

# Investor Sentiment, Anomalies, and Economic Forces:

## A Brief Introduction to Behavioral Finance

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# Part I: A Brief Introduction to Behavioral Asset Pricing

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# Market Efficiency: Theoretical Foundations and Historical Developments

## Three Arguments:

- Investors are rational and hence value securities rationally.
  - with rational risk-neutral investors, returns are unpredictable (Samuelson (1965))
- Some investors are irrational, but their trades are random and therefore cancel each other out without affecting prices.
- To the extent that investors are irrational in similar ways, they are met in the market by rational arbitrageurs who eliminate their influence on prices.
  - irrational investors lose money on average and are eliminated by the market in **the long run** (Friedman (1953))

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# Market Efficiency: Earlier Empirical Evidence

- Prices should react and incorporate news both **quickly and correctly** (Fama (1965))
  - stale information has no value in making money
  - stock returns are unpredictable with public information
- Event studies show earlier support (Fama et al. (1969)): takeover announcements, earnings and dividend announcements, divestitures, share issues, repurchases, and changes in management compensation
- Active fund management does not yield higher average returns, i.e. can not beat the market.
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# Market Efficiency: Cont'd

- Key and most powerful implication: any mispricing can be eliminated by arbitrageurs. Thus, prices are right and there is no free lunch.
- If A is underpriced, arbitrageurs will buy A and short its identical substitute B, making risk-free profits and bringing price of A to its fundamental.
- However, there is limits to arbitrage (discuss more below).
- Key distinction:
  - "prices are right " implies "no free lunch"
  - "no free lunch" does NOT implies "prices are right "
- Many people interpret "no free lunch" as evidence of market efficiency, which is completely wrong.

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# Limits to Arbitrage: Theory

- Fundamental risk: substitutes are not perfect in real world.
- Noise trader risk: prices can deviate even further.
- Implementation costs: shorting costs could be high and sometimes not allowed.
- Arbitrage is limited as long as
  - arbitrageurs are risk averse and have short horizon
  - the fundamental or noise trader risk is systematic
- In real world, there is more limits, such as agency problem, short-horizon (see DSSW (1990 JPE) and Shleifer and Vishny (1997 JF))

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# Limits to Arbitrage: Evidence

- **Anomalies: Subject to "joint hypothesis" criticism.**
- **Twin Shares:** In the case of Royal Dutch/Shell, prices can deviate as large as 35%
- **Index Inclusions:** on average stock price jumps 3.5% permanently after inclusion. Yahoo jumps 24% when added to the index. This jump is larger among firms with worst substitutes.
- **Internet Carve-outs:** Palm/3Com
- A lot more examples, such as change my name to [jianfeng.com](http://jianfeng.com)

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# Twin Shares: BT(2003)

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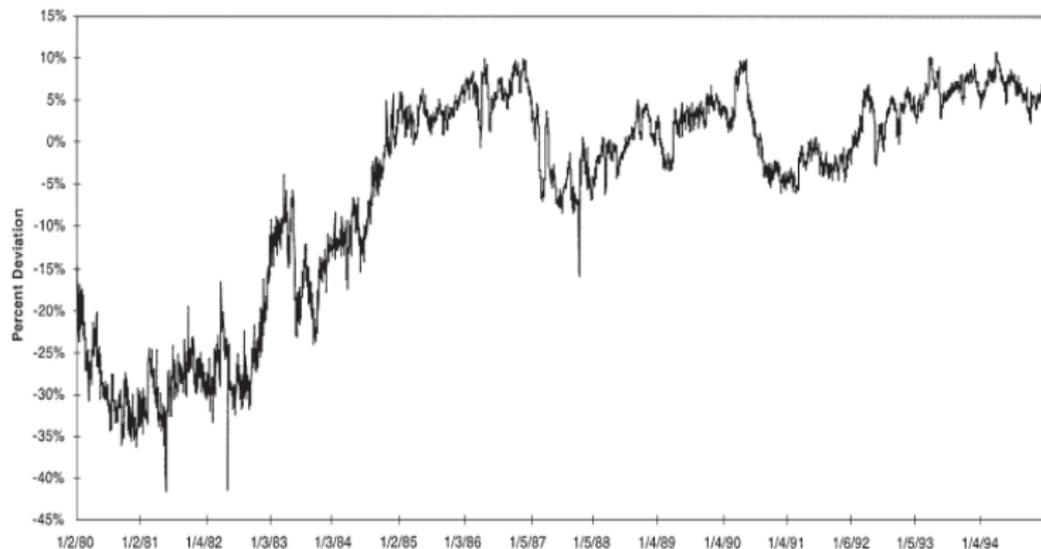
*N. Barberis and R. Thaler*

Fig. 1. Log deviations from Royal Dutch/Shell parity. Source: Froot and Dabora (1999).

# Limits to Arbitrage: A Summary

Table 1  
Arbitrage costs and risks that arise in exploiting mispricing

Example	Fundamental risk (FR)	Noise trader risk (NTR)	Implementation costs (IC)
Royal Dutch/Shell	X	✓	X
Index Inclusions	✓	✓	X
Palm/3Com	X	X	✓

# Psychology: Foundation for Sentiment

- Beliefs
  - Overconfidence
  - Representativeness
  - Conservatism
  - Anchoring
  - Availability bias, and many more
  - Too much freedom? But rationality per se does not yield many predictions. Predictions comes from auxiliary assumptions (Arrow, 1986)
- Preferences
  - Prospect Theory: loss aversion, probability weighting, reference point.
  - Ambiguity Aversion
- Applications to equity premium puzzle, cross-section of average returns, closed-end fund and comovement, corporate finance-market timing, managerial irrationality, etc.

# Part II: The Measure of Investor Sentiment

Part II: The Measure of Investor Sentiment and Implications on the Cross-Section of Asset Prices

# The Idea of Baker and Wurgler (2006)

Two Key ingredient for mispricing:

- Limits-to-arbitrage: Shleifer and Vishny (1997)
- Market-wide investor sentiment: DSSW (1990), BSV (1998)

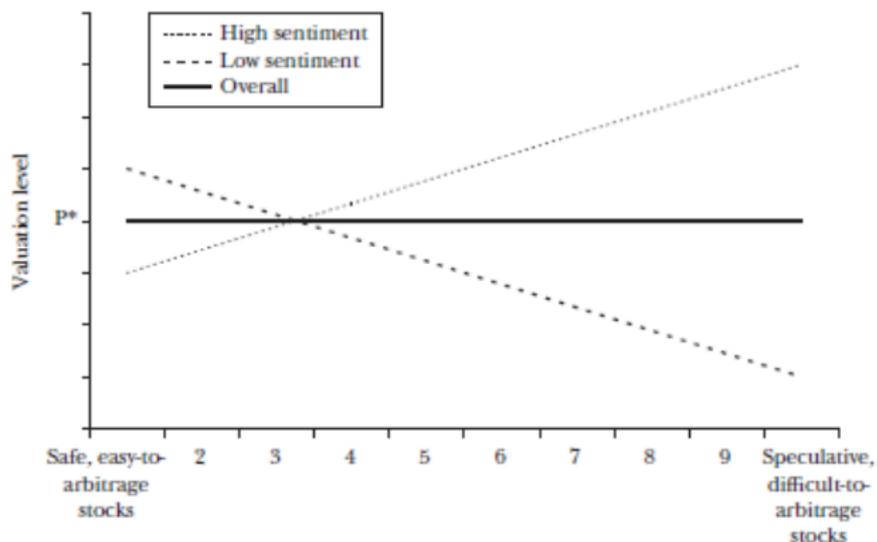
Implications:

- Firms which are more difficult to arbitrage or evaluate should be more influenced by sentiment
- After high sentiment, these firms are more overvalued, thus earn lower subsequent returns
- After low sentiment, these firms are more undervalued, thus earn higher subsequent returns

