

Outline

- ▶ Earnings momentum and price momentum
- ▶ Institutional trading costs
- ▶ Continuity of information
- ▶ Industry momentum
- ▶ Industries and reversals
- ▶ Momentum crashes

Earnings momentum and price momentum¹

- ▶ Price momentum
 - ▶ rank on prior 6-month return
- ▶ Earnings momentum using unexpected earnings
 - ▶ rank on $SUE = \Delta_E / \sigma(\Delta_E)$
 - ▶ Δ_E : year-to-year change in most recent quarterly earnings
 - ▶ $\sigma(\Delta_E)$: volatility of Δ_E for last 8 quarters
- ▶ Earnings momentum using analyst revisions
 - ▶ rank on $REV6$, 6-month average of Δ_F / P
 - ▶ Δ_F : monthly change in mean I/B/E/S forecast
 - ▶ P : prior month's stock price

¹ Louis K.C. Chan, Narasimhan Jegadeesh, and Josef Lakonishok, "The Profitability of Momentum Strategies,"

Table 1. Correlations between Prior Six-Month Return and Earnings Momentum Variables, 1973–93

	<i>R6</i> ^a	<i>SUE</i>	<i>REV6</i>
<i>R6</i>	1.000		
<i>SUE</i>	0.293	1.000	
<i>REV6</i>	0.294	0.440	1.000

^a*R6* is the stock compound return over the prior six months.

Note: Correlations based on monthly observations pooled across all eligible stocks.

Table 2. After-Formation Returns for Portfolios Based on Past Return Momentum and Earnings Momentum: One-Way Classification, 1973–93 Data

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)	10 – 1 (pps)
<i>A. Return: Classification based on prior six-month return</i>											
Past six months	–30.8	–12.6	–5.5	0.0	5.0	9.9	15.3	21.9	31.9	69.6	100.4
Six months APF	6.1	8.6	9.3	9.6	10.2	10.4	10.5	11.1	12.0	14.9	8.8
First year APF	14.3	18.5	19.8	20.8	21.4	22.2	22.3	23.5	24.8	29.7	15.4
Second year APF	20.5	20.1	20.5	20.6	20.8	20.8	20.4	20.8	20.7	19.9	–0.6
Third year APF	19.4	19.6	19.7	19.6	19.9	20.2	20.5	20.1	20.8	20.6	1.2
<i>B. Return: Classification based on standardized unexpected earnings</i>											
Past six months	–5.2	–0.4	2.7	6.2	9.9	12.7	14.9	16.6	18.6	22.6	27.8
Six months APF	5.1	6.3	8.1	9.1	10.5	11.4	11.4	11.5	11.9	11.9	6.8
First year APF	13.8	16.0	19.3	20.5	22.5	23.2	22.7	22.6	22.5	21.3	7.5
Second year APF	16.9	18.3	19.4	21.2	21.8	21.5	21.8	21.1	20.4	18.0	1.1
Third year APF	18.5	18.9	20.4	21.6	20.8	21.1	21.1	20.8	19.7	17.9	–0.6
<i>C. Return: Classification based on analyst forecast revisions</i>											
Past six months	–6.6	0.2	3.2	5.8	8.3	9.9	11.6	15.6	19.1	24.8	31.4
Six months APF	4.6	7.0	7.2	7.9	8.3	8.2	8.7	10.6	11.6	12.3	7.7
First year APF	13.2	15.9	16.4	17.1	17.7	17.4	17.7	20.3	21.6	22.9	9.7
Second year APF	15.9	18.0	17.8	18.7	18.0	17.1	17.8	17.5	18.8	21.4	5.5
Third year	17.7	18.2	17.4	17.3	18.6	17.9	17.6	18.9	19.4	20.2	2.5

APF = after portfolio formation.

