Cognitive Dissonance, Sentiment, and Momentum

Antoniou, Doukas, Subrahmanyam

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Introduction

Key Question: Do variations in profitability from momentum stem from variations in sentiment?

Introduction

Definition

Sentiment refers to whether an individual, for whatever extraneous reason, feels excessively optimistic or pessimistic about a situation.

Definition

Newswatchers documented by Hong and Stein (1999) are different groups who react to news, creating a slow dispersion of news and thus momentum.

Introduction

Hypothesis

- Newswatchers will underreact more strongly whent they receive information that contradicts their sentiment due to cognitive dissonance.
- This implies bad (good) news among (loser) winner stocks will diffuse slowly when sentiment is optimistic (pessimistic).
- This will lead to momentum, driven by the loser portfolio in optimistic sentiment periods and the winner portfolio in pessimistic sentiment periods.

Introduction

Main Results

- Strong momentum in optimistic periods controlloing for market returns, analyst coverage, size, and CAPM/FF
- No momentum in pessimistic periods
- Small investors are slow to sell losers during the optimistic periods in intraday transactions
- Momentum profits reverse significantly after optimistics periods (but not in pessimistic periods)

Previous Work

- Hong and Stein (1999): Newswatchers react to news and create momentum
- Cooper, Guitierrez, Hameed (2004): investor biases more accentuated after gains - momentum profits follow only market increases
- Chordia and Shivakumar (2002): Momentum profits are significant only in expanding economy
- Livnat and Petrovic (2008): investor sentiment linked to post-earnings announcement drift
  - Others also show fund flows, value effect, corporate disclosure, IPO, size effect

Data

- All common stocks of NYSE and AMEX from 1967 to 2008
- Construct momentum portfolios using method of Jegadeesh and Titman (1993)
  - Each month t sort stocks based on returns of past J months, create 10 portfolios
  - Winners at the top, losers on the bottom
  - Each month, hold winner portfolio and short loser portfolio, holding for K months
  - Portfolios are overlapping, close position in month $t-K$ and take new position using winners and losers of month t
  - As is standard, allow 1 month between end of the formation period and beginning of holding period
- Delete all stocks less than \$1

Data

Investor Sentiment Measure

- Monthly time series of consumer confidence sentiment constructed by the Conference Board (CB).
- Begins in 1967 for bimonthly measures, and 1977 has monthly measures
- Sent to 5000 randomly selected households in United States
- Asks 5 questions about outlook for the economy
- Sum favorable replies, divided by total replies

Data

Investor Sentiment Measure

- Purge Macroeconomics by regressing index on:
  - growth in industrial production
  - real growth in durable ocnsumption
  - nondurable consumption
  - services consumption
  - growth in employment
  - NBER recession indicator
- Take residuals and use them as the sentiment proxy

Data

Investor Sentiment Measure

For discovering optimism/pessimism:

- caluclate weighted-rolling average of the setiment level for the 3 motnhs prior to the end of the formation period
- give weight of 3 to sentiment in prior mornth, 2 to the one in month prior to that, and 1 beyond that
- Classify as optimistic (pessimistic) if the 3-month rollowing average ending in month t belongs in the top (bottom) 30% of the 3-month rolling average in the time series

Empirical Analysis

Hypothesis

Negative (positive) information about stocks when sentiment is optimistic (pessimistic) will conflict with investors' prior beliefs and cause cognitive dissonance.

Empirical Analysis

First Test

- Examine profitability of the momentum stratedgy conditioning on pessimistic and optimistic investor sentiment states
- Look at strateegies based on $J = 6$ month ranking period and holding periods of $K = 3, 6, 12$ months sorted by investor sentiment

Result

- Average monthly profits in optimistic periods are higly signficant, decrease as optimism decreases
- Higher momentum profits in optimistic periods arise because loser stocks continue to underperform in subsequent periods
  - bad news diffuses slowly when investors are optimistic - cognitive dissonance

