	0.06 %	0.04 %

Daily Costs of Immediacy = Returns from providing liquidity

These are measured using actual trading volumes and actual 20-day return reversals of stocks in the quartiles of stocks with the highest and lowest expected short-term return reversal