Table 3. After-Formation Returns for Portfolios Classified by Past Return Momentum and Earnings Momentum: Two-Way Classification, 1973–93 Data

A. Standardized unexpected earnings and prior six-month return

SUE:	1 (Low)	2	3	1	2	3	1	2	3 (High)
R6:	1 (Low)	1	1	2	2	2	3	3	3 (High)
Return									
First six months	5.5	9.4	8.5	7.6	10.6	11.3	7.4	11.8	13.6
First year	14.2	19.0	15.7	18.3	22.4	21.6	19.0	25.3	25.7

B. Revisions in analyst forecasts and prior six-month return

REV6:	1 (Low)	2	3	1	2	3	1	2	3 (High)
R6:	1 (Low)	1	1	2	2	2	3	3	3 (High)
Return									
First six months	4.2	6.3	8.5	7.7	8.8	11.2	9.3	10.3	13.0
First year	11.3	13.4	15.2	18.0	18.6	21.4	21.4	21.5	24.6

C. Revisions in analyst forecasts and standardized unexpected earnings

REV6:	1 (Low)	2	3	1	2	3	1	2	3 (High)
SUE:	1 (Low)	1	1	2	2	2	3	3	3 (High)
Return									
First six months	5.1	6.5	9.3	8.4	9.3	11.1	9.3	9.6	12.1
First year	13.7	15.3	19.0	18.4	19.6	22.4	18.5	18.7	22.0

Table 5. Earnings Announcement Returns and Analyst Forecast Revisions after Portfolio Formation, 1973–93 Data

	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
<i>A. Classification based on prior six-month return</i>										
	Abnormal Return around Earnings Announcements ^a									
First announcement APF	-1.1	-0.4	-0.1	0.0	0.2	0.3	0.4	0.6	0.9	1.5
Second announcement APF	-0.2	0.0	0.0	0.1	0.1	0.3	0.3	0.3	0.5	0.8
Third announcement APF	0.2	0.1	0.2	0.1	0.2	0.1	0.3	0.3	0.3	0.5
Fourth announcement APF	0.3	0.1	0.2	0.1	0.1	0.0	0.1	0.2	0.1	0.1
	Revisions in Analyst Forecasts ^b									
Average over 6 months APF	-2.138	-0.578	-0.368	-0.282	-0.220	-0.152	-0.117	-0.068	-0.041	0.004
Average for months 7–12 APF	-1.843	-0.555	-0.378	-0.318	-0.248	-0.206	-0.191	-0.165	-0.153	-0.180
<i>B. Classification based on standardized unexpected earnings</i>										
	Abnormal Return around Earnings Announcements									
First announcement APF	-1.2	-0.8	-0.5	-0.1	0.3	0.5	0.7	0.8	1.1	1.2
Second announcement APF	-0.3	-0.2	0.1	0.1	0.4	0.4	0.4	0.3	0.3	0.5
Third announcement APF	0.2	0.1	0.3	0.3	0.2	0.3	0.2	0.1	0.1	0.1
Fourth announcement APF	0.3	0.5	0.2	0.1	0.2	0.1	-0.1	-0.1	0.0	-0.2
	Revisions in Analyst Forecasts									
Average over 6 months APF	-1.480	-0.866	-0.647	-0.453	-0.325	-0.198	-0.119	-0.095	-0.054	0.005
Average for months 7–12 APF	-1.160	-0.817	-0.659	-0.352	-0.352	-0.247	-0.296	-0.232	-0.199	-0.155
<i>C. Classification based on past analyst forecast revisions</i>										
	Abnormal Return around Earnings Announcements									
First announcement APF	-0.6	-0.4	-0.2	-0.1	-0.1	0.0	0.2	0.3	0.5	0.9
Second announcement APF	-0.2	0.0	0.0	0.0	-0.1	0.2	0.2	0.1	0.3	0.4
Third announcement APF	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.0
Fourth announcement APF	0.2	0.2	0.1	0.0	-0.2	0.1	0.0	0.0	0.0	-0.1
	Revisions in Analyst Forecasts									
Average over 6 months APF	-2.027	-0.529	-0.323	-0.231	-0.158	-0.158	-0.116	-0.057	-0.037	-0.321
Average for months 7–12 APF	-1.994	-0.516	-0.320	-0.237	-0.190	-0.181	-0.153	-0.135	-0.156	-0.332

^aAbnormal returns around earnings announcement dates are relative to the equally weighted market index and are cumulated from two days before to one day after the date of earnings announcement.