# Prediction on Cross-Sectional Returns Behavior Conditional on Sentiment: BW(2007)

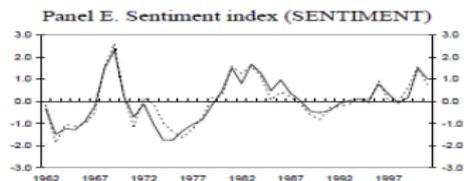
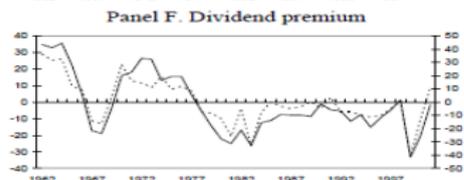
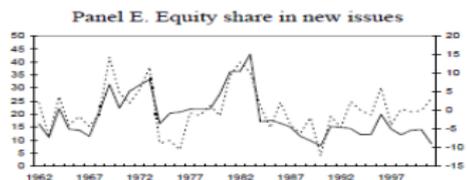
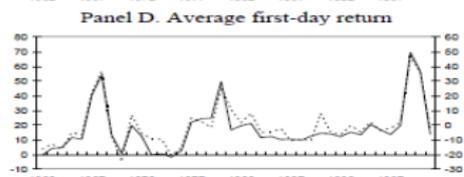
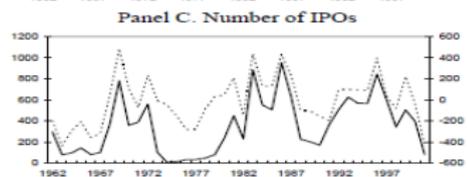
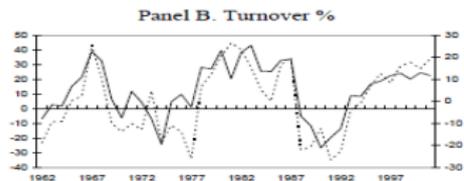
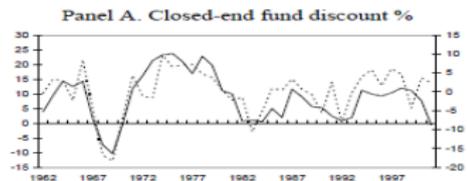
Figure 1

Theoretical Effects of Investor Sentiment on Different Types of Stocks



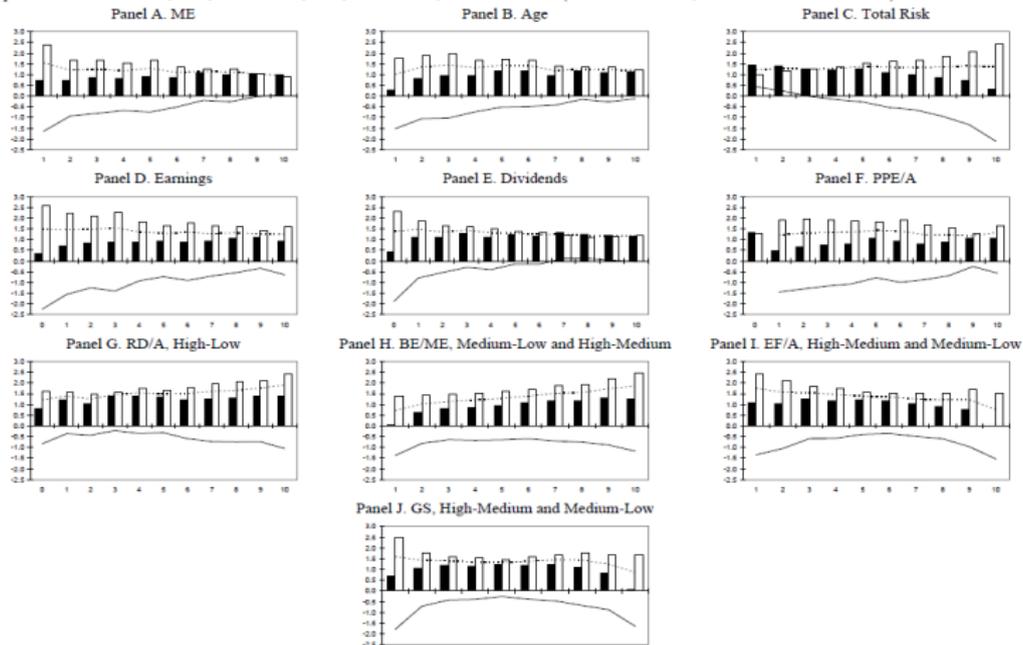
Note: Stocks that are speculative and difficult to value and arbitrage will have higher relative valuations when sentiment is high.

# Sentiment Index: BW(2006)



# Returns conditional on sentiment: BW(2006)

**Figure 2. Two-way Sorts: Future Returns by Sentiment Index and Firm Characteristics, 1963 to 2001.** For each month, we form ten portfolios according to the NYSE breakpoints of firm size (ME), age, total risk, earnings-book ratio for profitable firms (E/BE), dividend-book ratio for payers (D/BE), fixed assets (PPE/A), research and development (RD/A), book-to-market ratio (BE/ME), external finance over assets (EF/A), and sales growth (GS). We also calculate portfolio returns for unprofitable, nonpaying, zero PP&E, and zero R&D firms. The solid bars are returns following positive SENTIMENT<sup>+</sup> periods, and the clear bars are returns following negative sentiment periods. The dashed line is the average across both periods and the solid line is the difference. SENTIMENT<sup>+</sup> is positive for 1968 to 1970, 1972, 1979 to 1987, 1994, 1996 to 1997, and 1999 to 2001 (returns end in 2001, so the last value used is 2000).



# Returns conditional on sentiment: BW(2006)

**Table 3. Future Returns by Sentiment Index and Firm Characteristics, 1963 to 2001.** For each month, we form ten portfolios according to the NYSE breakpoints of firm size (ME), age, total risk, earnings-book ratio for profitable firms (E/BE), dividend-book ratio for dividend payers (D/BE), fixed assets (PPE/A), research and development (RD/A), book-to-market ratio (BE/ME), external finance over assets (EF/A), and sales growth (GS). We also calculate portfolio returns for unprofitable firms, nonpayers, zero PP&E firms, and zero R&D firms. We then report average portfolio returns over months where  $SENTIMENT_{t-1}^+$  from the previous year end is positive, negative, and the difference between the two averages.  $SENTIMENT^+$  is positive for 1968 to 1970, 1972, 1979 to 1987, 1994, 1996 to 1997, and 1999 to 2001 (the return series ends in 2001, so the last value used is 2000).