Empirical Analysis

Sentiment State		Momentum Portfolio: Sell 1	2	3	4	5	6	7	8	9	Buy 10	Buy – Sell	[*t*-Stat.]
Panel A. 30%–30% Sentiment States													
Panel A1. J = 6, K = 3													
OPTIMISTIC	(*n* = 133)	−0.85	−0.05	0.36	0.53	0.68	0.78	0.96	0.90	1.09	1.42	2.27	[5.06]
MILD	(*n* = 246)	−0.24	0.53	0.81	0.91	0.97	1.01	1.04	1.04	1.14	1.20	1.44	[4.67]
PESSIMISTIC	(*n* = 121)	1.86	2.07	2.21	2.14	2.08	1.97	1.91	1.84	1.89	2.15	0.29	[0.56]
											Opt. – Pes.	1.98	[2.90]
Panel A2. J, K = 6													
OPTIMISTIC	(*n* = 121)	−0.48	0.17	0.52	0.67	0.86	0.95	1.10	1.10	1.26	1.51	2.00	[5.66]
MILD	(*n* = 286)	−0.28	0.34	0.63	0.77	0.86	0.91	0.99	1.05	1.12	1.18	1.46	[5.66]
PESSIMISTIC	(*n* = 93)	2.12	2.41	2.45	2.31	2.24	2.21	2.11	2.13	2.21	2.45	0.34	[0.77]
											Opt. – Pes.	1.66	[2.96]
Panel A3. J = 6, K = 12													
OPTIMISTIC	(*n* = 109)	−0.27	0.20	0.49	0.62	0.78	0.86	0.94	0.96	1.00	1.00	1.27	[3.50]
MILD	(*n* = 337)	0.38	0.75	0.95	1.02	1.10	1.12	1.18	1.22	1.25	1.23	0.85	[4.14]
PESSIMISTIC	(*n* = 54)	2.05	2.25	2.21	2.12	2.11	2.05	2.00	2.00	2.06	2.14	0.09	[0.22]
											Opt. – Pes.	1.18	[2.20]
Panel B. 40%–40% Sentiment States													
Panel B1. J = 6, K = 3													
OPTIMISTIC	(*n* = 172)	−1.51	−0.53	−0.07	0.12	0.29	0.39	0.57	0.52	0.65	0.87	2.38	[6.09]
MILD	(*n* = 170)	0.24	0.91	1.16	1.27	1.31	1.33	1.35	1.35	1.42	1.48	1.24	[2.97]
PESSIMISTIC	(*n* = 158)	1.63	1.88	2.00	1.94	1.89	1.81	1.75	1.71	1.83	2.08	0.45	[1.05]
											Opt. – Pes.	1.93	[3.33]
Panel B2. J, K= 6													
OPTIMISTIC	(*n* = 149)	−0.99	−0.23	0.17	0.36	0.58	0.68	0.85	0.90	1.05	1.26	2.25	[6.83]
MILD	(*n* = 227)	0.05	0.65	0.93	1.05	1.08	1.11	1.15	1.18	1.24	1.26	1.21	[4.12]
PESSIMISTIC	(*n* = 124)	1.56	1.82	1.89	1.82	1.83	1.85	1.80	1.85	1.93	2.21	0.65	[1.83]
											Opt. – Pes.	1.60	[3.29]
Panel B3. J = 6, K = 12													
OPTIMISTIC	(*n* = 124)	−0.65	−0.08	0.24	0.38	0.57	0.66	0.76	0.79	0.82	0.80	1.45	[3.91]
MILD	(*n* = 304)	0.50	0.83	1.04	1.11	1.18	1.20	1.26	1.30	1.32	1.31	0.81	[3.71]
PESSIMISTIC	(*n* = 72)	1.96	2.13	2.06	1.95	1.93	1.89	1.84	1.84	1.89	2.00	0.04	[0.14]
											Opt. – Pes.	1.41	[2.87]

Empirical Analysis

Consitent with Cooper et al. (2004) consider market states

Design

- Classify each formation period into UP or DOWN market states independent of investor sentiment
  - CRSP value-weighted index return for 36, 24, and 12 month period
- Derive momentum profits for optimistic and pessimistic periods during UP and DOWN markets

Results

- Most (87.2%) significant momentum profits occur in UP markets
- Momentum strategies in DOWN markets

