Wharton
University of Pennsylvania

JACOBS LEVY EQUITY MANAGEMENT CENTER
for Quantitative Financial Research

Discussion of “Anomaly Time”

Boone Bowles, Adam V. Reed, Matthew C. Ringgenberg, Jacob R. Thornock

PRESENTER

Patricia M. Dechow, University of Southern California, Marshall School of Business

“Anomaly Time”

Early Bird Gets The Worm

What is an “Anomaly”?

Efficient Market Hypothesis

Stock price reflect quickly all known and available information.

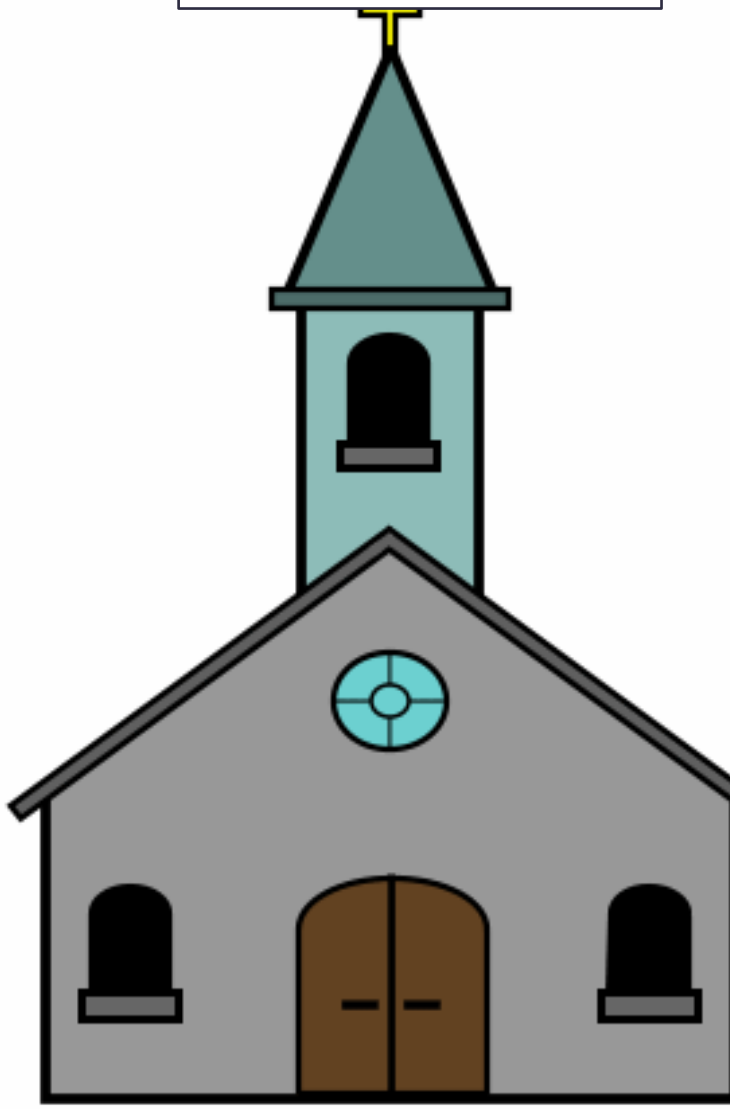
=> There are no under or overvalued stock.

Anomaly: Any evidence inconsistent with EMH

CAUSES OF ANOMALIES?

VIOLATION OF AN UNDERLYING PORTFOLIO THEORY ASSUMPTION

1. Returns from the assets are distributed normally.
2. Investors are rational and wealth maximizing
3. Investors are risk averse – require a higher return for more risk
4. All investors have access to the same information.
5. Taxes and trading costs are not considered while making decisions
6. All investors have the same views on the expected rate of return.
7. Atomistic investors, no single investor can influence prices
8. Unlimited capital at the risk-free rate of return can be borrowed.



Why do “Anomalies” exist? Three perspectives

EMH

Abnormal Returns are *fake* due to:

- Risk factors
- t-Hacking/selection bias
- Look-ahead biases

Behavioral Theories

Investors can under- or over-react to information

- Investors *fixate* on earnings
- Investors have *limited* attention
- Retail investors are *naïve/overconfident*

Market Friction Explanations

- *Investor Recognition*: investors do not have same access to information or stocks
- *Taxes, transaction costs, short-selling* restrictions impact and delays price responses
- *Market depth* limits ability to earn observed anomalous returns
- *Regulatory restrictions*, incentives, mandates - limit influence of institutional investors

Why do “Anomalies” exist? Three perspectives

EMH

Returns are *fake* due to:

- F
- t-Hacking/selection b
- Look-ahead biases

Behavioral Theories

Investors can under- or over-react to information

- Investors *fixate* on earnings
- s have *limited* attention
- ors are *naïve/overconfident*

Anomalies are Real

Anomaly Time

M ations

- *Investor Recognition*: invest in a ecurities
- *Taxes, transaction costs, short-selling* restrictions impact prices
- *Market depth* limit ability to earn returns
- *Regulatory restrictions*, incentives, mandates - limit influence of institutional investors

Why do “Anomalies” exist? Three perspectives

EMH

Returns are *fake* due to:

- R
- t-Hacking/selection b
- Look-ahead biases

Anomalies are Real

Behavioral Theories

Investors can under- or over-react to information

- Investors
- *limited* attention
- ors are *naïve/overconfident*

Supports these theories

M ations

- *Investor Recognition*: invest in a ecurities
- *Taxes, transaction costs, short-selling* restrictions impact prices
- *Market depth* limit ability to earn returns
- *Regulatory restrictions*, incentives, mandates - limit influence of institutional investors

Why do “Anomalies” exist? Three perspectives

EMH

Returns are *fake* due to:

- F
- t-Hacking/selection b
- Look-ahead biases

Behavioral Theories

Investors can under- or over-react to information

- Investors
- *limited* attention
- ors are *naïve/overconfident*

Anomalies are Real

Supports these theories

Anomaly Time

M ations

- *Investor Recognition*: invest in a ecurities
- *Taxes, transaction costs, short-s ing* restrictions impact prices
- *Market depth*
- *Regulatory restrictions*, incentives, mandates - limit influence of institutional investors

Supports Frictions: Need to Trade Quickly

Why do "Anomalies" exist? Three perspectives

EMH

Returns are *fake* due to:

- R
- t-Hacking / election b
- Look-ahead biases

Behavioral Theories

Investors can under- or over-react to information

- Investors
- *limited* attention
- ors are *naïve/overconfident*

M ations

- *Investor Recognition*: invest in a securities
- *Taxes, transaction costs, short-s ing* restrictions impact prices
- *Market depth*
- *Regulatory restrictions*, incentives, mandates - limit influence of institutional investors

Anomalies are Real

Supports these theories

Markets have become more efficient

Anomaly Time

Supports Frictions: Need to Trade Quickly

Why do "Anomalies" exist? Three perspectives

EMH

Returns are *fake* due to:

- R
- t-Hacking / election b
- Look-ahead biases

Behavioral Theories

Investors can under- or over-react to information

- Investors
- *limited* attention
- ors are *naïve/overconfident*

M ations

- *Investor Recognition*: invest in a securities
- *Taxes, transaction costs, short-s ing* restrictions impact prices
- *Market depth*
- *Regulatory restrictions*, incentives, mandates - limit influence of institutional investors

Anomalies are Real

Supports these theories

Markets have become more efficient

Anomaly Time

Supports Frictions: Need to Trade Quickly

Research Design: 8,000 stocks for 20 years 1997 - 2017

Selection of ”Anomalies”

McLean and Pontiff (2016) - 93 anomalies

Exclude anomalies requiring price or market-based data

Focus on anomalies with **clear information release dates**

1. Calculate anomaly at Snapshot information release date
2. Rank stocks based on the magnitude of variable (e.g., asset growth)
3. Portfolios are formed based on rankings (deciles)
4. Hedge portfolios (top 10% minus bottom 10%)
5. Continuous version (if stock is in extreme decile based on new calculation):
    1. Add stock into portfolio where it will remain for 240 days
    2. Remove another stock if no longer hits threshold
    3. Calculate daily abnormal returns (using weights from past year’s three factor Fama French model)

Research Design

Snapshot Compustat DATA

March 1, 2001
Earnings announcement
Learn income statement
Learn some Balance Sheet Accounts

March 24, 2001
10-K Release
Learn all Income Statement Accounts
Learn all Balance Sheet Accounts
Learn Cash Flow Statement
Learn Footnotes