^bAverages of percentage revisions relative to the beginning-of-month stock price in monthly median I/B/E/S estimates of current fiscal year earnings per share are reported.

Institutional trading costs²

- ▶ Data: 21 institutions, 25,732 orders
 - ▶ 3 indexers
 - ▶ 11 technical traders
 - ▶ 7 value traders
- ▶ Observe trading decisions
- ▶ Trading costs:
 - ▶ explicit (commissions on exchange-listed)
 - ▶ price impact
 - volume-weighted price vs. closing price day before decision
- ▶ Estimate role of investment style and stock's market cap when trading
 - ▶ 35,000 shares on a base of 30 mil. outstanding
 - ▶ with a one-day horizon

² Donald B. Keim and Ananth Madhavan, "The Cost of Institutional Equity Trades," *Financial Analysts Journal*,

Table 1. Average Trading Costs by Trade-Size Quartile for Common Stock Trades by 21 Institutions, January 1991–March 1993
(standard errors in parentheses)

Trade-Size Quartile	Exchange-Listed Stocks ^a				Nasdaq Stocks	
	Total Cost	Implicit Cost	Explicit Cost	Number of Trades	Total Cost	Number of Trades
<i>Buyer-initiated trades</i>						
1: Smallest	0.31% (0.02)	0.18% (0.02)	0.13% (0.00)	7,392	0.76% (0.06)	1,755
2	0.36 (0.03)	0.19 (0.03)	0.17 (0.00)	6,577	1.01 (0.07)	2,571
3	0.53 (0.04)	0.32 (0.04)	0.21 (0.00)	6,503	1.08 (0.09)	2,645
4: Largest	0.90 (0.05)	0.65 (0.05)	0.25 (0.00)	5,570	1.80 (0.10)	3,577
<i>Seller-initiated trades</i>						
1: Smallest	0.33 (0.03)	0.15 (0.03)	0.18 (0.00)	5,736	0.29 (0.12)	696
2	0.31 (0.04)	0.11 (0.03)	0.20 (0.00)	5,291	0.50 (0.11)	1,142
3	0.38 (0.04)	0.17 (0.04)	0.21 (0.00)	4,766	0.71 (0.11)	1,666
4: Largest	1.42 (0.08)	1.13 (0.08)	0.29 (0.00)	3,830	2.63 (0.14)	2,602

Notes: Implicit trading costs were defined as $(P_a/P_d) - 1$, where P_a is the average price of all the executed trades in the order and P_d is the closing price for the stock on the day before the decision to trade the stock. Explicit trading cost was defined as (Commissions per share/ P_d). Trade-size quartile was defined as number of shares traded divided by total outstanding shares; quartile cutoffs were determined separately for buy and sell transactions.

^aNYSE and Amex.

Table 2. Average Trading Costs by Market-Cap Quintile for Common Stock Trades by 21 Institutions, January 1991– March 1993
(standard errors in parentheses)

Market-Cap Quartile	Exchange-Listed Stocks ^a				Nasdaq Stocks	
	Total Cost	Implicit Cost	Explicit Cost	Number of Trades	Total Cost	Number of Trades
<i>Buyer-initiated trades</i>						
1: Largest	0.31% (0.02)	0.17% (0.02)	0.13% (0.00)	10,960	0.24% (0.11)	1,155
2	0.43 (0.03)	0.28 (0.03)	0.17 (0.00)	7,989	0.51 (0.09)	1,934
3	0.64 (0.06)	0.41 (0.06)	0.24 (0.00)	4,137	0.92 (0.08)	2,929
4	1.00 (0.07)	0.70 (0.08)	0.30 (0.00)	2,115	1.52 (0.09)	2,720
5: Smallest	1.78 (0.12)	1.35 (0.12)	0.42 (0.01)	834	2.85 (0.13)	1,801
<i>Seller-initiated trades</i>						
1: Largest	0.26 (0.02)	0.11 (0.02)	0.15 (0.00)	10,901	0.16 (0.12)	960
2	0.63 (0.04)	0.41 (0.05)	0.23 (0.00)	4,738	0.85 (0.18)	853
3	1.02 (0.00)	0.72 (0.09)	0.30 (0.00)	2,296	1.18 (0.12)	1,517
4	1.33 (0.16)	0.92 (0.15)	0.41 (0.01)	1,112	1.73 (0.15)	1,613
5: Smallest	2.03 (0.23)	1.36 (0.23)	0.67 (0.02)	568	2.91 (0.23)	1,106