		$SENTIMENT_{t-1}^+$										Comparisons				
		Decile														
		$\leq 0$	1	2	3	4	5	6	7	8	9	10	10-1	10-5	5-1	$>0$ $\leq 0$
ME	Positive	0.73	0.74	0.85	0.83	0.92	0.84	1.06	0.99	1.02	0.98	0.26	0.06	0.20		
	Negative	2.37	1.68	1.66	1.51	1.67	1.35	1.26	1.25	1.05	0.92	-1.45	-0.75	-0.70		
	Difference	-1.65	-0.93	-0.81	-0.68	-0.75	-0.51	-0.20	-0.26	-0.03	0.06	1.71	0.81	0.90		
Age	Positive	0.25	0.83	0.94	0.95	1.18	1.19	0.96	1.18	1.09	1.11	0.85	-0.07	0.93		
	Negative	1.77	1.88	1.97	1.68	1.70	1.68	1.38	1.34	1.36	1.24	-0.54	-0.46	-0.08		
	Difference	-1.52	-1.05	-1.03	-0.74	-0.51	-0.49	-0.42	-0.16	-0.27	-0.13	1.39	0.39	1.00		
$\sigma$	Positive	1.44	1.41	1.25	1.20	1.24	1.08	1.01	0.88	0.75	0.30	-1.14	-0.94	-1.20		
	Negative	1.01	1.17	1.26	1.37	1.52	1.61	1.65	1.83	2.08	2.41	1.40	0.89	0.51		
	Difference	0.43	0.24	-0.01	-0.16	-0.28	-0.53	-0.65	-0.95	-1.33	-2.11	-2.54	-1.84	-0.71		
E/BE	Positive	0.35	0.68	0.85	0.86	0.89	0.92	0.88	0.92	1.05	1.10	0.93	0.24	0.01	0.24	0.61
	Negative	2.59	2.24	2.10	2.26	1.82	1.65	1.79	1.62	1.59	1.43	1.57	-0.67	-0.08	-0.59	-0.95
	Difference	-2.25	-1.56	-1.25	-1.40	-0.93	-0.73	-0.91	-0.70	-0.54	-0.34	-0.65	0.91	0.09	0.82	1.56
D/BE	Positive	0.44	1.08	1.09	1.29	1.11	1.24	1.17	1.31	1.24	1.19	1.15	0.07	-0.09	0.16	0.75
	Negative	2.32	1.87	1.63	1.59	1.51	1.38	1.30	1.20	1.12	1.16	1.18	-0.69	-0.19	-0.49	-0.89
	Difference	-1.88	-0.79	-0.54	-0.30	-0.40	-0.14	-0.14	0.11	0.12	0.03	-0.03	0.76	0.11	0.65	1.64
PPE/A	Positive	1.31	0.48	0.66	0.74	0.81	1.04	0.90	0.79	0.87	1.04	1.05	0.57	0.02	0.56	-0.53
	Negative	1.26	1.93	1.96	1.90	1.87	1.82	1.89	1.66	1.56	1.29	1.62	-0.31	-0.20	-0.11	0.53
	Difference	0.05	-1.45	-1.31	-1.17	-1.07	-0.78	-0.99	-0.87	-0.69	-0.25	-0.56	0.88	0.22	0.67	-1.05
RD/A	Positive	0.80	1.21	1.04	1.37	1.37	1.34	1.22	1.24	1.29	1.39	1.38	0.17	0.04	0.13	0.55
	Negative	1.63	1.57	1.47	1.58	1.73	1.66	1.81	1.97	2.04	2.13	2.44	0.87	0.78	0.09	0.43
	Difference	-0.83	-0.36	-0.43	-0.22	-0.36	-0.32	-0.60	-0.73	-0.75	-0.74	-1.05	-0.69	-0.74	0.04	0.12
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EF/A	Positive	1.08	1.04	1.25	1.18	1.19	1.17	1.02	0.92	0.75	-0.01	-1.09	-1.20	0.11		
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	Difference	-1.35	-1.05	-0.59	-0.57	-0.40	-0.35	-0.49	-0.60	-0.96	-1.54	-0.18	-1.14	0.96		
GS	Positive	0.70	1.07	1.19	1.15	1.21	1.18	1.22	1.10	0.81	0.05	-0.65	-1.16	0.51		
	Negative	2.49	1.78	1.61	1.54	1.47	1.57	1.68	1.78	1.68	1.69	-0.80	0.22	-1.02		
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# Part III: Anomalies and Risk Factors

Part III: The implication of Market-wide Sentiment on Asset Pricing Anomalies and Economic Models

# Outline of the Rest of Talk

Two Key Ingredients:

- Short-sale constraint
- Market-wide sentiment

Key Implications on:

- Asset Pricing Anomalies (Paper 1, joint with Rob Stambaugh and Yu Yuan)
- The Pricing of Macroeconomic Risk Factors (Paper 2, joint with Junyan Shen)

# Motivation

Two Key Ingredients:

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# Shorting Impediments

- Institutional constraints.
- Arbitrage risk: Traders who short a security in the belief that its price is too high can be correct, in that the price will eventually fall, but they face the risk that the price will go up before it goes down. Such a price move, requiring additional capital, can force the traders to liquidate at a loss. (Shleifer and Vishny (1997))
- Behavioral biases of traders: Only 0.29% of positions of individual investors are short positions. (Barber and Odean (2008))
- Trading costs: Many stocks are costly to short due to low supplies of stock loans from institutional investors. (D'Avolio (2002))

## Miller (1977) Intuition

- Overpricing should be more prevalent than underpricing with short sale constraints. Prices should reflect only the valuations of most optimistic investors – **Short-sale impediments tie hands of relative pessimistic people in the market.**
- Figlewski (1981), Chen, Hong, and Stein (2002), Diether, Malloy, and Scherbina (2002), Duffie, Garleanu and Pedersen (2002), Jones and Lamont (2002), Scheinkman and Xiong (2003), Lamont (2004), Lamont and Stein (2004), Ofek, Richardson, and Whitelaw (2004), Nagel (2005), and Avramov, Chordia, Jostova, and Philipov (2010)

# Our Intuition

- Time-varying market-wide sentiment.
  - High sentiment (bubbles): Sentiment-driven traders are too optimistic. Short-sale impediments tie hands of arbitrageurs (rational investors). Prices should be more likely to reflect the opinions of sentiment-driven traders.
  - Low sentiment: Sentiment-driven traders are too pessimistic. Short-sale impediments tie hands of sentiment-driven traders (irrational investors). Prices should be more likely to reflect the opinions of rational investors.
- The market is less efficient during high-sentiment periods.
- Hypothesis 1: The anomalies should be stronger following high sentiment periods.

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# Our Intuition

- Time-varying market-wide sentiment.
  - High sentiment (bubbles): Sentiment-driven traders are too optimistic. **Short-sale impediments tie hands of arbitrageurs (rational investors)**. Prices should be more likely to reflect the opinions of sentiment-driven traders.
  - Low sentiment: Sentiment-driven traders are too pessimistic. **Short-sale impediments tie hands of sentiment-driven traders (irrational investors)**. Prices should be more likely to reflect the opinions of rational investors.
- The market is less efficient during high-sentiment periods.
- **Hypothesis 1**: The anomalies should be stronger following high sentiment periods.

# Our Intuition (Continued)

- In our world with short-sale impediments, overpricing should be prevalent. The profits of the long-short strategy based on “anomalies” should arise primarily from overpricing of stocks in the short leg.
- Since prevalent mispricing exists in short legs, investor sentiment should have strong impact on these most mispriced securities:
  - **Hypothesis 2:** The short legs of long-short strategies should have lower returns following high investor sentiment.
- The long legs are either underpriced or less overpriced, which should be less influenced by market sentiment.
  - **Hypothesis 3:** The long legs of long-short strategies should have similar returns following high and low sentiment periods

## Example: Momentum

- Following high sentiment, short-sale impediments tie rational investors, while they tie irrational investors following low sentiment. We expect mispricing is more severe with high sentiment.
- **Hypothesis 1:** Momentum (winners-losers) should be stronger during the high-sentiment periods.

## Example: Momentum (Continued)

- If momentum is primarily caused by mispricing, losers (short leg) are overpriced, or winners (long leg) are underpriced, or both.
- We do not hypothesize why investors may overprice losers or underprice winners.
- We DO argue that overpricing is more prevalent. Hence, losers (short leg) are more likely to be mispriced, while mispricing in winners should be relatively small.
- Investor sentiment should have bigger impact on mispriced securities.
  - **Hypothesis 2:** Losers (short leg) should have lower returns following high investor sentiment.
  - **Hypothesis 3:** Winners (long leg) should have similar returns following high and low sentiment.

# Anomalies we study in this paper

- Financial distress: Failure, O-score
- Net stock issues (NSA), Composite equity issues (CEI)
- Total accruals (TA)
- Net operating asset (NOA)
- Momentum (MOM)
- Gross-profit-to-assets (GPA)
- Asset growth (AG)
- Return-on-assets (ROA)
- Investment-over-assets (INV)

## Related Studies

- Influence of sentiment on size, book-to-market, cash flow, and etc. (Baker and Wurgler (2006, 2007))
- Influence of sentiment on size (Lemmon and Portniaguina (2006)), on the post earnings announcement drift (Livnat and Petrovic (2008)), on the value effect (Frazzini and Lamont (2008)), on foreign exchange market (Yu (2009)), and on momentum (Antoniou, Doukas, and Subrahmanyam (2010)), on risk-return trade-off (Yu and Yuan (2010)), and etc.