Empircal Analysis

Table 3 UP states

Sentiment State		Momentum Portfolio: Sell 1	2	3	4	5	6	7	8	9	Buy 10	Buy – Sell	[t-Stat.]
Panel A. UP Markets													
Panel A1. 36-Month Market													
OPTIMISTIC	($n = 113$)	−0.60	0.11	0.48	0.63	0.82	0.90	1.05	1.08	1.24	1.52	2.12	[4.73]
MILD	($n = 254$)	−0.27	0.39	0.70	0.83	0.95	1.00	1.06	1.14	1.22	1.28	1.55	[5.18]
PESSIMISTIC	($n = 69$)	1.15	1.74	1.88	1.80	1.75	1.73	1.61	1.62	1.74	2.01	0.87	[1.51]
											Opt. – Pes.	1.25	[1.72]
Panel A2. 24-Month Market													
OPTIMISTIC	($n = 103$)	−0.75	−0.02	0.36	0.54	0.75	0.82	0.98	1.01	1.18	1.45	2.21	[4.86]
MILD	($n = 252$)	−0.34	0.37	0.69	0.83	0.95	1.01	1.09	1.18	1.29	1.40	1.74	[6.01]
PESSIMISTIC	($n = 76$)	1.50	1.94	2.00	1.91	1.86	1.84	1.74	1.74	1.89	2.16	0.66	[1.25]
											Opt. – Pes.	1.55	[2.22]
Panel A3. 12-Month Market													
OPTIMISTIC	($n = 87$)	−0.50	0.30	0.71	0.85	1.08	1.15	1.34	1.42	1.62	2.03	2.53	[6.16]
MILD	($n = 206$)	0.06	0.69	0.93	1.00	1.09	1.12	1.17	1.24	1.36	1.49	1.43	[5.36]
PESSIMISTIC	($n = 86$)	1.81	2.22	2.29	2.16	2.11	2.10	2.01	2.01	2.14	2.42	0.61	[1.49]
											Opt. – Pes.	1.92	[3.29]

Empircal Analysis

Table 3 DOWN states

TABLE 3 (continued)

Momentum Profits Conditional on Different Market States and Investor Sentiment

		Momentum Portfolio											
Sentiment State		Sell 1	2	3	4	5	6	7	8	9	Buy 10	Buy – Sell	[*t*-Stat.]
Panel B. DOWN Markets													
Panel B1. 36-Month Market													
OPTIMISTIC	($n = 8$)	1.20	0.95	1.00	1.31	1.43	1.57	1.80	1.39	1.53	1.46	0.26	[0.10]
MILD	($n = 32$)	−0.36	−0.11	0.02	0.37	0.22	0.24	0.38	0.35	0.29	0.40	0.76	[0.60]
PESSIMISTIC	($n = 24$)	4.91	4.33	4.09	3.78	3.65	3.60	3.55	3.59	3.55	3.72	−1.20	[−0.82]
											Opt. – Pes.	1.46	[0.50]
Panel B2. 24-Month Market													
OPTIMISTIC	($n = 18$)	1.06	1.27	1.40	1.44	1.49	1.66	1.79	1.59	1.71	1.87	0.80	[0.45]
MILD	($n = 34$)	0.17	0.11	0.18	0.38	0.21	0.19	0.25	0.05	−0.19	−0.45	−0.62	[−0.48]
PESSIMISTIC	($n = 17$)	4.88	4.52	4.47	4.11	3.93	3.86	3.77	3.86	3.65	3.75	−1.12	[0.61]
											Opt. – Pes.	1.92	[0.75]
Panel B3. 12-Month Market													
OPTIMISTIC	($n = 34$)	−0.45	−0.16	0.03	0.22	0.32	0.43	0.49	0.27	0.33	0.18	0.63	[0.47]
MILD	($n = 80$)	−1.17	−0.58	−0.15	0.20	0.27	0.38	0.52	0.57	0.50	0.37	1.54	[1.74]
PESSIMISTIC	($n = 7$)	5.95	4.67	4.42	4.15	3.81	3.60	3.41	3.54	3.02	2.86	−3.09	[−1.03]
											Opt. – Pes.	3.72	[1.13]

Empirical Analysis

Model

$$PROFITS = b_0 + b_1 SENTIMENT + b_2 MARKET + b_3 MARK$$

Where:

- $PROFITS$ is the time series of average monthly MOM profits at t
- $MARKET$ is lagged market return of the value-weighted index incluyding divedends

Results

- Momentum Profits increase with the market return but decrease with the squared market term (nonlinear - supports Cooper et al (2013)).
- Sentiment predicts momentum profits independently of