Notes: The sample is partitioned by market capitalization with cutoffs determined by NYSE quintile break points as of December 1991. See also the notes for Table 1.

^aNYSE and Amex.

Figure 2. Estimated One-Way Trading Costs by Investment Style for a Hypothetical Trade in a Nasdaq Stock

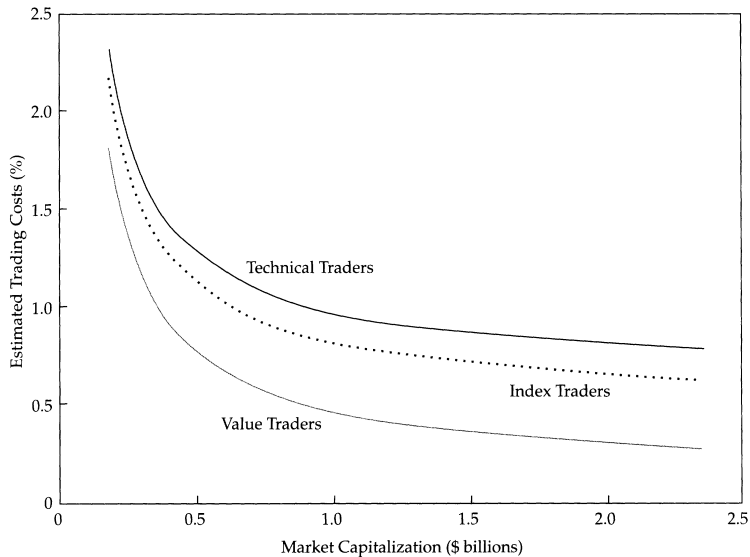
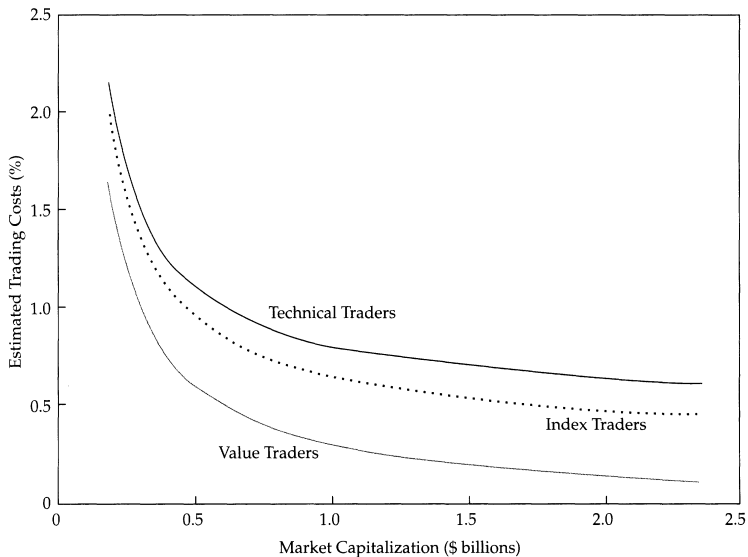


Figure 3. Estimated One-Way Trading Costs by Investment Style for a Hypothetical Trade in an NYSE Stock