## Related Studies: cont'd

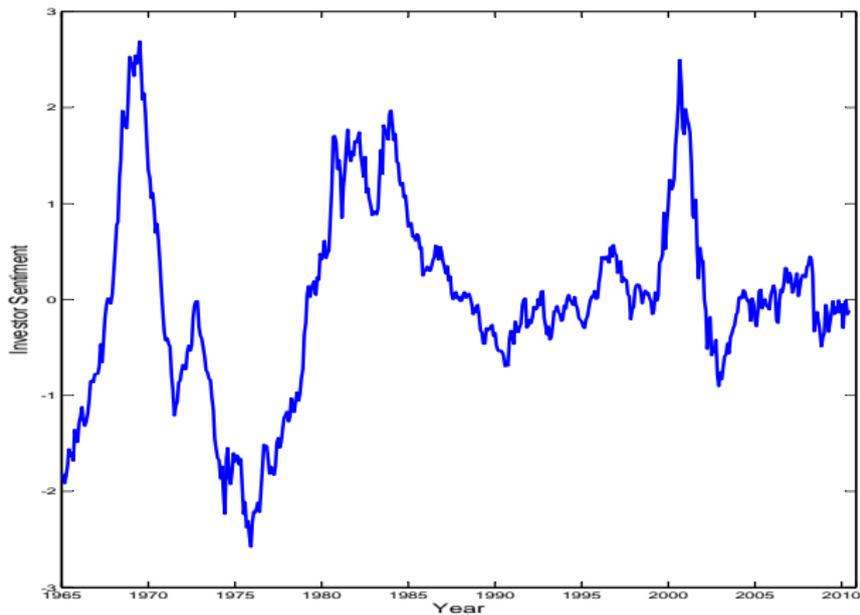
- Among stocks which are more difficult to arbitrage, anomalous returns are stronger.
  - Zhang (2006, JF) on momentum and PEAD, Li and Zhang (2010, JFE) on Investment-to-assets, Asset growth, etc
  - Ali, Hwang, and Trombley (2003, JFE) on book-to-market: BM effect are stronger among stocks with higher idiosyncratic risk, and higher transaction cost. (i.e., stocks with higher arbitrage risk).
  - Nagel (2005, JFE) shows that underperformance of stocks with high book-to-market, analyst forecast dispersion, turnover, or volatility is most pronounced among stocks with low institutional ownership, a proxy for short sale constraint.
- This study focuses on the variation of the anomalous returns across *time*, rather than across *firm characteristic*. We also consider a large set of anomalies.

# Main Results

- The anomalous returns are much higher following high sentiment periods. About 70% comes from high sentiment periods.
- The short legs of long-short strategies have significantly lower returns following high investor sentiment. The shorting profits following high sentiment periods account for 76% of total profits from shorting.
- The long legs of long-short strategies have very similar returns following high and low sentiment periods
- Economic Significance: a one-standard-deviation increase in sentiment raises the profit about 0.5% per month.

# Investor Sentiment Measure

Baker and Wurgler (2006) Sentiment Index: the first principal component from six individual indices



# Correlations Among Long-Short Strategies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>A. Correlations: Long minus short</u>												
(1) Failure probability	1.00											
(2) Ohlson's O (distress)	0.64	1.00										
(3) Net stock issues	0.44	0.38	1.00									
(4) Comp. equity issues	0.40	0.32	0.59	1.00								
(5) Total accruals	0.28	0.19	0.26	0.25	1.00							
(6) Net operating assets	0.20	0.28	0.30	0.20	0.30	1.00						
(7) Momentum	0.53	0.19	0.23	0.25	0.16	0.17	1.00					
(8) Gross profitability	0.28	0.28	0.12	-0.07	-0.14	0.14	0.20	1.00				
(9) Asset growth	0.07	-0.10	0.37	0.33	0.25	0.28	0.13	-0.16	1.00			
(10) Return on assets	0.67	0.62	0.32	0.21	0.12	0.14	0.31	0.35	-0.08	1.00		
(11) Investment/assets	0.04	-0.05	0.26	0.25	0.36	0.28	0.06	-0.19	0.61	-0.08	1.00	
(12) Average	0.83	0.66	0.65	0.58	0.47	0.48	0.61	0.32	0.37	0.66	0.33	1.00

# Mean Returns for Long-Short Strategies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<u>B. Excess Returns</u>												
<i>Means</i>												
Long leg	0.94	0.51	0.70	0.62	0.72	0.71	1.11	0.69	1.00	0.64	0.91	0.76
Short leg	-0.01	-0.19	0.07	0.20	0.13	0.06	-0.45	0.29	0.04	-0.34	0.15	-0.01
Long minus short	0.95	0.70	0.63	0.42	0.58	0.65	1.56	0.40	0.96	0.98	0.75	0.77
<i>t-statistics</i>												
Long leg	3.97	2.18	3.66	3.47	2.54	2.98	3.81	3.20	3.82	2.56	3.65	3.57
Short leg	-0.01	-0.51	0.27	0.79	0.40	0.22	-1.23	1.33	0.14	-0.88	0.57	-0.05
Long minus short	2.55	2.83	5.11	2.59	3.11	4.41	5.45	2.45	5.34	3.53	5.22	6.91
<u>C. Benchmark-Adjusted Returns</u>												
<i>Means</i>												
Long leg	0.39	0.21	0.20	0.02	0.26	0.25	0.63	0.43	0.22	0.38	0.17	0.28
Short leg	-1.16	-0.93	-0.46	-0.41	-0.34	-0.51	-1.14	-0.23	-0.44	-0.90	-0.37	-0.60
Long minus short	1.55	1.13	0.66	0.43	0.61	0.76	1.77	0.66	0.66	1.28	0.54	0.87
<i>t-statistics</i>												
Long leg	3.39	3.37	3.87	0.29	1.85	2.27	4.95	4.42	1.76	4.40	1.59	7.66
Short leg	-4.53	-6.17	-4.62	-3.85	-2.24	-4.75	-5.11	-2.19	-3.93	-4.29	-3.30	-7.07
Long minus short	5.00	7.13	5.96	3.18	3.09	4.98	5.82	4.30	3.94	5.48	3.78	9.38

# Conditional Sorts by Investor Sentiment: Raw Returns

	Long Leg			Short Leg			Long – Short		
	High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low
Failure probability	0.77	1.14	-0.38	-1.10	1.25	-2.34	1.86	-0.10	1.96
Ohlson's O (distress)	0.42	0.61	-0.19	-0.98	0.61	-1.59	1.40	-0.00	1.40
Net stock issues	0.64	0.75	-0.11	-0.50	0.63	-1.13	1.14	0.12	1.02
Comp. equity issues	0.53	0.72	-0.19	-0.28	0.69	-0.97	0.81	0.02	0.79
Total accruals	0.37	1.07	-0.71	-0.57	0.84	-1.41	0.94	0.23	0.70
Net operating assets	0.50	0.92	-0.43	-0.57	0.69	-1.26	1.07	0.24	0.83
Momentum	0.78	1.43	-0.64	-1.24	0.34	-1.58	2.03	1.09	0.93
Gross profitability	0.59	0.79	-0.20	-0.06	0.64	-0.70	0.65	0.15	0.50
Asset growth	0.79	1.22	-0.43	-0.60	0.68	-1.27	1.39	0.54	0.85
Return on assets	0.61	0.66	-0.05	-1.10	0.44	-1.55	1.72	0.22	1.50
Investment/assets	0.44	1.38	-0.94	-0.47	0.78	-1.25	0.91	0.60	0.30
Average	0.56	0.95	-0.39	-0.68	0.65	-1.32	1.23	0.31	0.93