Empirical Analysis

Table 4

		Part 1: 12-Month Market Return			Part 2: 24-Month Market Return			Part 3: 36-Month Market Return		
Parameter		Est.	*t*-Stat.	Adj. R^2	Est.	*t*-Stat.	Adj. R^2	Est.	*t*-Stat.	Adj. R^2
Panel A. Cooper et al. Regression with SENTIMENT: Mom. PROFITS $= b_0 + b_1 SENTIMENT + b_2 MARKET + b_3 MARKET^2 + u$										
Constant	b_0	0.014	5.03	1.80%	0.0143	4.76	3.06%	0.011	3.39	3.34%
SENTIMENT	b_1	0.327	3.33		0.309	3.37		0.272	2.95	
MARKET	b_2	0.061	1.69		0.083	2.37		0.109	3.53	
$MARKET^2$	b_3	−0.447	−1.52		−0.470	−2.53		−0.378	−3.36	
Panel B. Regression with Market Returns and SENTIMENT: Mom. PROFITS $= b_0 + b_1 MARKET + b_2 SENTIMENT + u$										
Constant	b_0	0.012	4.39	1.60%	0.01	2.99	1.87%	0.008	2.29	1.96%
SENTIMENT	b_1	0.338	3.39		0.300	3.15		0.270	2.86	
MARKET	b_2	0.047	1.44		0.046	1.74		0.043	2.00	
Panel C. Cooper et al. Regression (as in Panel A) with SENTIMENT Orthogonal to Market Returns										
Constant	b_0	0.014	5.04	1.82%	0.013	4.46	2.92%	0.010	2.98	3.26%
SENTIMENT	b_1	0.328	3.34		0.297	3.21		0.264	2.80	
MARKET	b_2	0.060	1.67		0.094	2.66		0.122	3.98	
$MARKET^2$	b_3	−0.448	−1.53		−0.469	−2.51		−0.380	−3.36	

Empirical Analysis

Analyst Coverage

- Previous research suggests momentum is stronger for stocks with low analyst coverage
- Using IBES, get 1-year-ahead earnings per share forecasts as proxy for analyst coverage
- Isolate role of analyst following size by regressing log one plus ANALYSTS = a + b*SIZE + e
  - get ranked residuals and separate in three equal weighted portfolios
  - Makes low-, mid-, and high-residual coverage stocks.

Results

- Difference in momentum profits between optimistic and pessimistic perdios is simlare across all groups
- Retain insignificance in pessimistic periods

Empirical Analysis

Table 5

Sentiment State		Momentum Portfolio: Sell 1	2	3	4	5	6	7	8	9	Buy 10	Buy – Sell	[t-Stat.]
Panel A. Low Coverage (mean = 2.57 analysts)													
OPTIMISTIC	($n = 77$)	−0.94	0.05	0.65	0.79	0.86	0.98	1.04	0.96	1.15	1.26	2.19	[4.32]
MILD	($n = 200$)	−0.83	0.12	0.45	0.66	0.85	0.94	0.97	1.04	1.08	1.20	2.03	[6.62]
PESSIMISTIC	($n = 71$)	1.56	2.20	2.24	2.16	2.03	2.11	1.84	1.94	2.13	2.05	0.49	[0.92]
											Opt. – Pes.	1.70	[2.37]
Panel B. Mid Coverage (mean = 6.48 analysts)													
OPTIMISTIC	($n = 77$)	−0.48	0.41	0.79	0.78	1.02	0.97	1.03	1.08	1.17	1.53	2.01	[4.28]
MILD	($n = 200$)	−0.43	0.25	0.65	0.80	0.94	1.01	1.04	1.09	1.07	0.93	1.35	[4.31]
PESSIMISTIC	($n = 71$)	2.11	2.18	2.25	2.15	2.07	1.98	2.01	1.97	2.01	2.46	0.35	[0.70]
											Opt. – Pes.	1.66	[2.44]
Panel C. High Coverage (mean = 10.42 analysts)													
OPTIMISTIC	($n = 77$)	−0.17	0.51	0.67	0.78	0.93	0.97	1.21	1.24	1.28	1.66	1.83	[3.37]
MILD	($n = 200$)	−0.36	0.33	0.64	0.67	0.82	0.89	0.91	0.99	1.10	1.30	1.66	[5.20]
PESSIMISTIC	($n = 71$)	2.42	2.51	2.48	2.23	2.29	2.21	2.08	2.06	2.16	2.43	0.02	[0.03]
											Opt. – Pes.	1.81	[2.26]

Empirical Analysis

Size

- Previous Research shows that return predictability is stronger for smaller companies

Method

- Separate firms into small and large market capitalization using Kenneth French's size breakpoints

Result

- Momentum is generally larger for smaller compaines
- Sentiment is more dramatic in smaller compaines (probably diffuses more slowly

Empirical Analysis

Is it Risk?

- Are higher/lower returns of the winner/loser portfolio during periods of optimism load more/less strongly on economic risk factors?