Continuity of information³

- ▶ Suppose under-reaction is a major driver of momentum.
- ▶ Gradual frequent changes are less noticed than dramatic ones.
- ▶ Information discreteness measure:
 - ▶ $ID = \text{sign}(\text{PRET}) \cdot [\% \text{neg} - \% \text{pos}]$
 - ▶ PRET : return during past year
 - ▶ %neg (%pos): % of days with \downarrow (\uparrow) returns during past year
- ▶ Form portfolios: 5×5 sort by PRET and ID

Average ID	6-Month Momentum Profit	
	Raw difference	3-factor alpha
0.04	0.67	3.18
-0.01	4.25	5.17
-0.03	5.35	7.62
-0.06	6.35	8.90
-0.11	8.23	8.14

³ Zhi Da, Umit G. Gurun, and Mitch Warachka, "Frog in the Pan: Continuous Information and Momentum,"

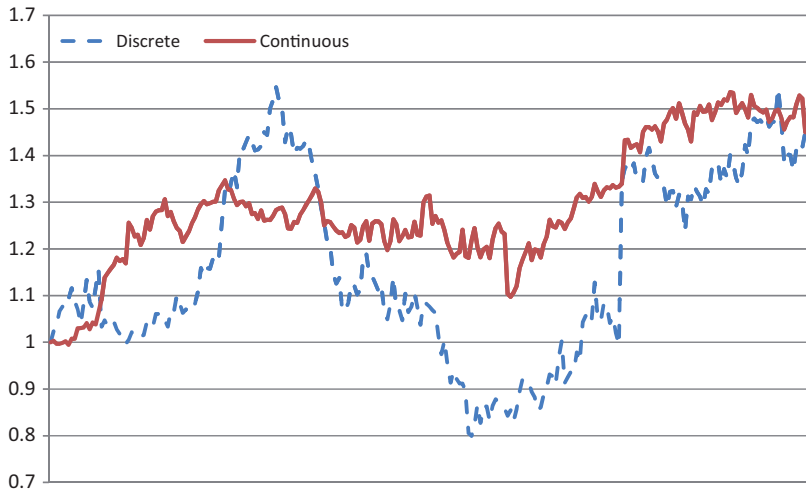
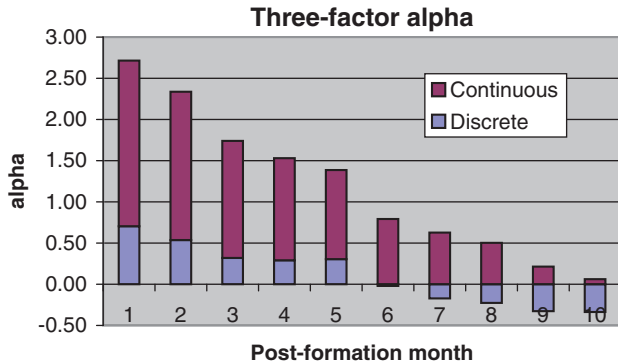


Figure 1
Continuous versus discrete information

This figure provides a visual illustration of the difference between continuous information versus discrete information. Both firms have the same starting and ending stock prices but with different intermediate returns over the 250 “daily” periods. ID is defined in Equation (1) to capture the distribution of daily returns across the formation period. Continuous information arrives frequently in small amounts, while discrete information arrives infrequently in large amounts. In this figure, ID equals -0.136 for the stock with continuous information and 0.072 for the stock with discrete information.



Industry momentum⁴

- ▶ A significant portion of momentum occurs at the industry level:
 - ▶ assign stocks to 20 industries
 - ▶ form value-weighted portfolio for each industry
 - ▶ rank industry portfolios on past 12-month returns
 - ▶ long (short) an equally weighted combination of the top (bottom) 3 industries
 - ▶ average monthly long-short return difference over the next
 - ▶ 1 month: 0.85%
 - ▶ 6 months: 0.53%
 - ▶ 12 months: 0.26%

(sample period: 7/1963–7/1995)
- ▶ Industry effects limit the diversification of momentum strategies

⁴Tobias Moskowitz and Mark Grinblatt, "Do Industries Explain Momentum?" *Journal of Finance*, 1999