# Conditional Sorts by Investor Sentiment: Benchmark-Adjusted Returns

	Long Leg			Short Leg			Long – Short		
	High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low
Failure probability	0.43	0.33	0.10	-1.65	-0.58	-1.07	2.08	0.91	1.17
Ohlson's O (distress)	0.25	0.16	0.09	-1.24	-0.60	-0.64	1.49	0.76	0.73
Net stock issues	0.28	0.11	0.17	-0.80	-0.12	-0.68	1.08	0.23	0.85
Comp. equity issues	0.08	-0.03	0.11	-0.64	-0.17	-0.47	0.72	0.14	0.58
Total accruals	0.19	0.34	-0.14	-0.70	0.02	-0.73	0.89	0.31	0.58
Net operating assets	0.22	0.27	-0.05	-0.87	-0.15	-0.72	1.09	0.42	0.67
Momentum	0.66	0.60	0.06	-1.51	-0.76	-0.75	2.17	1.36	0.81
Gross profitability	0.46	0.41	0.05	-0.40	-0.06	-0.33	0.85	0.47	0.38
Asset growth	0.37	0.07	0.30	-0.82	-0.06	-0.76	1.18	0.13	1.05
Return on assets	0.49	0.27	0.23	-1.26	-0.51	-0.75	1.75	0.78	0.97
Investment/assets	0.01	0.32	-0.31	-0.73	-0.01	-0.72	0.74	0.33	0.41
Average	0.30	0.26	0.04	-0.92	-0.26	-0.66	1.22	0.52	0.70

# Predictive Regressions: Raw Returns

$$R_{i,t} = a + bS_{t-1} + u_t,$$

	Long Leg		Short Leg		Long – Short	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
Failure probability	-0.43	<b>-1.74</b>	-1.80	<b>-2.99</b>	1.37	<b>2.59</b>
Ohlson's O (distress)	-0.24	-0.80	-1.09	<b>-2.31</b>	0.85	<b>2.95</b>
Net stock issues	-0.28	-1.38	-0.84	<b>-2.92</b>	0.55	<b>3.93</b>
Comp. equity issues	-0.21	-1.12	-0.68	<b>-2.38</b>	0.47	<b>2.68</b>
Total accruals	-0.59	<b>-1.82</b>	-0.96	<b>-2.49</b>	0.37	<b>1.77</b>
Net operating assets	-0.34	-1.29	-0.83	<b>-2.76</b>	0.49	<b>3.50</b>
Momentum	-0.69	<b>-2.38</b>	-1.02	<b>-2.41</b>	0.33	1.07
Gross profitability	-0.22	-0.94	-0.54	<b>-2.21</b>	0.32	<b>1.81</b>
Asset growth	-0.48	<b>-1.68</b>	-0.91	<b>-2.66</b>	0.44	<b>2.16</b>
Return on assets	-0.20	-0.66	-1.14	<b>-2.35</b>	0.94	<b>2.79</b>
Investment/assets	-0.70	<b>-2.46</b>	-0.77	<b>-2.51</b>	0.07	0.49
Average	-0.43	<b>-1.85</b>	-0.93	<b>-2.90</b>	0.50	<b>3.79</b>

# Predictive Regressions: Benchmark-Adjusted Returns

$$R_{i,t} = a + bS_{t-1} + cMKT_t + dSMB_t + eHML_t + u_t,$$

	Long Leg		Short Leg		Long – Short	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
Failure probability	-0.01	-0.09	-0.92	<b>-2.79</b>	0.91	<b>2.15</b>
Ohlson's O (distress)	0.07	0.95	-0.52	<b>-2.64</b>	0.59	<b>3.03</b>
Net stock issues	0.01	0.13	-0.38	<b>-3.58</b>	0.39	<b>3.38</b>
Comp. equity issues	0.02	0.29	-0.21	<b>-1.89</b>	0.23	<b>1.77</b>
Total accruals	-0.02	-0.12	-0.26	<b>-1.54</b>	0.24	1.21
Net operating assets	0.07	0.72	-0.32	<b>-2.81</b>	0.39	<b>2.86</b>
Momentum	-0.04	-0.30	-0.30	-1.11	0.26	0.76
Gross profitability	0.14	1.40	-0.20	<b>-1.62</b>	0.34	<b>1.94</b>
Asset growth	0.06	0.62	-0.35	<b>-2.88</b>	0.41	<b>2.74</b>
Return on assets	0.14	1.44	-0.58	<b>-2.49</b>	0.71	<b>2.67</b>
Investment/assets	-0.21	<b>-2.07</b>	-0.24	<b>-2.22</b>	0.03	0.22
Average	0.00	0.15	-0.32	<b>-3.01</b>	0.32	<b>2.98</b>

# Control Additional Macro Variables

- By construction, the BW sentiment index is orthogonal to the following six variables.
  - Growth in industrial production.
  - Growth in durable consumption.
  - Growth in nondurable consumption.
  - Growth in service consumption.
  - Growth in employment.
  - NBER recession flag.
- We control five more variables, which may be related to risk premium.
  - Default premium: BAA - AAA.
  - Term premium: 20 year - 1 year.
  - Real interest: 1 month - inflation.
  - Inflation.
  - CAY.

# Empirical Results after Controlling for Macro Variables

$$R_{i,t} = a + bS_{t-1} + cMKT_t + dSMB_t + eHML_t + \sum_{j=1}^5 m_j X_{j,t-1} + u_t$$

	Long Leg		Short Leg		Long – Short	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
Failure probability	0.05	0.28	-1.17	-2.97	1.22	2.39
Ohlson's O (distress)	0.07	0.79	-0.52	-2.04	0.58	2.33
Net stock issues	0.02	0.26	-0.44	-3.61	0.46	3.46
Comp. equity issues	0.04	0.43	-0.20	-1.82	0.23	1.73
Total accruals	0.06	0.33	-0.30	-1.49	0.35	1.52
Net operating assets	0.05	0.44	-0.34	-2.61	0.39	2.47
Momentum	0.01	0.05	-0.22	-0.72	0.22	0.58
Gross profitability	0.09	0.83	-0.27	-1.93	0.36	1.86
Asset growth	-0.05	-0.46	-0.35	-2.50	0.30	1.81
Return on assets	0.06	0.59	-0.89	-3.24	0.95	3.01
Investment/assets	-0.28	-2.65	-0.27	-2.23	-0.02	-0.15
Average	-0.01	-0.22	-0.35	-2.86	0.34	2.68

# Empirical Results after Controlling for Macro Variables

$$R_{i,t} = a + bS_{t-1} + cMKT_t + dSMB_t + eHML_t + \sum_{j=1}^5 m_j X_{j,t-1} + u_t$$

	Long Leg		Short Leg		Long – Short	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
Failure probability	0.05	0.28	-1.17	-2.97	1.22	2.39
Ohlson's O (distress)	0.07	0.79	-0.52	-2.04	0.58	2.33
Net stock issues	0.02	0.26	-0.44	-3.61	0.46	3.46
Comp. equity issues	0.04	0.43	-0.20	-1.82	0.23	1.73
Total accruals	0.06	0.33	-0.30	-1.49	0.35	1.52
Net operating assets	0.05	0.44	-0.34	-2.61	0.39	2.47
Momentum	0.01	0.05	-0.22	-0.72	0.22	0.58
Gross profitability	0.09	0.83	-0.27	-1.93	0.36	1.86
Asset growth	-0.05	-0.46	-0.35	-2.50	0.30	1.81
Return on assets	0.06	0.59	-0.89	-3.24	0.95	3.01
Investment/assets	-0.28	-2.65	-0.27	-2.23	-0.02	-0.15
Average	-0.01	-0.22	-0.35	-2.86	0.34	2.68

# Michigan Consumer Sentiment

$$R_{i,t} = a + bS_{t-1} + cMKT_t + dSMB_t + eHML_t + u_t$$

	Long Leg		Short Leg		Long – Short	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
Failure probability	0.23	1.65	-0.45	-1.66	0.68	2.10
Ohlson's O (distress)	0.03	0.52	0.01	0.05	0.03	0.16
Net stock issues	0.07	1.12	-0.36	-2.93	0.43	3.60
Comp. equity issues	-0.06	-0.68	-0.21	-1.69	0.16	1.03
Total accruals	0.02	0.14	-0.39	-2.24	0.41	2.03
Net operating assets	0.06	0.53	-0.41	-3.23	0.47	2.82
Momentum	0.11	0.71	-0.32	-1.15	0.42	1.13
Gross profitability	0.35	2.98	-0.08	-0.66	0.44	2.39
Asset growth	-0.23	-1.82	-0.38	-2.75	0.15	0.78
Return on assets	0.13	1.50	0.07	0.28	0.07	0.25
Investment/assets	-0.20	-1.72	-0.23	-1.84	0.03	0.23
Average	0.06	1.40	-0.27	-2.68	0.33	3.00