Income Statement

1. Gross Profit (Novy-Marx 2013)
2. Profit Margin (Soliman 2008)

Balance Sheet Only

3. Asset Growth (Cooper et al 2008)
4. **Balance Sheet and Income Statement**
5. Accruals (Sloan 1996)
6. Inventory (Thomas and Zhang 2002)
7. Return on Equity (Haugen and Barker 1996)
8. Sustainable Growth (Lockwood and Prombutr 2010)

Table 2: Returns in Event Time

	Compound Returns Earned After Release of Information			Mean Annualized Return Earned Over Span of Days		
	(1)	(2)	(3)	(4)	(5)	(6)
Anomaly	30 Days	120 Days	240 Days	1 - 30 Days	31 - 120 Days	121 - 240 Days
Super	0.98	2.13	1.97	7.87	3.31	0.37
	(.000)	(.000)	(.000)	(.000)	(.000)	(.328)
Accruals	0.79	0.65	-0.55	6.30	-0.60	-2.57
	(.000)	(.085)	(.306)	(.000)	(.496)	(.003)
Asset Growth	2.29	5.56	6.13	18.28	9.53	2.45
	(.000)	(.000)	(.000)	(.000)	(.000)	(.005)
Gross Profitability	1.04	1.60	1.42	8.29	1.86	1.24
	(.000)	(.000)	(.006)	(.000)	(.031)	(.117)
Inventory Growth	1.10	2.78	1.88	8.76	4.47	-1.35
	(.000)	(.000)	(.000)	(.000)	(.000)	(.081)
Net Working Capital	0.76	0.73	-0.10	6.10	-0.10	-2.53
	(.000)	(.048)	(.854)	(.000)	(.910)	(.003)
Operating Leverage	0.05	0.01	0.41	0.43	-0.05	1.59
	(.731)	(.985)	(.415)	(.731)	(.948)	(.049)
Profit Margin	0.36	0.66	0.05	2.89	0.96	0.01
	(.038)	(.066)	(.919)	(.038)	(.240)	(.986)
ROE	0.66	1.39	2.07	5.26	2.71	1.75
	(.000)	(.000)	(.000)	(.000)	(.002)	(.041)
Sustainable Growth	1.59	5.07	5.72	12.71	9.61	2.43
	(.000)	(.000)	(.000)	(.000)	(.000)	(.007)

Significant

Significant

More accurate timing of INFORMATION RELEASE results in better identification of the abnormal returns

Table 3: Returns First Five Days

	1998-2007		2008-2017	
Anomaly	1 Day	5 Days	1 Day	5 Days
Super	0.03	0.12	0.07	0.23
	(.245)	(.017)	(.001)	(.000)
Accruals	0.01	0.14	0.15	0.28
	(.899)	(.276)	(.002)	(.008)
Asset Growth	0.17	0.46	0.15	0.62
	(.003)	(.000)	(.015)	(.000)
Gross Profitability	-0.05	-0.05	0.01	0.05
	(.456)	(.726)	(.846)	(.682)
Inventory Growth	0.11	0.22	0.14	0.46
	(.034)	(.047)	(.006)	(.000)
Net Working Capital	0.05	0.15	0.18	0.39
	(.414)	(.235)	(.002)	(.001)
Operating Leverage	0.01	0.06	0.09	0.29
	(.889)	(.603)	(.077)	(.003)
Profit Margin	-0.08	-0.49	-0.09	-0.14
	(.199)	(.000)	(.102)	(.195)
ROE	0.00	0.39	-0.02	-0.15
	(.965)	(.002)	(.767)	(.227)
Sustainable Growth	0.07	0.27	0.08	0.36
	(.312)	(.047)	(.153)	(.001)

More significant returns in the first five days in 2008-2017

Significant

Significant

In earlier period it took longer for the stock market to respond to the information

Table 3: Percent of abnormal return earned in first 30 Days

Anomaly	1998-2007 First 5-Days	2008-2017 First 5-Days
Super	11.11	31.94
Accruals	18.67	40.58
Asset Growth	18.04	31.96
Gross Profitability	-3.85	7.14
Inventory Growth	21.57	42.99
Net Working Capital	27.27	48.75
Operating Leverage	-18.75	725
Profit Margin	-114	-1400
ROE	25.49	-65.22
Sustainable Growth	15.25	33.96

Proportion earned in first 5 Days period

Now – you have to be quick because lots of the returns are earned in the first few days

Comments

EMH

Returns are *fake* due to:

- Risk factors
- t-Hacking/selection bias
- Look-ahead biases

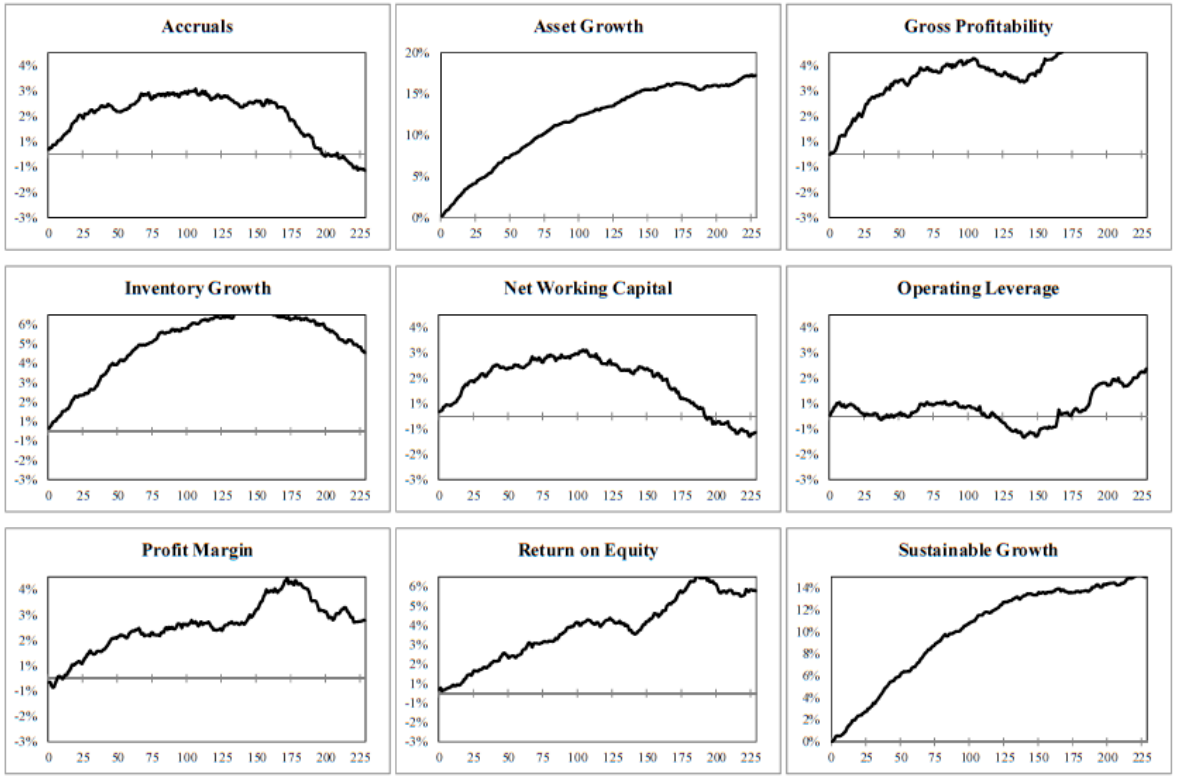


Figure 1: Anomaly Returns in Event Time using Information Release Dates

Comments

EMH

Returns are *fake* due to:

- **Risk factors**
- t-Hacking/selection bias
- Look-ahead biases

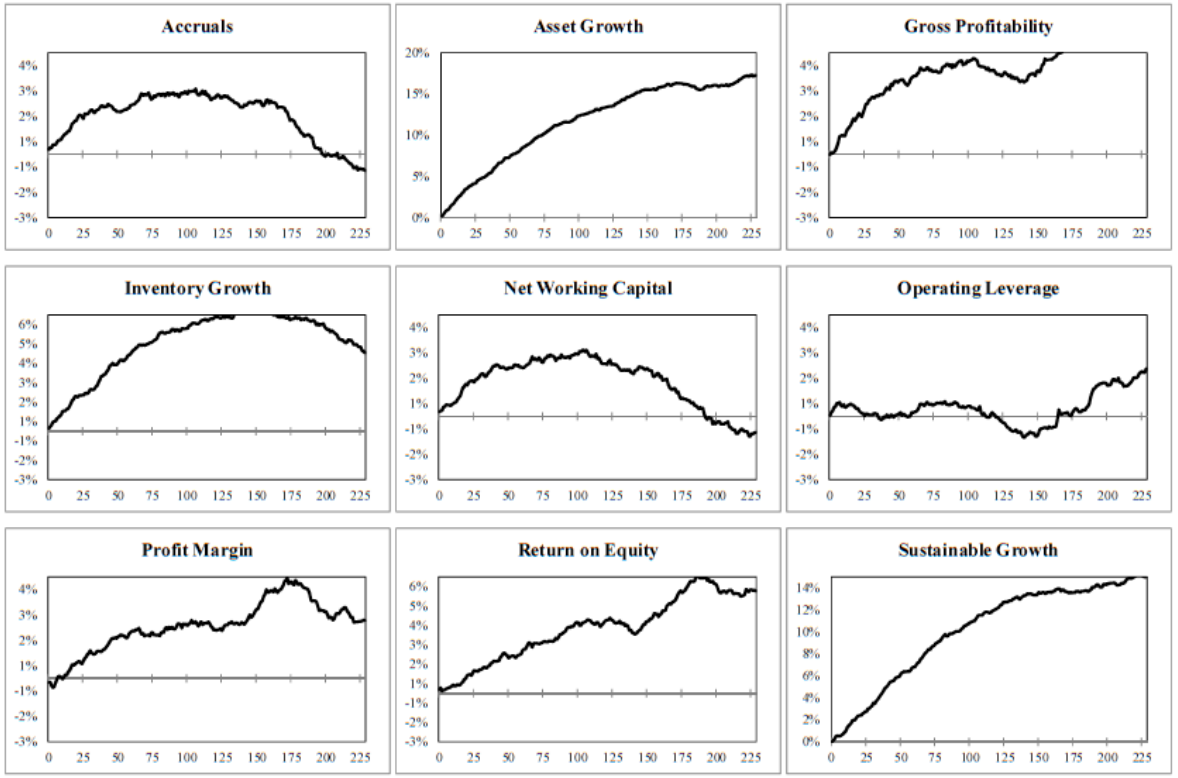


Figure 1: Anomaly Returns in Event Time using Information Release Dates

1. How do we reconcile the need for *fast trading* when *profit margin* and *sustainable growth anomalies* appear to earn abnormal returns for a long time?

The Journal of Financial Research • Vol. XXXIII, No. 4 • Pages 519–538 • Winter 2010

SUSTAINABLE GROWTH AND STOCK RETURNS

Larry Lockwood
Texas Christian University

Wikrom Prombutr
University of North Carolina at Pembroke

Risk factor

Abstract

We examine relations between sustainable growth and stock returns over 1964–2007. Findings indicate that high sustainable growth firms tend to have low default risk, low book-to-market ratios, and low subsequent returns. Of the four sustainable growth components, we find that the net profit margin is the major determinant of subsequent returns. Results persist after controlling for asset growth and capital expenditure growth. Additional tests indicate that the sustainable growth effect is attributable to risk and not to mispricing.

ELSEVIER

Journal of Financial Economics
Volume 117, Issue 2, August 2015, Pages 225-248

Deflating profitability ☆

Ray Ball [a], Joseph Gerakos [a], Juhani T. Linnainmaa [a, b], Valeri V. Nikolaev [a]

Show more

https://doi.org/10.1016/j.jfineco.2015.02.004

Get rights and content

Ten years

Abstract

Gross profit scaled by book value of total assets predicts the cross section of average returns. Novy-Marx (2013) concludes that it outperforms other measures of profitability such as bottom line net income, cash flows, and dividends. One potential explanation for the measure's predictive ability is that its numerator (gross profit) is a cleaner measure of economic profitability. An alternative explanation lies in the measure's deflator. We find that net income equals gross profit in predictive power when they have consistent deflators. Deflating profit by the book value of total assets results in a variable that is the product of profitability and the ratio of the market value of equity to the book value of total assets, which is priced. We then construct an alternative measure of profitability, operating profitability, which better matches current expenses with current revenue. This measure exhibits a far stronger link with expected returns than either net income or gross profit. It predicts returns as far as ten years ahead, seemingly inconsistent with irrational pricing explanations.

Sustainable Growth
Gross Profit – Gross Margin - Net Profit
Are correlated and similar "Anomalies"

Comments

EMH

Returns are *fake* due to:

- Risk factors
- **t-Hacking/selection bias**
- Look-ahead biases

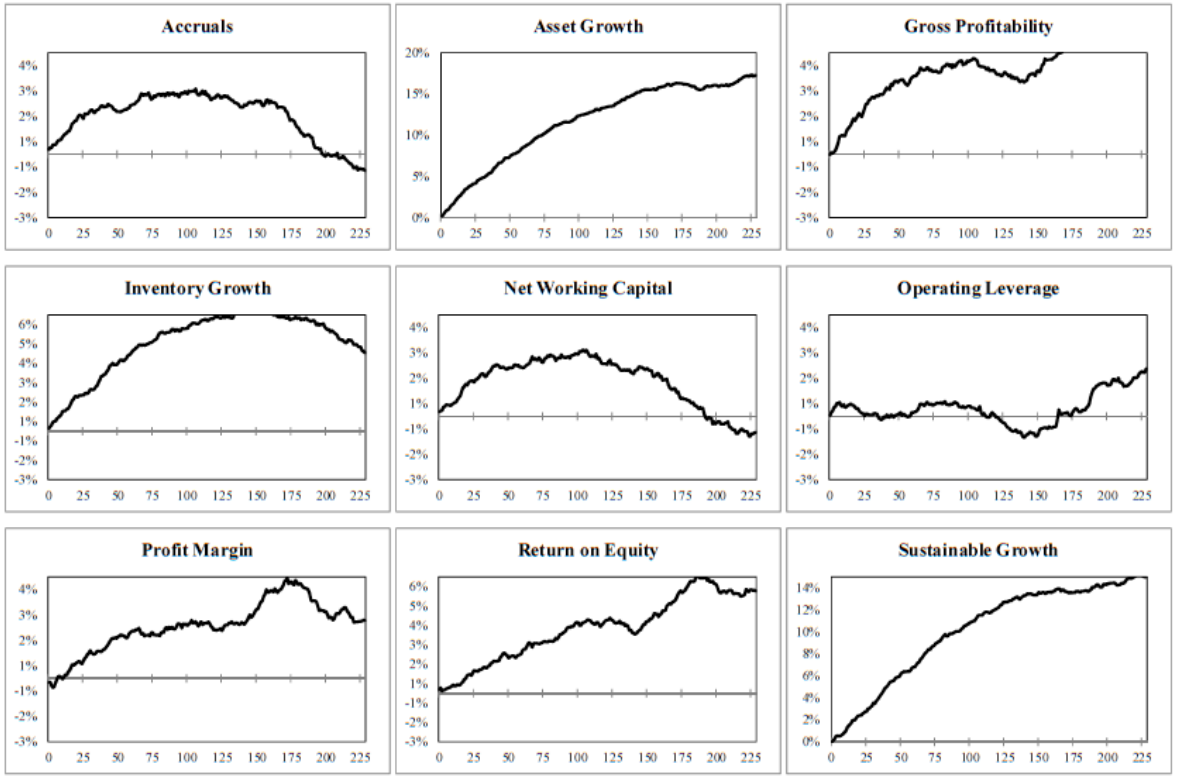


Figure 1: Anomaly Returns in Event Time using Information Release Dates

2. **Selection of "Anomalies" investigated in study is not random**

3. **None of the anomalies involve a valuation multiple**, e.g., Market-to-Book, Earnings-to-Price, Momentum? The abnormal returns for these are due to selection issues (e.g., worked for a subset of securities in 1970's).

EMH

Equity Investments

Facts about Formulaic Value Investing

U-Wen Kok , CFA, Jason Ribando , CFA & Richard Sloan

Pages 81-99 | Published online: 26 Dec 2018

Journal
Financial Analysts Journal ›
Volume 73, 2017 - Issue 2

Abstract

The term “value investing” is increasingly being adopted by quantitative investment strategies that use ratios of common fundamental metrics (e.g., book value, earnings) to market price. A hallmark of such strategies is that they do not involve a comprehensive effort to determine the intrinsic value of the underlying securities. We document two facts about such strategies. First, there is little compelling evidence that these strategies deliver superior investment performance for US equities. Second, instead of identifying undervalued securities, these strategies systematically identify companies with temporarily inflated accounting numbers. We argue that these strategies should not be confused with value strategies that use a comprehensive approach in determining the intrinsic value of the underlying securities.

Are there abnormal returns when new information impacts the **fundamentals** in Market-to-book Price-to-earnings?