Industries and reversals⁵

- ▶ Returns over short periods (e.g. 1-month or less) exhibit reversals
- ▶ A significant portion of this reversal effect appears to be intra-industry
- ▶ Reversal strategies:
 - ▶ Unconditional: weight stocks in proportion to (minus) return vs. market average
 - ▶ Intra-industry: weight stocks in proportion to (minus) return vs. industry average
 - ▶ Inter-industry: weight industries in proportion to (minus) return vs. market average
- ▶ Returns on \$1 long and \$1 short (i.e., 50% margin)
- ▶ Inter-industry reversal strategy is not profitable
 - ▶ industry-level returns exhibit momentum, not reversals
- ▶ Intra-industry strategy is more profitable than unconditional
 - ▶ industry momentum weakens unconditional reversal

⁵ Allaudeen Hameed and G. Mujtaba Mian, "Industries and Stock Return Reversals," *Journal of Financial and*

TABLE 2

Unconditional Reversal Strategy and Its Decomposition

Table 2 reports the monthly returns from the unconditional reversal strategy (π) and its decomposition into intra-industry (π^{INTRA}) and inter-industry (π^{INTER}) reversal return components as depicted in equation (6). In Panel A, we report the return for π , where the strategy takes long (short) positions in the stocks that underperformed (outperformed) the market in the previous month, and we group these stocks as LOSERS (WINNERS). π is defined as LOSERS minus WINNERS. In Panel B, we report π^{INTRA} , where the strategy takes long (short) positions in the stocks that underperformed (outperformed) the industry portfolio in the previous month. H^{INTRA} and H are the scaling factors for the unconditional and intra-industry strategies, so that the portfolio weights add to \$1 dollar long and \$1 short in the respective strategies. Panel C reports π^{INTER} , where the strategy takes long (short) positions in the industry portfolios that underperformed (outperformed) the market portfolio. H^{INTER} is the scaling factor for the inter-industry strategy. We report the holding period returns for each portfolio, which include raw returns as well as risk-adjusted returns using CAPM, Fama–French (1993) 3-factor model, and a 4-factor model that further includes the Pastor–Stambaugh (2003) liquidity factor. The sample period is from 1968 to 2010. Newey–West (1987) adjusted t-statistics are reported in parentheses.

Portfolio	Raw Return	Risk-Adjusted Returns		
		CAPM	3-Factor	4-Factor
<i>Panel A. Unconditional Reversal</i>				
LOSERS	1.298 (4.28)	0.301 (2.08)	0.147 (1.51)	0.146 (1.48)
WINNERS	0.491 (1.80)	−0.423 (−2.73)	−0.504 (−4.78)	−0.481 (−4.69)
π (LOSERS − WINNERS)	0.806 (4.55)	0.725 (4.40)	0.651 (3.51)	0.627 (3.43)
<i>Panel B. Intra-Industry Reversal</i>				
LOSERS	1.479 (4.93)	0.485 (3.45)	0.333 (4.11)	0.336 (4.10)
WINNERS	0.343 (1.27)	−0.574 (−3.85)	−0.659 (−7.21)	−0.637 (−7.13)
π^{INTRA} (LOSERS − WINNERS)	1.136 (7.76)	1.059 (7.66)	0.993 (6.55)	0.974 (6.52)
$\pi^{\text{INTRA}} \times H^{\text{INTRA}}/H$	1.101 (7.87)	1.026 (7.68)	0.963 (6.57)	0.944 (6.54)
<i>Panel C. Inter-Industry Reversal</i>				
LOSERS	0.378 (1.49)	−0.529 (−3.79)	−0.706 (−6.62)	−0.721 (−6.75)
WINNERS	1.679 (6.74)	0.795 (5.92)	0.630 (6.10)	0.643 (6.16)
π^{INTER} (LOSERS − WINNERS)	−1.301 (−7.84)	−1.324 (−7.72)	−1.336 (−7.02)	−1.364 (−7.15)
$\pi^{\text{INTER}} \times H^{\text{INTER}}/H$	−0.295 (−6.13)	−0.302 (−6.23)	−0.311 (−5.63)	−0.317 (−5.68)