# Michigan Consumer Sentiment

$$R_{i,t} = a + bS_{t-1} + cMKT_t + dSMB_t + eHML_t + u_t$$

	Long Leg		Short Leg		Long – Short	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
Failure probability	0.23	1.65	-0.45	-1.66	0.68	2.10
Ohlson's O (distress)	0.03	0.52	0.01	0.05	0.03	0.16
Net stock issues	0.07	1.12	-0.36	-2.93	0.43	3.60
Comp. equity issues	-0.06	-0.68	-0.21	-1.69	0.16	1.03
Total accruals	0.02	0.14	-0.39	-2.24	0.41	2.03
Net operating assets	0.06	0.53	-0.41	-3.23	0.47	2.82
Momentum	0.11	0.71	-0.32	-1.15	0.42	1.13
Gross profitability	0.35	2.98	-0.08	-0.66	0.44	2.39
Asset growth	-0.23	-1.82	-0.38	-2.75	0.15	0.78
Return on assets	0.13	1.50	0.07	0.28	0.07	0.25
Investment/assets	-0.20	-1.72	-0.23	-1.84	0.03	0.23
Average	0.06	1.40	-0.27	-2.68	0.33	3.00

# Horse Race with Macro Variables

Anomaly	Sentiment	DEF	TERM	INT	INFL	Cay	Splus
Failure probability	2.29	-1.00	-0.45	0.34	-0.18	32.55	-58.72
Ohlson's O (distress)	1.34	-0.38	-0.35	0.15	-0.08	34.79	-32.41
Net stock issues	0.66	-1.17	0.18	-0.07	0.09	-5.27	-5.79
Comp. equity issues	0.54	-1.58	0.58	-0.26	0.31	-29.06	-13.17
Total accruals	0.46	-0.73	-0.13	0.10	0.00	15.11	14.98
Net operating assets	0.50	-1.06	0.17	-0.07	0.04	-9.09	9.27
Momentum	0.32	-1.75	0.32	-0.24	0.23	-30.82	-1.26
Gross profitability	0.39	0.49	-0.18	0.13	-0.17	21.97	-6.89
Asset growth	0.28	-0.11	0.22	-0.15	0.08	-36.24	7.81
Return on assets	1.53	-0.55	-0.31	0.25	-0.07	32.88	-28.81
Investment/assets	-0.02	0.28	0.08	-0.04	0.07	-3.87	10.35
Exp. Sign	+	+	+	+	+	+	-

# Conclusion

- We document the following results with 11 anomalies.
  - Stronger anomalies following high sentiment.
  - Lower returns on short legs following high sentiment.
  - Little impact of sentiment on long legs
- Only sentiment-related variables show such patterns.
  - Can: BW sentiment, Michigan sentiment, and Conference Board Sentiment.
  - CANNOT: 11 macro variables.
- The results are predicted by our hypotheses combining short-sale impediments and market-wide sentiment.

# Transition to Paper Two

# Motivation

- Economic theory suggests that pervasive macro factors should be priced in the cross-section
  - ICAPM: pervasive factor such as term premium, default premium, interest rate, inflation, etc
  - CAPM, Consumption-based CAPM: consumption growth
  - Production-based CAPM: TFP growth, industrial production
- Lack of empirical evidence: Anomalies
  - Chen, Roll and Ross (1986): a systematic study using size portfolios
  - After 25 years, there are many approaches to obtain return spreads based on firm-specific attributes.

# Motivation: Cont'd

- To avoid potential data-mining issue
  - Form portfolios based directly on the sensitivity to a broad set of macro factors
  - We find, however, that there is **no significant return spread** between high and low risk portfolios

# Motivation: Cont'd

- Three key ingredients/assumptions
  - Short-sale impediments
  - Market-wide sentiment
  - Firms with high macro risk are more subject to the influence of investor sentiment ( a conjecture confirmed later in the data)
- (Recall:) The market is more efficient during low-sentiment periods.
- **Hypothesis 1:** The return spread between high and low risk firms should be **positive** following **low sentiment** periods.

# Motivation: Cont'd

- Three key ingredients/assumptions
  - Short-sale impediments
  - Market-wide sentiment
  - Firms with high macro risk are more subject to the influence of investor sentiment ( a conjecture confirmed later in the data)
- (Recall:) The market is more efficient during low-sentiment periods.
- **Hypothesis 1:** The return spread between high and low risk firms should be **positive** following **low sentiment** periods.

# Our Intuition (Continued)

- Key conjecture: high-risk firms are relatively more subject to the influence of sentiment (see Hong and Sraer (2011))
- High-risk firms are relatively more over-pricing during high-sentiment periods, and thus earn a lower subsequent returns.(Baker and Wurgler (2006))
  - **Hypothesis 2:** The return spread between high and low risk firms should be **smaller and potentially negative** following high sentiment periods.
- Direct implication of the conjecture:
  - **Hypothesis 3a:** The high risk firms should earn a **lower** subsequent returns following high sentiment periods
  - **Hypothesis 3b:** The low risk firms should have **similar** returns following high and low sentiment periods

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## Example: the market factor

- Following high sentiment, short-sale impediments tie rational investors, while they tie irrational investors following low sentiment. We expect the risk-return tradeoff is more pronounced during low-sentiment periods.
- **Hypothesis 1a:** the return spread between high- and low-beta portfolios should be positive during low-sentiment periods.
- If the high-beta portfolio is more subject to the movements by sentiment, then the high-beta portfolio is more overpriced than the low-beta portfolio during high-sentiment periods.
  - e.g., the market return itself is affected by sentiment

## Example: the market factor (Continued)

- During high sentiment periods, there are two countervailing forces for the return spread between high- and low-beta portfolio.
  - risk: the high-beta portfolio should earn higher expected returns
  - mispricing: the high-beta portfolio should earn lower subsequent returns
- Thus, we have
  - **Hypothesis 2**: the return difference between high- and low-beta portfolios should be smaller and potentially negative following high investor sentiment.
  - **Hypothesis 3a**: the high-beta portfolio should have lower returns following high sentiment than following low sentiment
  - **Hypothesis 3b**: the low-beta portfolio should have similar returns following high and low sentiment.

# Macro factors we study in this paper

- Consumption growth (Consumption-based CPAM)
- TFP growth (Production-based CAPM)
- Industrial production growth (Production-based CAPM)
- Aggregate market returns (CAPM)
- Labor income growth (CAPM with labor income)
- Change in market volatility (ICAPM)
- Term premia (ICAPM, prior: negative price of risk)
- Default premia (ICAPM, prior: negative price of risk)
- Unexpected inflation (ICAPM, prior: positive price of risk)
- Changes in expected inflation (ICAPM, prior: positive price of risk)

# Main Results

- The return spreads based on macro factors are **not significantly different from zero** on average (**3 bp per month**)
- The average return spreads based on macro factors are **significantly positive** following low sentiment (**61 bp per month**)
- The average return spreads based on macro factors are **significantly negative** following high sentiment (**-56 bp per month**)
- High-risk portfolios are significantly influenced by sentiment, whereas low-risk firms are much less influenced by sentiment
- Economic Significance: a one-standard-deviation decrease in sentiment raises the profit from the high-minus-low beta portfolio about **0.55% per month**.