Method

- Use CAPM, FF, and Conditional CAPM
- Perform risk adjustment to get risk-adjusted profits

$$r_{kt}^{ADJ} = r_{kt} - \sum_{t} \beta_{ik} f_{it}$$

Empirical Analysis

Is it Risk? - Method

- Also use a CCAPM robustness check, allow covariance between returns of mom portfolios with excess market return to vary with investor sentiment:

$$r_{kt}^{ADJ} = r_{kt} - (\beta_{ik} - \beta_{ik}^{SENT} \times SENTIMENT_{t-j})(R_m - R_f)$$

- r_{kt} is the raw returns of each MOM portfolio for the strategy in the holding period month K in month t
- β_{ik} is the estimated factor lading in month K on excess the market return
- β_{ik}^{SENT} is the factor laoding in month K on the interaction between excess market return and investor sentiment

Empirical Analysis

Table 7

Sentiment State		Momentum Portfolio: Sell 1	2	3	4	5	6	7	8	9	Buy 10	Buy – Sell	[*t*-Stat.]
Panel A. CAPM													
OPTIMISTIC	($n = 121$)	−0.83	−0.13	0.24	0.41	0.61	0.69	0.85	0.84	0.98	1.20	2.03	[5.46]
MILD	($n = 286$)	−0.52	0.14	0.44	0.60	0.69	0.75	0.82	0.87	0.93	0.97	1.49	[5.93]
PESSIMISTIC	($n = 93$)	0.72	1.22	1.34	1.25	1.22	1.20	1.10	1.09	1.11	1.21	0.48	[1.10]
											Opt. – Pes.	1.55	[2.68]
Panel B. FF													
OPTIMISTIC	($n = 121$)	−0.87	−0.25	0.10	0.26	0.47	0.55	0.71	0.72	0.90	1.21	2.08	[5.39]
MILD	($n = 286$)	−0.82	−0.14	0.19	0.35	0.47	0.53	0.61	0.67	0.74	0.80	1.61	[6.83]
PESSIMISTIC	($n = 93$)	−0.46	0.18	0.39	0.36	0.39	0.42	0.33	0.35	0.40	0.51	0.96	[2.30]
											Opt. – Pes.	1.12	[1.95]
Panel C. Conditional CAPM													
OPTIMISTIC	($n = 121$)	−0.83	−0.12	0.25	0.41	0.61	0.70	0.85	0.84	0.99	1.20	2.03	[5.46]
MILD	($n = 286$)	−0.52	0.13	0.43	0.59	0.68	0.74	0.81	0.87	0.92	0.96	1.48	[5.92]
PESSIMISTIC	($n = 93$)	0.64	1.09	1.19	1.09	1.06	1.04	0.95	0.95	0.98	1.11	0.47	[1.07]
											Opt. – Pes.	1.56	[2.70]

Empirical Analysis

Controlling for future macro events with VIX and one period ahead macro variables

Sentiment State		Momentum Portfolio: Sell 1	2	3	4	5	6	7	8	9	Buy 10	Buy – Sell	[t-Stat.]
OPTIMISTIC	($n = 54$)	−1.44	−0.47	0.06	0.27	0.48	0.52	0.72	0.68	0.84	0.98	2.42	[4.34]
MILD	($n = 167$)	−0.53	0.26	0.58	0.68	0.79	0.86	0.88	0.88	0.90	0.99	1.51	[4.73]
PESSIMISTIC	($n = 51$)	1.88	1.88	1.82	1.73	1.69	1.66	1.61	1.67	1.82	2.15	0.27	[0.43]
											Opt. – Pes.	2.15	[2.52]

Empirical Analysis

An Alternate Sentiment Index

Following Baker and Wurgler (2006, 2007): - Make time series of six sentiment proxies: (1) Trading Volume (2) Premium for dividend-paying stocks (3) Closed-End Fund Discount (4) Number of IPOs (5) Mean 1st-day IPO Returns (6) Equity share in new issues

- Regress against macro variables. Take residuals from each.
- Take first principle component of residuals

Emprical Analysis

Table 9

Sentiment State		Momentum Portfolio: Sell 1	2	3	4	5	6	7	8	9	Buy 10	Buy – Sell	[t-Stat.]
OPTIMISTIC	($n = 387$)	−0.18	0.47	0.76	0.88	0.98	1.04	1.1	1.14	1.25	1.4	1.59	[7.69]
PESSIMISTIC	($n = 120$)	2.31	2.34	2.29	2.21	2.11	2.04	2.1	2.15	2.28	2.61	0.30	[0.21]
											Opt. – Pes.	1.29	[2.86]

Cognitive Dissonance, Short Sale Constraints, and Momentum Profits

Authors have shown that momentum is stronger in optimistic sentiment periods, driven by continued underperformance in loser portfolio. \

They claim cognitive dissonance toward negative news during optimistic period is the cause

Left to Show

1. Examine market's response to negative earnings surprises for loser stocks, conditional on sentiment
2. Short-selling constraints a part of the reason that congnitive dissonance subsists
3. Effect of smaller vs big investors
4. Reversion in the long-run