If these ”anomalies” were investigated in the paper then the authors should not find results…

Comments

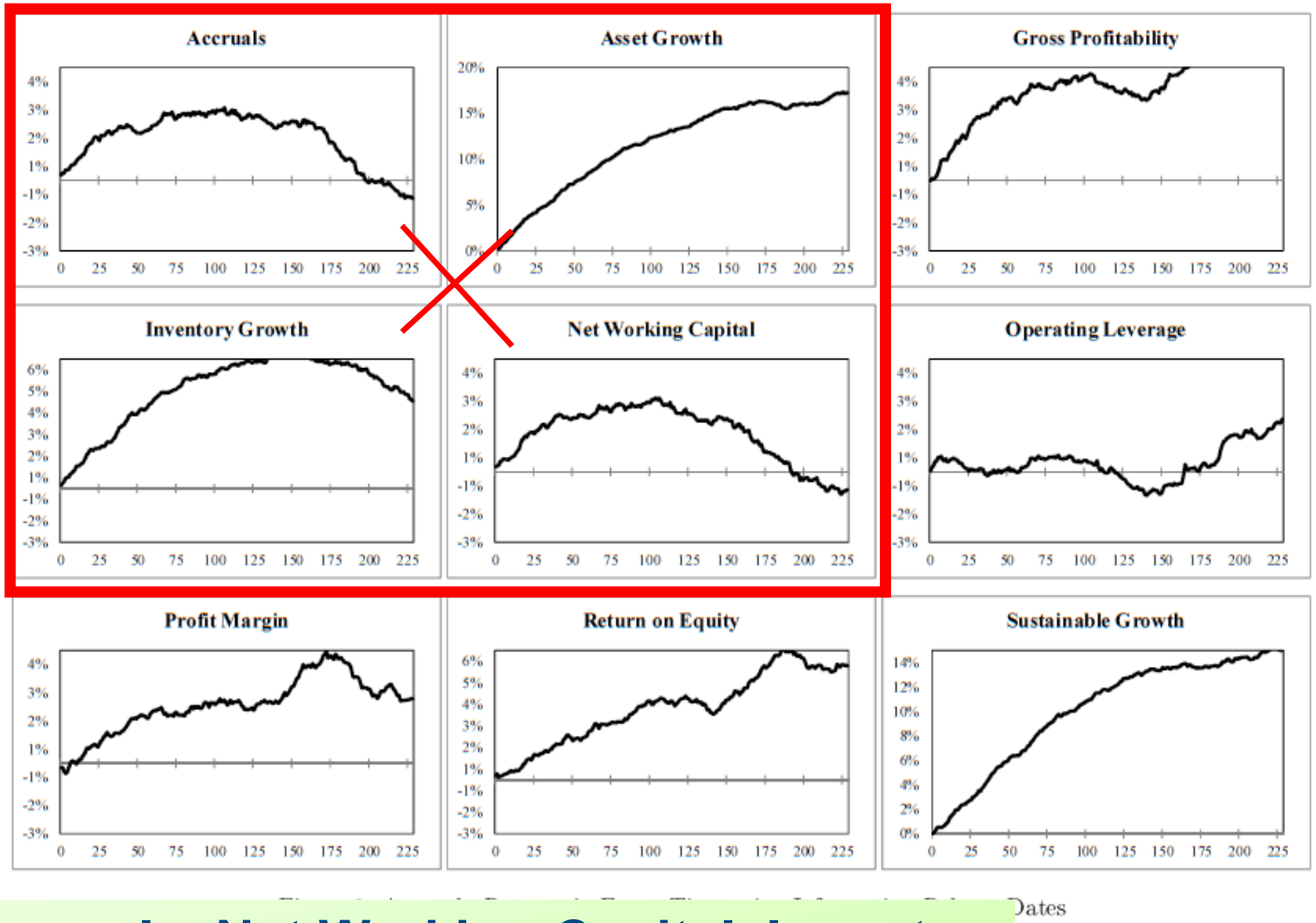
Behavioral Theories

Investors can under- or over-react to information

- Investors *fixate* on earnings
- **Investors have *limited* attention**
- Retail investors are *naïve/overconfident*

1. **Trading quickly is helpful when there is an *under-reaction to news*:**
   - **Shouldn't the most powerful tests for "Anomaly Time" be under-reaction anomalies?**
   - **Post-earnings announcement drift**
   - **Analyst forecast revisions**
   - **Why aren't these "anomalies" investigated?**

Comments



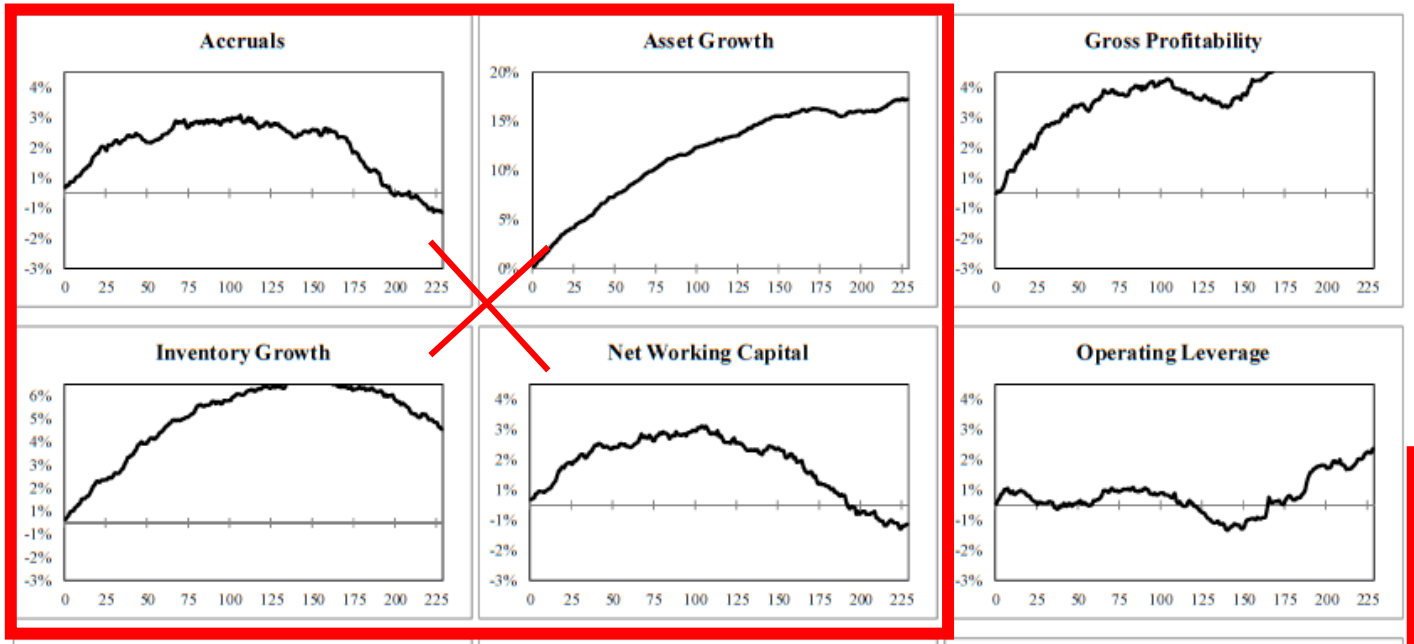
Accruals, Net Working Capital, Inventory Growth, Asset Growth are highly correlated and similar constructs

Behavioral Theories

Investors can under- or over-react to information

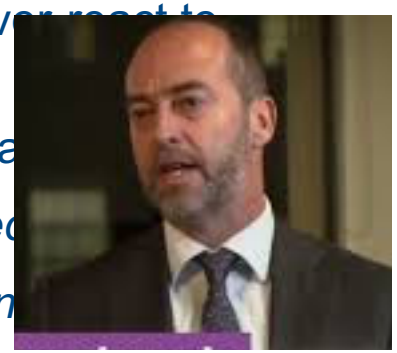
- **Investors *fixate* on earnings**
- Investors have *limited* attention
- Retail investors are *naïve/overconfident*

Comments



Accruals, Net Working Capital, Inventory Growth, Asset Growth are highly correlated and similar constructs

Behavioral Theories



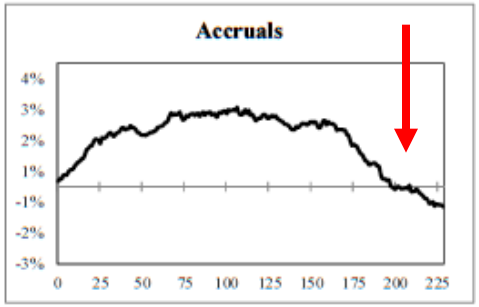
Richardson, Sloan, Soliman, and Tuna (2006)