# Correlations among Macro Factors

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		<u>Correlations among macro factors</u>									
(1)	<i>CON</i>	1.00									
(2)	<i>TFP</i>	0.42	1.00								
(3)	<i>IPG</i>	0.52	0.32	1.00							
(4)	<i>TERM</i>	-0.27	-0.17	-0.20	1.00						
(5)	<i>DEF</i>	-0.16	-0.28	-0.28	0.19	1.00					
(6)	<i>UI</i>	0.07	0.15	0.16	-0.09	-0.27	1.00				
(7)	<i>DEI</i>	0.22	0.17	0.18	-0.11	-0.15	0.65	1.00			
(8)	<i>VOL</i>	-0.03	-0.03	0.05	0.00	0.03	0.03	0.11	1.00		
(9)	<i>MKT</i>	0.18	0.14	0.03	0.03	-0.05	-0.07	-0.14	-0.23	1.00	
(10)	<i>LAB</i>	0.36	0.16	0.16	-0.13	0.00	0.03	0.07	-0.00	0.06	1.00

# Correlations among Macro-Factor Based Portfolio Returns

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13)

## A. Correlations: Long minus short

(1)	<i>CON</i>	1.00												
(2)	<i>TFP</i>	0.34	1.00											
(3)	<i>IPG</i>	0.36	0.14	1.00										
(4)	<i>TERM</i>	0.06	-0.02	0.23	1.00									
(5)	<i>DEF</i>	0.23	0.30	0.38	0.16	1.00								
(6)	<i>UI</i>	-0.10	-0.03	0.23	0.28	0.16	1.00							
(7)	<i>DEI</i>	-0.12	-0.04	0.20	0.21	0.21	0.55	1.00						
(8)	<i>VOL</i>	0.43	0.28	0.35	0.07	0.36	0.15	-0.04	1.00					
(9)	<i>MKT</i>	0.46	0.36	0.37	0.22	0.32	0.16	-0.02	0.66	1.00				
(10)	<i>LAB</i>	0.23	0.25	0.43	0.22	0.40	0.42	0.34	0.48	0.44	1.00			
(11)	<i>Ave1</i>	0.67	0.55	0.61	0.19	0.47	0.21	0.07	0.79	0.84	0.68	1.00		
(12)	<i>Ave2</i>	0.62	0.52	0.62	0.37	0.61	0.25	0.13	0.75	0.81	0.69	0.97	1.00	
(13)	<i>Ave3</i>	0.52	0.46	0.63	0.41	0.61	0.47	0.36	0.69	0.75	0.74	0.92	0.96	1.00

# Macro-Factor Based Portfolio Returns Across All Months

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
<u>B. Excess Returns</u>													
<i>Means</i>													
High Risk	0.29	0.75	0.79	0.52	0.40	0.52	0.46	0.49	0.45	0.16	0.49	0.48	0.48
Low Risk	0.46	0.38	0.41	0.32	0.54	0.52	0.52	0.35	0.49	0.60	0.45	0.44	0.46
High – Low	-0.17	0.36	0.39	0.20	-0.14	0.00	-0.06	0.15	-0.04	-0.44	0.04	0.04	0.03
<i>t-statistics</i>													
High Risk	0.77	2.10	2.06	1.49	1.07	1.58	1.39	1.20	1.00	0.39	1.28	1.30	1.36
Low Risk	1.53	1.36	1.27	0.97	1.95	1.60	1.52	1.46	2.80	2.03	1.87	1.78	1.75
High – Low	-0.70	1.49	1.86	0.79	-0.53	0.00	-0.24	0.54	-0.10	-1.53	0.22	0.23	0.16

# Macro-Factor Based Portfolio Returns During High and Low Sentiment

	Low Risk			High Risk			High – Low		
	High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low
<i>CON</i>	0.19	0.73	-0.54	-0.48	1.06	-1.54	-0.67	0.33	-1.00
<i>TFP</i>	0.21	0.56	-0.35	0.08	1.42	-1.34	-0.13	0.86	-0.99
<i>IPG</i>	-0.08	0.89	-0.97	-0.11	1.70	-1.81	-0.03	0.80	-0.83
<i>TERM</i>	0.10	0.54	-0.44	-0.23	1.26	-1.49	-0.33	0.72	-1.05
<i>DEF</i>	0.46	0.62	-0.16	-0.50	1.30	-1.81	-0.96	0.69	-1.64
<i>UI</i>	0.22	0.82	-0.60	-0.22	1.27	-1.49	-0.45	0.45	-0.89
<i>DEI</i>	0.09	0.94	-0.85	-0.35	1.27	-1.62	-0.45	0.33	-0.78
<i>VOL</i>	0.09	0.61	-0.51	-0.32	1.31	-1.63	-0.41	0.70	-1.11
<i>MKT</i>	0.57	0.41	0.16	-0.45	1.35	-1.80	-1.02	0.94	-1.96
<i>LAB</i>	0.26	0.94	-0.68	-0.92	1.24	-2.15	-1.17	0.30	-1.47
<i>Ave1</i>	0.21	0.69	-0.48	-0.37	1.35	-1.71	-0.57	0.66	-1.23
<i>Ave2</i>	0.22	0.66	-0.44	-0.37	1.33	-1.70	-0.59	0.67	-1.26
<i>Ave3</i>	0.21	0.71	-0.49	-0.35	1.32	-1.67	-0.56	0.61	-1.17

# Benchmark-Adjusted Portfolio Returns During High and Low Sentiment

	Low Risk			High Risk			High – Low		
	High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low
<i>CON</i>	-0.01	-0.03	0.02	-0.73	-0.02	-0.71	-0.72	0.01	-0.73
<i>TFP</i>	0.08	-0.10	0.18	-0.14	0.46	-0.60	-0.22	0.57	-0.78
<i>IPG</i>	-0.23	0.06	-0.29	-0.31	0.72	-1.03	-0.08	0.66	-0.74
<i>TERM</i>	-0.13	-0.37	0.23	-0.36	0.44	-0.80	-0.23	0.81	-1.04
<i>DEF</i>	0.33	-0.10	0.43	-0.79	0.21	-1.00	-1.13	0.31	-1.43
<i>UI</i>	-0.02	-0.12	0.10	-0.45	0.36	-0.81	-0.43	0.48	-0.91
<i>DEI</i>	-0.08	0.01	-0.09	-0.56	0.47	-1.03	-0.48	0.46	-0.94
<i>VOL</i>	-0.02	0.08	-0.10	-0.56	0.13	-0.69	-0.54	0.05	-0.59
<i>MKT</i>	0.27	-0.08	0.35	-0.67	0.20	-0.86	-0.94	0.28	-1.22
<i>LAB</i>	-0.02	0.05	-0.07	-1.10	0.30	-1.40	-1.09	0.25	-1.33
<i>Ave1</i>	0.01	-0.00	0.02	-0.58	0.30	-0.88	-0.60	0.30	-0.90
<i>Ave2</i>	0.03	-0.06	0.10	-0.58	0.31	-0.89	-0.62	0.37	-0.98
<i>Ave3</i>	0.02	-0.06	0.08	-0.57	0.33	-0.89	-0.58	0.39	-0.97

# Predictive Regressions for Excess Returns on Long-Short Strategies

$$R_{i,t} = a + bS_{t-1} + \epsilon_t$$

	Low Risk		High Risk		High – Low	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
<i>CON</i>	-0.55	-1.98	-1.14	-2.95	-0.59	-2.44
<i>TFP</i>	-0.58	-1.77	-0.81	-2.28	-0.23	-0.97
<i>IPG</i>	-0.70	-2.29	-1.07	-2.90	-0.37	-2.04
<i>TERM</i>	-0.48	-1.67	-1.00	-2.75	-0.52	-2.02
<i>DEF</i>	-0.43	-1.56	-1.05	-2.93	-0.62	-2.83
<i>UI</i>	-0.54	-1.62	-0.93	-3.13	-0.39	-1.76
<i>DEI</i>	-0.73	-2.11	-0.91	-3.38	-0.18	-0.77
<i>VOL</i>	-0.36	-1.61	-1.24	-3.16	-0.88	-3.38
<i>MKT</i>	-0.08	-0.39	-1.23	-2.90	-1.15	-3.34
<i>LAB</i>	-0.69	-2.29	-1.30	-3.43	-0.61	-1.86
<i>Ave1</i>	-0.49	-2.02	-1.13	-3.09	-0.64	-3.64
<i>Ave2</i>	-0.48	-1.96	-1.10	-3.07	-0.62	-3.89
<i>Ave3</i>	-0.51	-1.97	-1.07	-3.15	-0.55	-4.26