Congnitive Dissonance and Momentum Profits

Method

- Identify winners and losers, based on 6-month cumulative returns
- Look at SUE for month $t+1$
- Rank firms in deciles based on SUE, calculate cumulative returns in impact and adjustment

Result

- Short-term absolute reaction for negative earnings during optimistic periods is highre than that for pessimistic ones
- Post-earnings announcement drift after negative surpries is stronger when sentiment is optimistic

Congnitive Dissonance and Momentum Profits

Table 10

			Horizon		
Sentiment State			(−1, 1)		(2, 60)
Panel A. Post-Earnings Announcement Drift for Loser Stocks with Low SUE					
OPTIMISTIC			−1.72		−2.08
MILD			−1.61		1.29
PESSIMISTIC			−1.11		8.65
OPTIMISTIC – PESSIMISTIC			−0.62		−10.73
[*t*-statistic]			[−2.26]		[−12.73]
Sentiment State		Losers	Winners	Profits	[*t*-Stat.]
Panel B. Momentum Profits					
Panel B1. All Stocks					
OPTIMISTIC	($n = 77$)	−0.44	1.49	1.93	[4.17]
MILD	($n = 280$)	−0.19	1.17	1.36	[5.25]
PESSIMISTIC	($n = 100$)	2.89	2.48	−0.55	[−0.64]
Panel B2. Excluding Losers with Low SUE					
OPTIMISTIC	($n = 77$)	0.57	1.49	0.92	[2.34]
MILD	($n = 280$)	0.44	1.17	0.73	[3.18]
PESSIMISTIC	($n = 100$)	3.37	2.48	−1.03	[−1.34]

Short-Selling Constraints on Momentum

Table 11

Sentiment State		Momentum Portfolio: Sell 1	2	3	4	5	6	7	8	9	Buy 10	Buy – Sell	[t-Stat.]
Panel A. By Institutional Ownership													
Low Institutional Ownership													
OPTIMISTIC	($n = 74$)	−1.09	−0.09	0.40	0.70	0.79	0.84	1.04	1.09	1.14	1.30	2.39	[5.67]
MILD	($n = 147$)	−1.07	0.06	0.42	0.64	0.86	0.87	0.99	1.12	1.07	1.10	2.17	[7.05]
PESSIMISTIC	($n = 75$)	1.81	2.13	2.18	2.28	2.12	2.17	2.03	2.02	2.15	2.44	0.62	[1.18]
											Opt. – Pes.	1.77	[2.63]
High Institutional Ownership													
OPTIMISTIC	($n = 74$)	0.28	0.72	0.84	0.81	0.93	1.00	1.10	1.18	1.24	1.83	1.54	[2.64]
MILD	($n = 147$)	−0.19	0.39	0.54	0.86	0.89	0.93	0.90	1.02	1.07	1.25	1.44	[4.41]
PESSIMISTIC	($n = 75$)	1.88	2.03	1.93	2.02	1.79	1.81	1.79	1.68	1.80	2.04	0.16	[0.31]
											Opt. – Pes.	1.38	[1.76]
Panel B. By Options Listing Status													
No Listed Options													
OPTIMISTIC	($n = 58$)	−0.86	−0.13	0.48	0.66	0.79	0.88	0.98	1.03	1.14	1.44	2.30	[5.06]
MILD	($n = 85$)	−1.39	−0.52	−0.10	0.15	0.40	0.41	0.53	0.64	0.47	0.40	1.79	[4.68]
PESSIMISTIC	($n = 11$)	4.55	3.26	3.20	3.10	2.92	2.86	3.13	3.59	3.54	2.36	−2.20	[−1.38]
											Opt. – Pes.	4.50	[2.72]
With Listed Options													
OPTIMISTIC	($n = 58$)	0.79	0.96	1.02	0.96	1.01	1.17	1.23	1.24	1.38	2.06	1.27	[1.61]
MILD	($n = 85$)	−0.57	−0.21	−0.04	0.21	0.24	0.24	0.29	0.37	0.40	0.57	1.14	[2.33]
PESSIMISTIC	($n = 11$)	5.92	4.54	3.90	3.50	3.15	3.14	2.97	2.88	2.76	3.14	−2.78	[−1.49]
											Opt. – Pes.	4.05	[2.00]
Panel C. By Disagreement													
High Disagreement													
OPTIMISTIC	($n = 77$)	−0.57	0.54	0.68	0.75	0.84	0.86	1.12	1.11	1.23	1.78	2.35	[4.41]
MILD	($n = 246$)	−0.36	0.24	0.47	0.61	0.77	0.80	0.86	0.97	1.11	1.29	1.65	[5.00]
PESSIMISTIC	($n = 71$)	1.88	2.23	2.30	2.18	2.09	2.10	2.05	1.88	1.85	2.14	0.26	[0.40]
											Opt. – Pes.	2.09	[2.46]
Low Disagreement													
OPTIMISTIC	($n = 77$)	0.46	0.94	0.99	1.10	1.07	1.16	1.19	1.15	1.34	1.47	1.01	[2.23]
MILD	($n = 246$)	0.41	0.83	0.96	0.99	1.06	1.04	1.08	1.10	1.20	1.36	0.95	[4.77]
PESSIMISTIC	($n = 71$)	1.77	1.99	1.97	1.98	1.77	1.71	1.69	1.76	1.79	2.12	0.35	[0.63]
											Opt. – Pes.	0.67	[0.94]