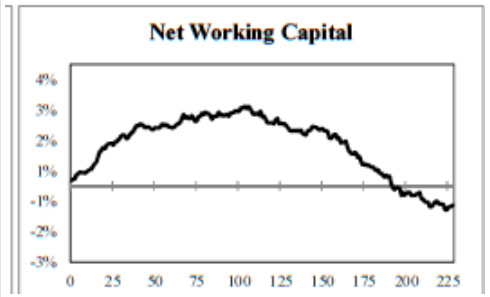
Total Accruals = Δ [Net Operating Assets]

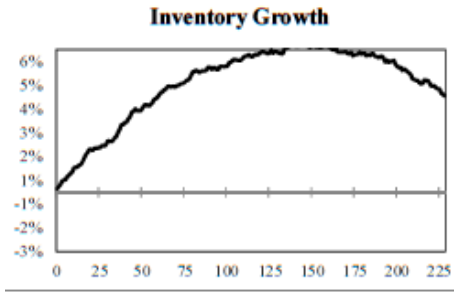
Net Operating Assets:
Assets – Cash – [Total Liabilities - Financial Liabilities]

A more powerful measure of construct is RSST's Total Accruals - these accruals contain more *estimation error* and lead to lower earnings persistence

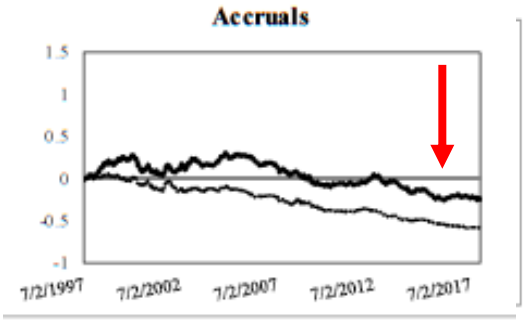
Comments

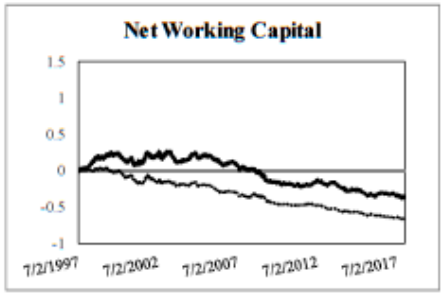






Hedge returns from day of information release





Hedge returns over time of continuous and annual rebalancing portfolio

Behavioral Theories

Investors can under- or over-react to information

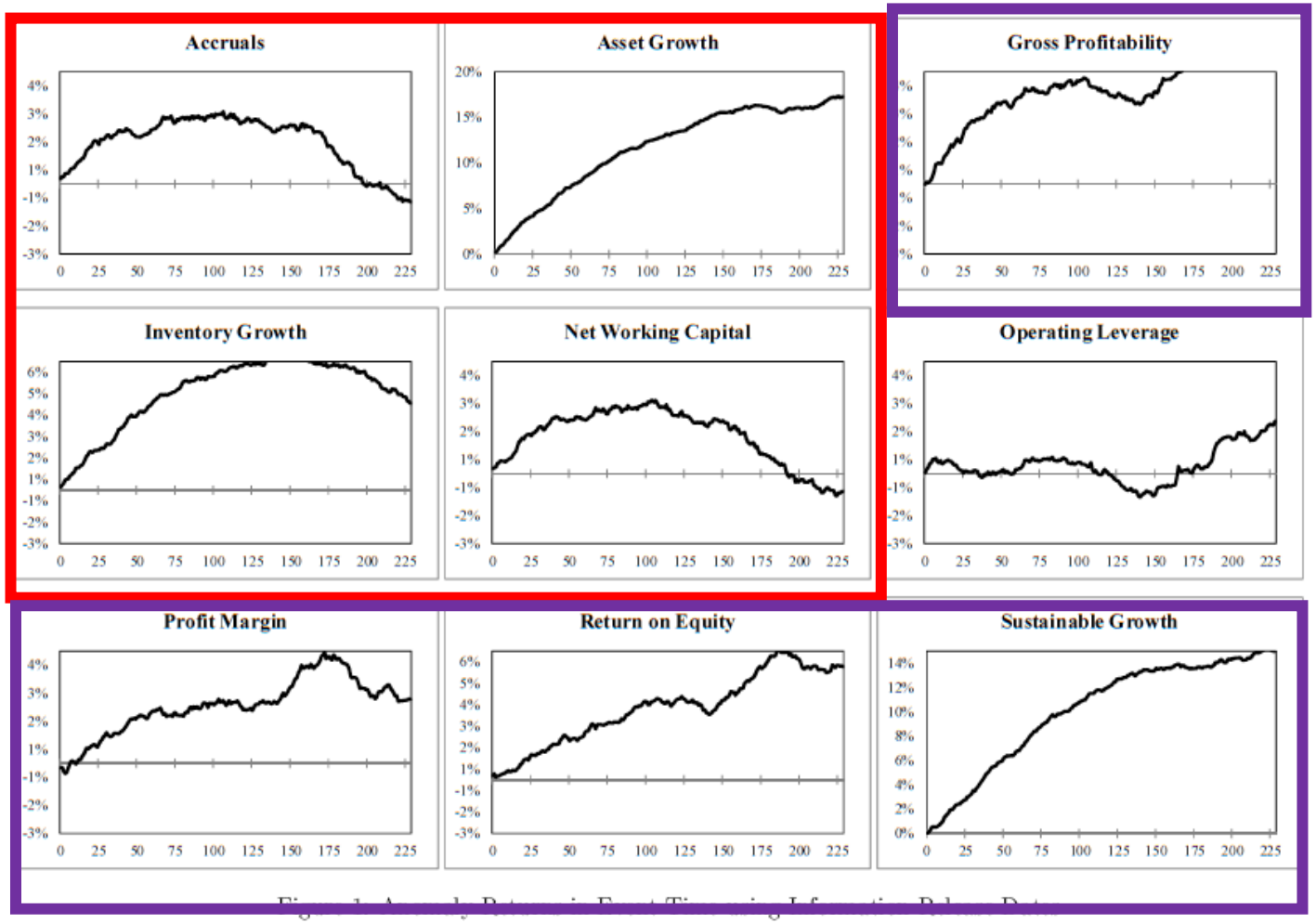
- Investors *fixate* on earnings
- Investors have *limited* attention
- Retail investors are *naïve/overconfident*

New Behavioral Theories

Do Quant Screens – *fixate* (overinvest) in accrual trading strategies?

4. What is going on with the accrual strategy? Lose money if hold for too long?

Comments



Behavioral Theories

Investors can under- or over-react to information

- Investors *fixate* on earnings
- Investors have *limited* attention
- Retail investors are *naïve/overconfident*

3. What is the overlap of securities selected in each anomaly portfolios? SUPER PORTFOLIO is not equally weighting underlying securities

Comments

Market Friction

- ***Investor Recognition*: investors have information on a subset of securities**
- *Taxes,* ***transaction costs, short-selling* restrictions impact prices**
- *Market depth* limit ability to earn returns
- *Regulatory restrictions*, incentives, mandates - limit influence of institutional investors

Time Series Trends suggest

- Investors have *better access* to information
- Cost of trading has *decreased*
- Easier for retail investors to trade
- Greater use of **quantitative investing screens**
  - "Anomaly time" presents evidence that **funds that invest quickly** make money

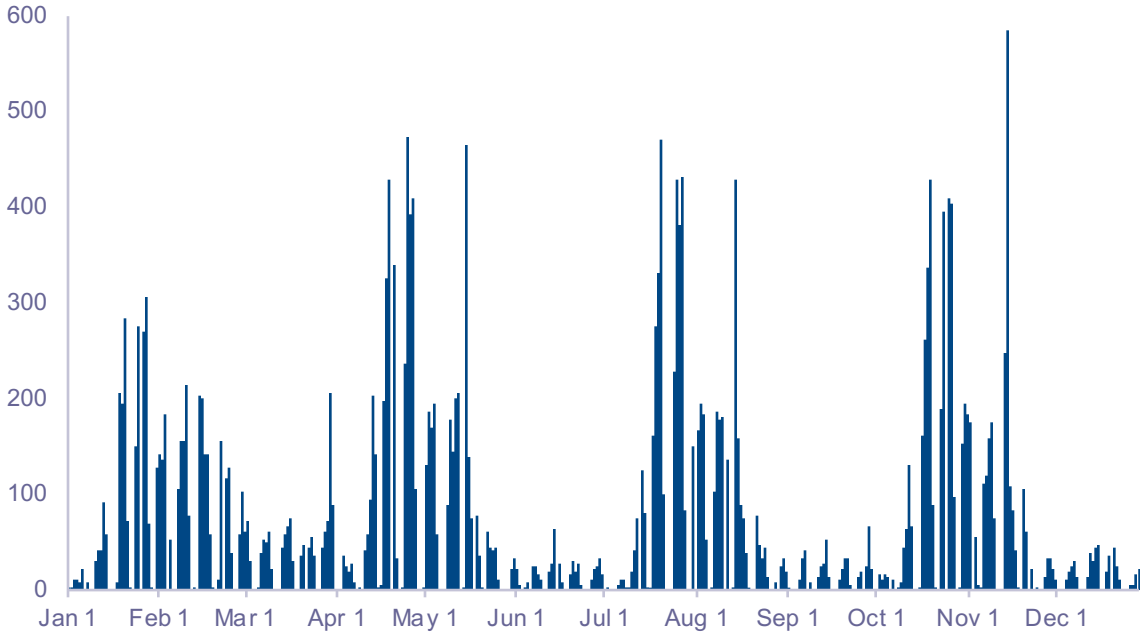
Does the past reflect the future?