# Predictive Regressions for Benchmark-Adjusted Returns on Long-Short Strategies

$$R_{i,t} = a + bS_{t-1} + cMKT_t + dSMB_t + eHML_t + \epsilon_t$$

	Low Risk		High Risk		High - Low	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
<i>CON</i>	-0.07	-0.43	-0.43	-3.03	-0.36	-1.67
<i>TFP</i>	-0.10	-0.71	-0.16	-1.02	-0.06	-0.28
<i>IPG</i>	-0.11	-0.77	-0.39	-2.58	-0.29	-1.70
<i>TERM</i>	0.09	0.76	-0.39	-2.31	-0.48	-2.09
<i>DEF</i>	0.10	0.79	-0.36	-2.32	-0.46	-2.11
<i>UI</i>	0.06	0.53	-0.33	-2.39	-0.39	-1.80
<i>DEI</i>	-0.07	-0.69	-0.38	-2.28	-0.30	-1.53
<i>VOL</i>	0.03	0.25	-0.43	-3.13	-0.46	-2.48
<i>MKT</i>	0.08	0.74	-0.41	-3.33	-0.48	-2.58
<i>LAB</i>	-0.17	-1.27	-0.64	-3.08	-0.47	-1.68
<i>Ave1</i>	-0.06	-0.81	-0.41	-3.69	-0.36	-2.92
<i>Ave2</i>	-0.02	-0.27	-0.40	-3.72	-0.38	-3.40
<i>Ave3</i>	-0.02	-0.26	-0.39	-3.81	-0.38	-3.71

# Investor Sentiment Changes and Macro-Factor Based Portfolios

$$R_{i,t} = a + b\Delta S_t + \epsilon_t$$

	Low Risk		High Risk		High – Low	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
<i>CON</i>	2.12	5.94	3.55	8.20	1.44	4.91
<i>TFP</i>	2.26	6.02	3.06	6.69	0.79	2.39
<i>IPG</i>	2.64	5.86	3.74	7.09	1.10	3.50
<i>TERM</i>	2.49	7.01	2.98	5.77	0.48	1.41
<i>DEF</i>	2.43	5.75	3.23	8.28	0.80	2.19
<i>UI</i>	2.47	7.30	2.69	6.20	0.22	0.55
<i>DEI</i>	3.03	6.27	2.64	5.93	-0.39	-1.21
<i>VOL</i>	1.76	6.32	3.88	7.17	2.13	5.33
<i>MKT</i>	0.22	0.89	4.05	7.92	3.84	6.27
<i>LAB</i>	2.16	8.03	3.43	6.02	1.27	2.15
<i>Ave1</i>	1.86	7.52	3.62	7.49	1.76	5.34
<i>Ave2</i>	2.01	7.37	3.49	7.51	1.48	5.23
<i>Ave3</i>	2.16	7.45	3.32	7.32	1.17	4.42

# Sentiment Change as a Factor

Panel A: Returns across Two Sentiment Regimes

Low Risk			High Risk			High – Low		
High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low	High Sent.	Low Sent.	High – Low
0.42	0.53	-0.10	-0.78	0.88	-1.67	-1.21	0.35	-1.56
(1.24)	(1.88)	(-0.24)	(-1.14)	(1.50)	(-1.81)	(-2.19)	(0.77)	(-2.20)

Panel B:  $R_{i,t} = a + bS_{t-1} + \epsilon_t$

Low Risk			High Risk			High – Low		
$a$	$b$	$R^2$	$a$	$b$	$R^2$	$a$	$b$	$R^2$
0.48	-0.07	0.02	0.09	-1.36	1.92	-0.39	-1.30	2.51
(2.13)	(-0.29)		(0.21)	(-2.87)		(-1.11)	(-3.71)	

Panel C: Regression of Market Excess Returns on Lagged Sentiment

$R_t = a + bS_{t-1} + \epsilon_t$			$R_t = a + b^+ S_{t-1}^+ + b^- S_{t-1}^- + \epsilon_t$			
$a$	$b$	$R^2$	$a$	$b^+$	$b^-$	$R^2$
0.43	-0.32	0.49	0.81	-0.82	0.21	1.08
(2.05)	(-1.44)		(2.96)	(-2.54)	(0.56)	

# Control Additional Macro Variables

- By construction, the BW sentiment index is orthogonal to the following six variables.
  - Growth in industrial production.
  - Growth in durable consumption.
  - Growth in nondurable consumption.
  - Growth in service consumption.
  - Growth in employment.
  - NBER recession flag.
- We control five more variables, which may be related to risk premium.
  - Default premium: BAA - AAA.
  - Term premium: 20 year - 1 year.
  - Real interest: 1 month - inflation.
  - Inflation.
  - CAY.

# Controlling for Additional Macro Variables: Predictive Regressions

$$R_{i,t} = a + bS_{t-1} + \sum_{j=1}^5 m_j X_{j,t-1} + \epsilon_t,$$

	Low Risk		High Risk		High – Low	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
<i>CON</i>	-0.66	-2.39	-1.45	-3.87	-0.80	-3.47
<i>TFP</i>	-0.77	-2.39	-1.07	-2.93	-0.30	-1.14
<i>IPG</i>	-0.87	-2.93	-1.29	-3.57	-0.41	-2.22
<i>TERM</i>	-0.71	-2.53	-1.13	-3.10	-0.42	-1.63
<i>DEF</i>	-0.68	-2.49	-1.24	-3.56	-0.57	-2.44
<i>UI</i>	-0.78	-2.45	-1.08	-3.80	-0.30	-1.31
<i>DEI</i>	-0.94	-2.75	-0.98	-3.64	-0.04	-0.16
<i>VOL</i>	-0.44	-2.08	-1.56	-4.01	-1.13	-3.87
<i>MKT</i>	-0.20	-1.05	-1.45	-3.50	-1.25	-3.33
<i>LAB</i>	-0.89	-2.99	-1.49	-3.61	-0.59	-1.48
<i>Ave1</i>	-0.64	-2.74	-1.38	-3.79	-0.75	-3.66
<i>Ave2</i>	-0.65	-2.76	-1.33	-3.74	-0.68	-3.70
<i>Ave3</i>	-0.69	-2.78	-1.27	-3.81	-0.58	-3.76

# Michigan Sentiment Index: Controlling for Macro Variables

$$R_{i,t} = a + bS_{t-1} + \sum_{j=1}^5 m_j X_{j,t-1} + \epsilon_t,$$

	Low Risk		High Risk		High - Low	
	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.	$\hat{b}$	t-stat.
<i>CON</i>	-0.25	-0.62	-1.03	-2.22	-0.78	-2.70
<i>TFP</i>	-0.32	-0.81	-0.50	-1.03	-0.18	-0.54
<i>IPG</i>	-0.33	-0.81	-0.59	-1.21	-0.26	-1.01
<i>TERM</i>	-0.27	-0.60	-1.04	-2.25	-0.77	-2.40
<i>DEF</i>	-0.34	-0.89	-0.86	-2.20	-0.53	-1.74
<i>UI</i>	-0.35	-0.91	-0.94	-2.25	-0.59	-1.96
<i>DEI</i>	-0.31	-0.73	-0.81	-1.88	-0.50	-1.83
<i>VOL</i>	-0.25	-0.79	-0.95	-1.92	-0.70	-2.35
<i>MKT</i>	-0.01	-0.03	-0.84	-1.52	-0.84	-1.54
<i>LAB</i>	-0.32	-0.87	-1.09	-2.05	-0.77	-1.93
<i>Ave1</i>	-0.24	-0.81	-0.83	-1.74	-0.59	-2.43
<i>Ave2</i>	-0.26	-0.80	-0.86	-1.91	-0.60	-3.09
<i>Ave3</i>	-0.27	-0.82	-0.86	-1.96	-0.59	-3.42

# Conclusion

- We document the following results with 10 macro factors.
  - On average, high- and low-risk firms earn similar returns
  - High-risk firms earn higher returns than low-risk firms following low sentiment
  - High-risk firms earn lower returns than low-risk firms following low sentiment
  - Little impact of sentiment on low-risk firms
- Only sentiment-related variables show such patterns.
  - Can: BW sentiment, Michigan sentiment, and Conference Board Sentiment
  - CANNOT: 11 macro variables.
- The results are predicted by our hypotheses combining short-sale impediments and market-wide sentiment.