Investor Size

- Categorize small and large investor net OIB (order imbalances) using intraday data

Result

- small investor order flow for loser portfolio during optimistic periods is positive and signficant in 5 of 6 months in formation period
  - turns negative in holding period
- Supports idea that unsophisticated investors are slow to sell losers during optimistic periods, prolonging pricing of bad news

Investor Size

Table 12

Sentiment State	Formation-Period Month −6	−5	−4	−3	−2	−1	Holding-Period Month 1	2	3	4	5	6
Panel A. Optimistic												
A1. Small Investors												
Losers	2.78	3.19	2.85	2.48	1.79	0.54	0.66	−1.34	−2.22	−2.53	−3.2	−4.3
[*t*-stat.]	[2.76]	[3.47]	[3.07]	[2.81]	[2.08]	[0.63]	[0.6]	[−1.22]	[−1.95]	[−2.04]	[−2.76]	[−3.94]
Winners	−2.28	−1.65	−1.23	−0.97	−0.92	0.16	−0.58	0.83	1.48	2.15	2.43	2.78
[*t*-stat.]	[−3.12]	[−2.04]	[−1.49]	[−1.18]	[−1.11]	[0.20]	[−0.83]	[1.21]	[2.07]	[3.31]	[3.81]	[4.61]
A2. Large Investors												
Losers	−7.34	−7.02	−6.58	−6.51	−6.11	−5.25	−3.32	−3.31	−2.96	−2.45	−2.25	−1.95
[*t*-stat.]	[−7.62]	[−7.59]	[−7.12]	[−7.29]	[−6.87]	[−6.16]	[−3.27]	[−3.11]	[−2.71]	[−2.12]	[−1.88]	[−1.62]
Winners	2.63	2.65	2.99	3.14	3.02	2.74	−1.06	−1.35	−1.6	−1.34	−0.78	−0.56
[*t*-stat.]	[3.48]	[3.47]	[3.83]	[3.99]	[3.78]	[3.4]	[−1.38]	[−1.75]	[−2.11]	[−1.71]	[−0.99]	[−0.70]
Panel B. Pessimistic												
B1. Small Investors												
Losers	0.81	0.60	0.78	0.32	−0.66	−2.07	−0.15	−1.78	−2.81	−3.46	−4.03	−4.3
[*t*-stat.]	[0.94]	[0.74]	[0.96]	[0.43]	[−0.92]	[−3.13]	[−0.17]	[−2.06]	[−3.13]	[−4.07]	[−4.72]	[−4.56]
Winners	−2.16	−1.92	−2.08	−2.10	−1.79	−0.34	−1.89	−0.78	−0.12	−0.02	0.2	0.45
[*t*-stat.]	[−2.25]	[−2.22]	[−2.46]	[−2.56]	[−2.19]	[−0.40]	[−2.52]	[−1.1]	[−0.16]	[−0.02]	[0.24]	[0.56]
B2. Large Investors												
Losers	−1.39	−0.59	0.14	0.65	1.41	1.65	3.79	4.52	5.13	5.64	6.38	6.59
[*t*-stat.]	[−1.54]	[−0.63]	[0.16]	[0.71]	[1.43]	[1.68]	[3.53]	[3.98]	[4.65]	[5.08]	[5.62]	[5.85]
Winners	9.5	9.78	9.89	9.77	10.12	9.84	5.9	6.22	6.24	6.11	6.31	6.6
[*t*-stat.]	[7.38]	[7.59]	[7.65]	[7.3]	[7.3]	[7.23]	[4.86]	[5.46]	[5.58]	[5.36]	[5.67]	[6.14]