Earnings Season is More Concentrated Now than in 2000

Market Friction

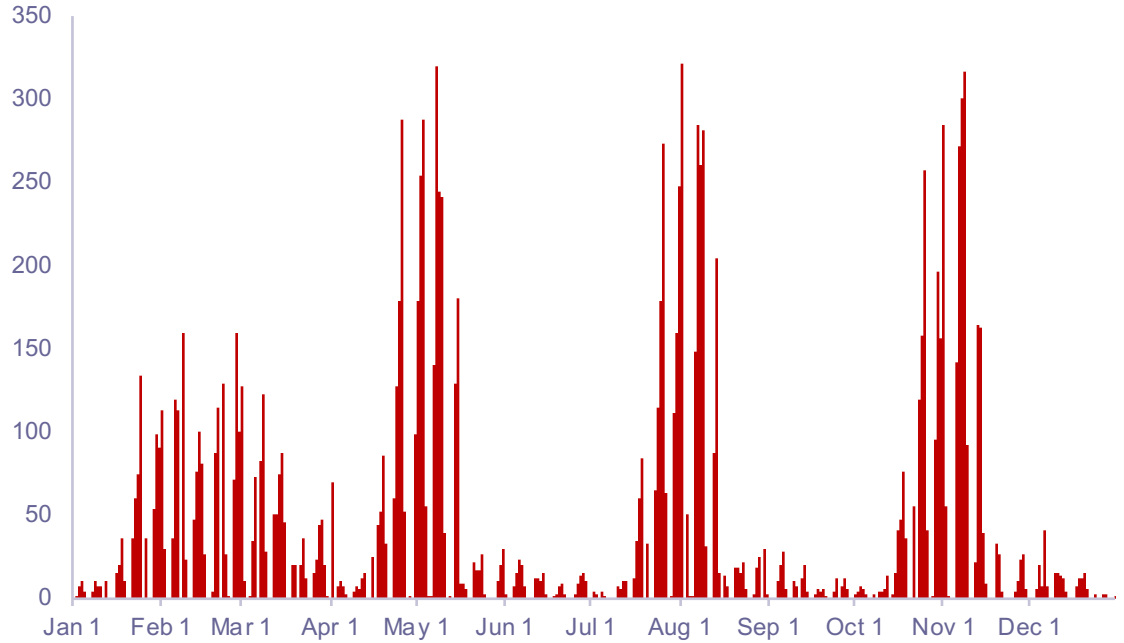
EARNINGS ANNOUNCEMENTS BY **DAY**

YEAR 2000



EARNINGS ANNOUNCEMENTS BY **DAY**

YEAR 2018



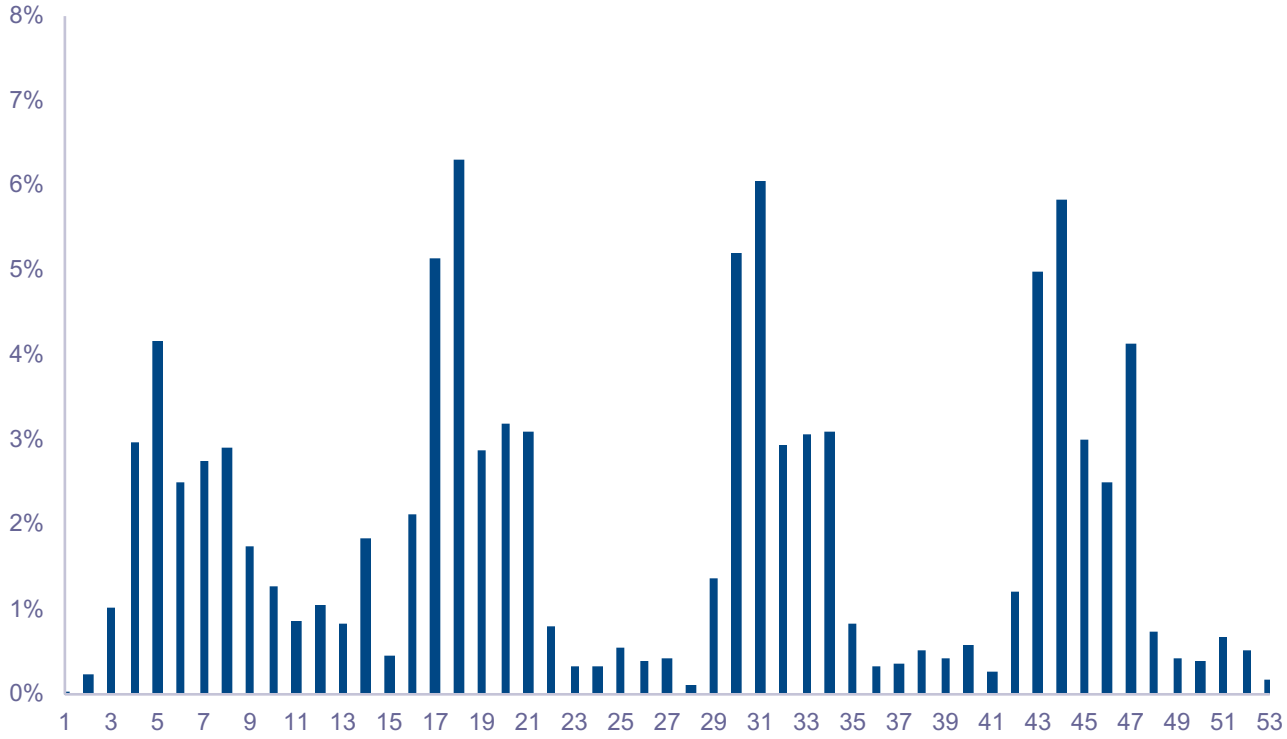
LOTS OF PORTFOLIO REBALANCING ON VERY SPECIFIC DAYS

Earnings Season is More Concentrated Now than in the Past

Market Friction

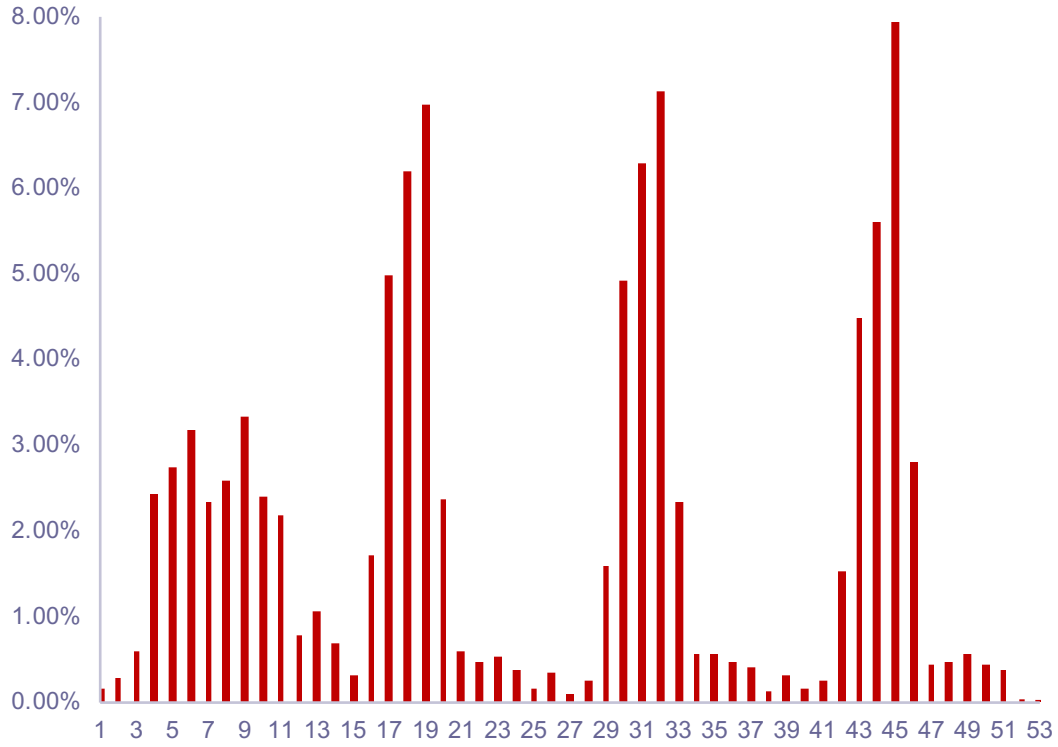
EARNINGS ANNOUNCEMENTS BY **WEEK**

YEAR 2000



EARNINGS ANNOUNCEMENTS BY **WEEK**

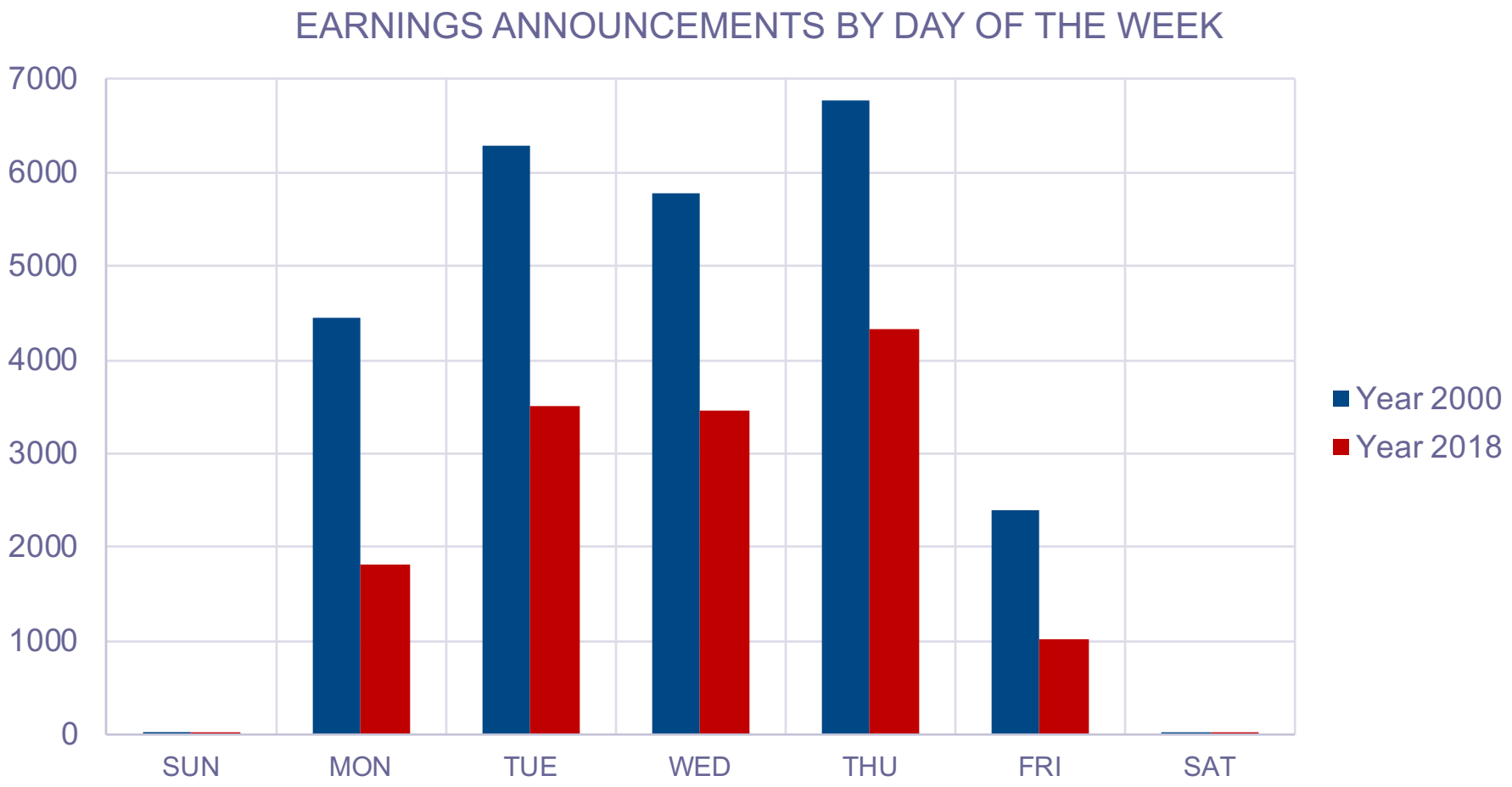
YEAR 2018



VERY BUSY IN SPECIFIC WEEKS