Momentum crashes⁶

- ▶ Momentum is profitable on average but occasionally performs very poorly
- ▶ These momentum “crashes” are typically spread over several months
- ▶ Magnitudes \Rightarrow momentum can underperform for relatively long periods
- ▶ Crashes mostly attributable to big gains on the past losers (short leg)
- ▶ Momentum crashes tend to occur
 - ▶ after down markets
 - ▶ during market recoveries
 - ▶ during high volatility
- ▶ Timing the momentum strategy
 - ▶ invest less after down markets and when volatility is high
 - ▶ doubles the alpha and Sharpe ratio

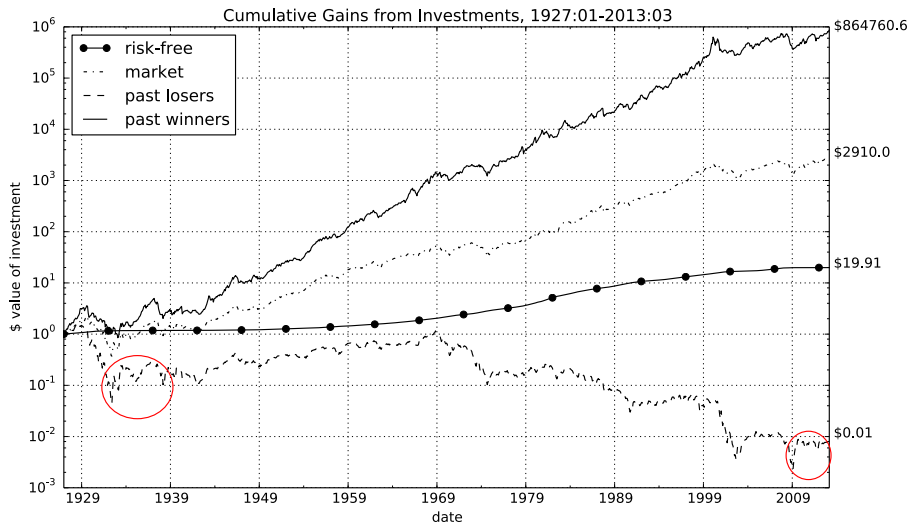


Fig. 1. Winners and Losers, 1927-2013. Plotted are the cumulative returns to four assets: (1) the risk-free asset; (2) the CRSP value-weighted index; (3) the bottom decile “past loser” portfolio; and (4) the top decile “past winner” portfolio over the full sample period 1927:01 to 2013:03. To the right of the plot we tabulate the final dollar values for each of the four portfolios, given a \$1 investment in January 1927.

Table 2

Worst monthly momentum returns

This table lists the 15 worst monthly returns to the WML momentum portfolio over the 1927:01-2013:03 time period. Also tabulated are Mkt-2y, the 2-year market returns leading up to the portfolio formation date, and Mkt_t , the contemporaneous market return. The dates between July 1932 and September 1939 are marked with *, those between April and August of 2009 with † ; those from January 2001 and November 2002 with ‡ . All numbers in the table are in percent.

Rank	Month	WML_t	MKT-2y	Mkt_t
1	1932-08*	-74.36	-67.77	36.49
2	1932-07*	-60.98	-74.91	33.63
3	2001-01 ‡	-49.19	10.74	3.66
4	2009-04 †	-45.52	-40.62	10.20
5	1939-09*	-43.83	-21.46	16.97
6	1933-04*	-43.14	-59.00	38.14
7	2009-03 †	-42.28	-44.90	8.97
8	2002-11 ‡	-37.04	-36.23	6.08
9	1938-06*	-33.36	-27.83	23.72
10	2009-08 †	-30.54	-27.33	3.33
11	1931-06*	-29.72	-47.59	13.87
12	1933-05*	-28.90	-37.18	21.42
13	2001-11 ‡	-25.31	-19.77	7.71
14	2001-10 ‡	-24.98	-16.77	2.68
15	1974-01	-24.04	-5.67	0.46