Investor Size

- Authors calculate avewrage daily OIB for large and small investors following strong negative earnings surprises
- Selling pressure during event period for small investors is stronger when sentiment is pessimistic (not statistically significant)
- Small investors exert delayed selling pressure in adjustment period, suggesting cognitive dissonance
- Large investors sell losers with bad news four times more heave when sentiment is optimistic

Investor Size

Table 13

Sentiment State	Horizon (−1, 1)	Horizon (2, 60)	Dif.	[t-Stat.]
Panel A. OIB for Small Investors				
OPTIMISTIC	−1.70	−7.00	5.30	[5.71]
MILD	−1.80	−3.00	1.20	[1.22]
PESSIMISTIC	−4.10	−6.30	2.20	[1.75]
OPTIMISTIC – PESSIMISTIC	2.40	−0.70		
[t-statistic]	[1.40]	[−0.88]		
Panel B. OIB for Large Investors				
OPTIMISTIC	−9.00	−8.00	−1.00	[−0.80]
MILD	−9.00	−4.00	−5.00	[−3.98]
PESSIMISTIC	−2.00	0.00	−2.00	[−0.74]
OPTIMISTIC – PESSIMISTIC	−7.00	−8.00		
[t-statistic]	[−3.34]	[−9.59]		

Reversals

Cognitive Dissonance, Sentiment, and Momentum

Antoniou, Doukas, Subrahmanyam

Table 14

TABLE 14

Long-Run Profits of Momentum Portfolios Conditional on Investor Sentiment

Table 14 presents long-run event time returns for momentum portfolios formed after optimistic and pessimistic periods. For each momentum portfolio we define an event period 13 months after the initial formation period of 6 months. From this event date month onward we compute the average monthly return of this portfolio in the following 5 years. The final return of each portfolio is the geometric average of these monthly average profits. Panel A uses raw returns, Panel B CAPM-adjusted returns, and Panel C returns adjusted according to the FF (1993) 3-factor model. Sentiment is defined as in Table 2. In this table we use 30%–30% cutoff points for optimistic and pessimistic sentiment. To test whether momentum profits in each sentiment state, respectively, are equal to 0, we regress the time series of average monthly momentum profits on OPTIMISTIC, PESSIMISTIC, and MILD sentiment dummy variables, with no intercept. To test if mean profits in OPTIMISTIC sentiment periods are different from profits in PESSIMISTIC sentiment periods, we regress average monthly momentum profits on a MILD sentiment dummy variable and an OPTIMISTIC sentiment dummy variable with a constant. The *t*-statistics of the significance of momentum profits and the difference between profits derived after optimistic and pessimistic periods are calculated using Newey-West (1987) standard errors, where the lag is set to the number of overlapping strategies, which is 6.

		Momentum Portfolio											
Sentiment State		Sell 1	2	3	4	5	6	7	8	9	Buy 10	Buy – Sell	[*t*-Stat.]
Panel A. Raw													
OPTIMISTIC	($n = 121$)	0.81	0.73	0.70	0.68	0.67	0.65	0.62	0.57	0.49	0.32	−0.49	[−5.79]
MILD	($n = 233$)	1.36	1.36	1.37	1.35	1.36	1.34	1.34	1.32	1.30	1.20	−0.17	[−1.86]
PESSIMISTIC	($n = 91$)	1.13	1.28	1.29	1.29	1.30	1.27	1.27	1.24	1.20	1.06	−0.06	[−0.54]
											Opt. – Pes.	−0.43	[−2.90]
Panel B. CAPM													
OPTIMISTIC	($n = 121$)	0.96	0.85	0.80	0.77	0.76	0.73	0.71	0.66	0.60	0.48	−0.49	[−6.26]
MILD	($n = 233$)	0.78	0.83	0.86	0.86	0.87	0.85	0.84	0.82	0.77	0.62	−0.17	[−1.83]
PESSIMISTIC	($n = 91$)	0.37	0.59	0.63	0.65	0.67	0.65	0.65	0.60	0.53	0.33	−0.04	[−0.33]
											Opt. – Pes.	−0.45	[−3.12]
Panel C. FF													
OPTIMISTIC	($n = 121$)	0.60	0.47	0.42	0.41	0.41	0.39	0.38	0.35	0.31	0.21	−0.38	[−4.34]
MILD	($n = 233$)	0.36	0.42	0.48	0.49	0.52	0.51	0.52	0.51	0.48	0.37	0.01	[0.14]
PESSIMISTIC	($n = 91$)	0.10	0.29	0.33	0.36	0.39	0.38	0.40	0.37	0.33	0.22	0.13	[1.13]
											Opt. – Pes.	−0.51	[−3.58]