Earnings Season is More Concentrated Now than in the Past

Market Friction

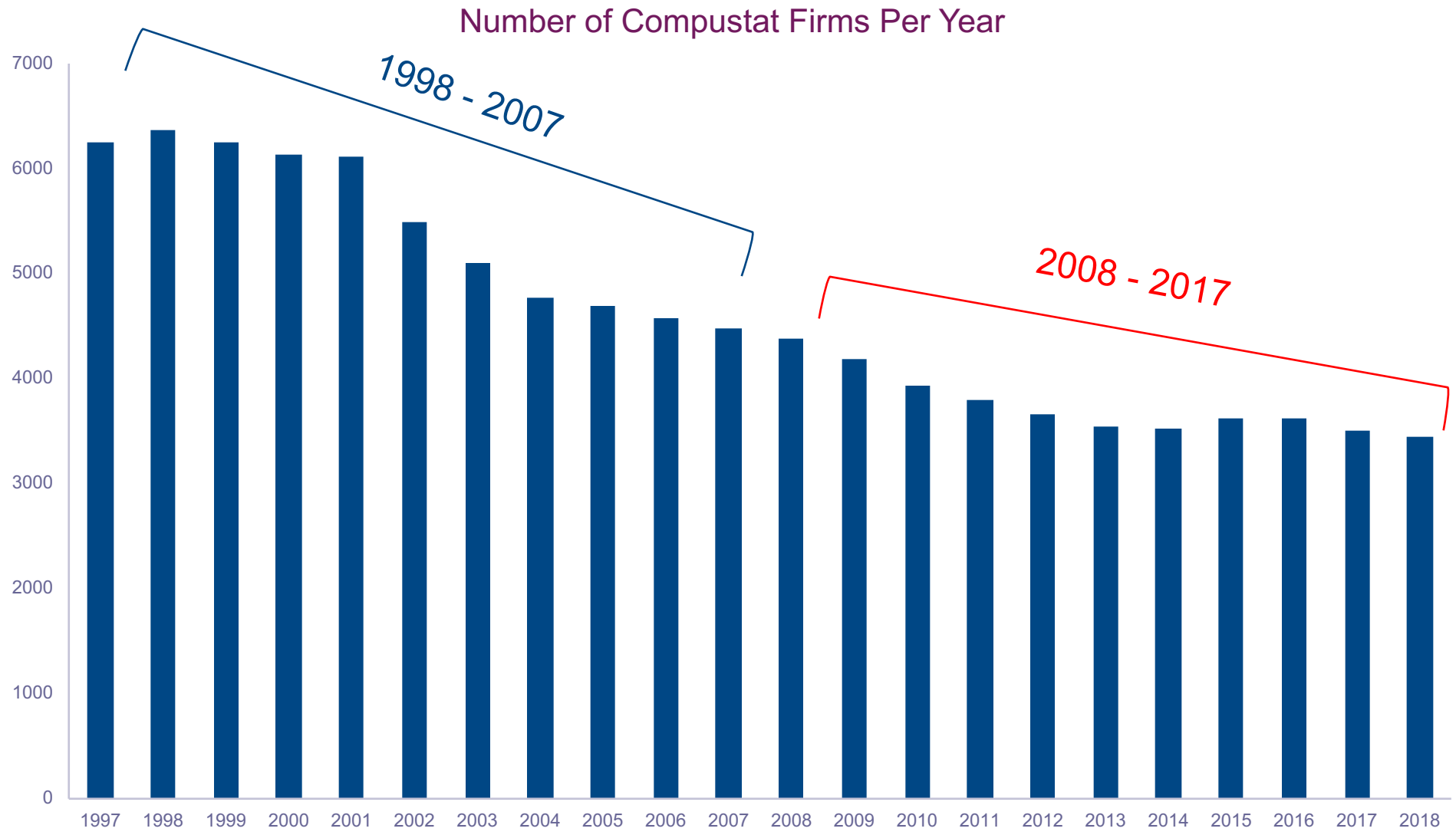


AFTER HOUR ANNOUNCEMENTS => VERY BUSY ON THURSDAY EVENING

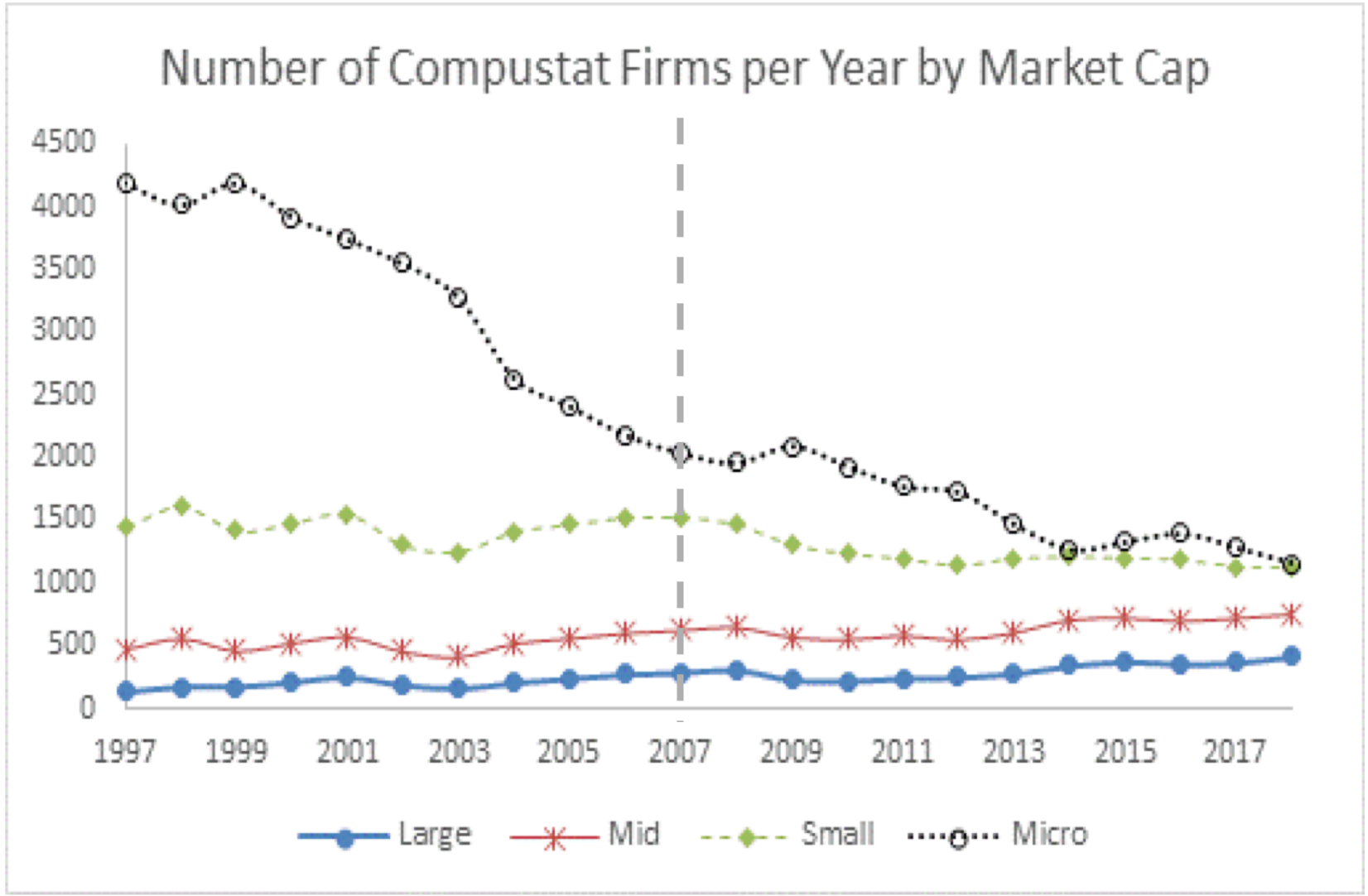
Implications for "Anomaly Time"

1. ***Annual/Fourth quarter announcements are more dispersed than other quarters***
   - Suggests processing costs and portfolio updating is easier for annual earnings announcements than for quarterly earnings news… and Mondays and Fridays
2. *Research suggests that **investors focus on the first firm in the industry announcing earnings** and **infer earnings news** for late announcers*
   - Investors ignore firm-specific-news for later announcers
   - Suggests "anomalies" could be stronger for *late announcers, that are less followed, and have earnings news that is* less correlated with industry
   - *Growth in Indexing* – greater categorization of stocks could result in more co-movement mispricing errors

Changing Compositions of Sample Through Time



Changing Compositions of Sample Through Time



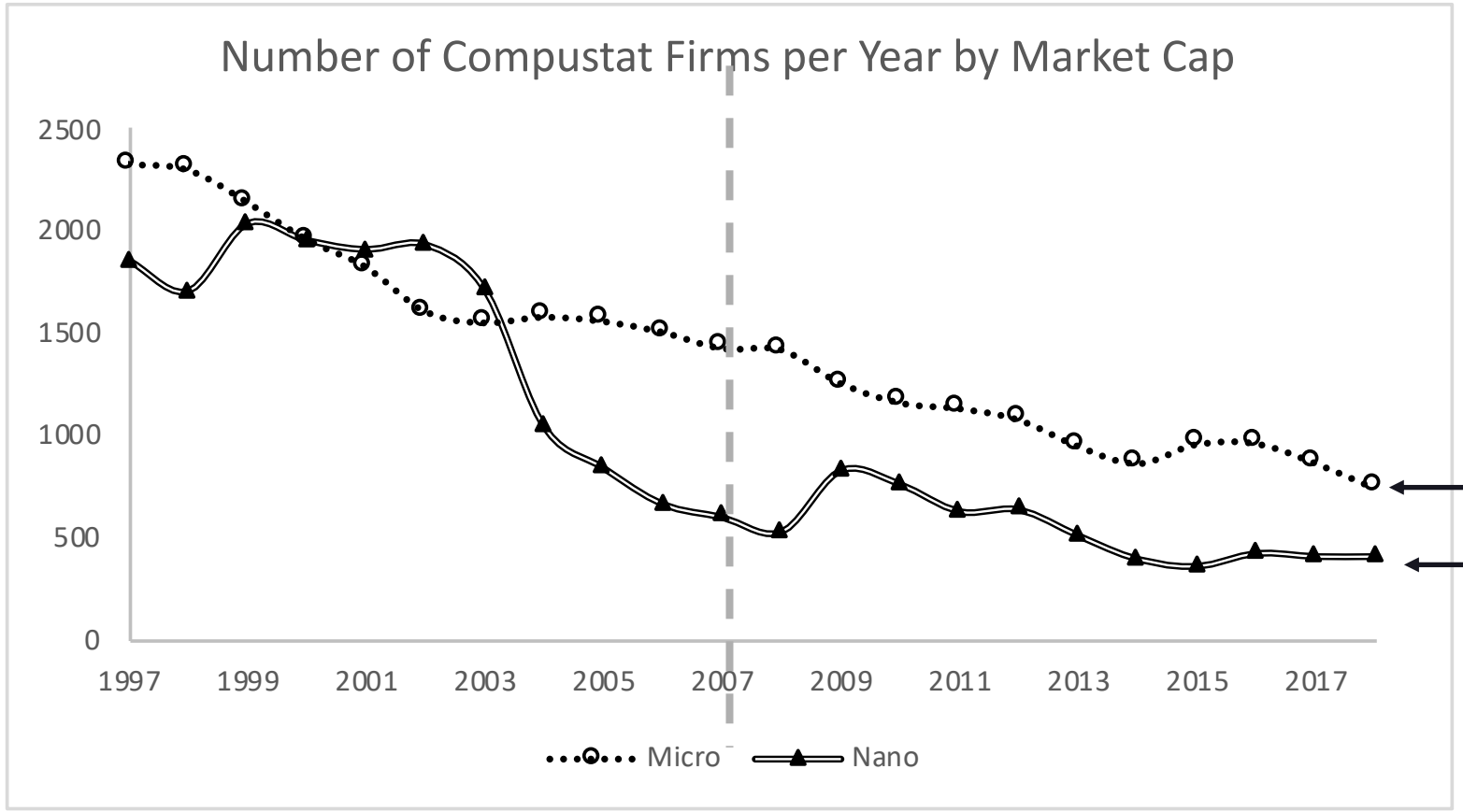
Micro-cap – Under $300 million

Small cap: $300 million - $2 billion

Mid cap: $2 billion - $10 billion

Large cap: $10 billion or greater

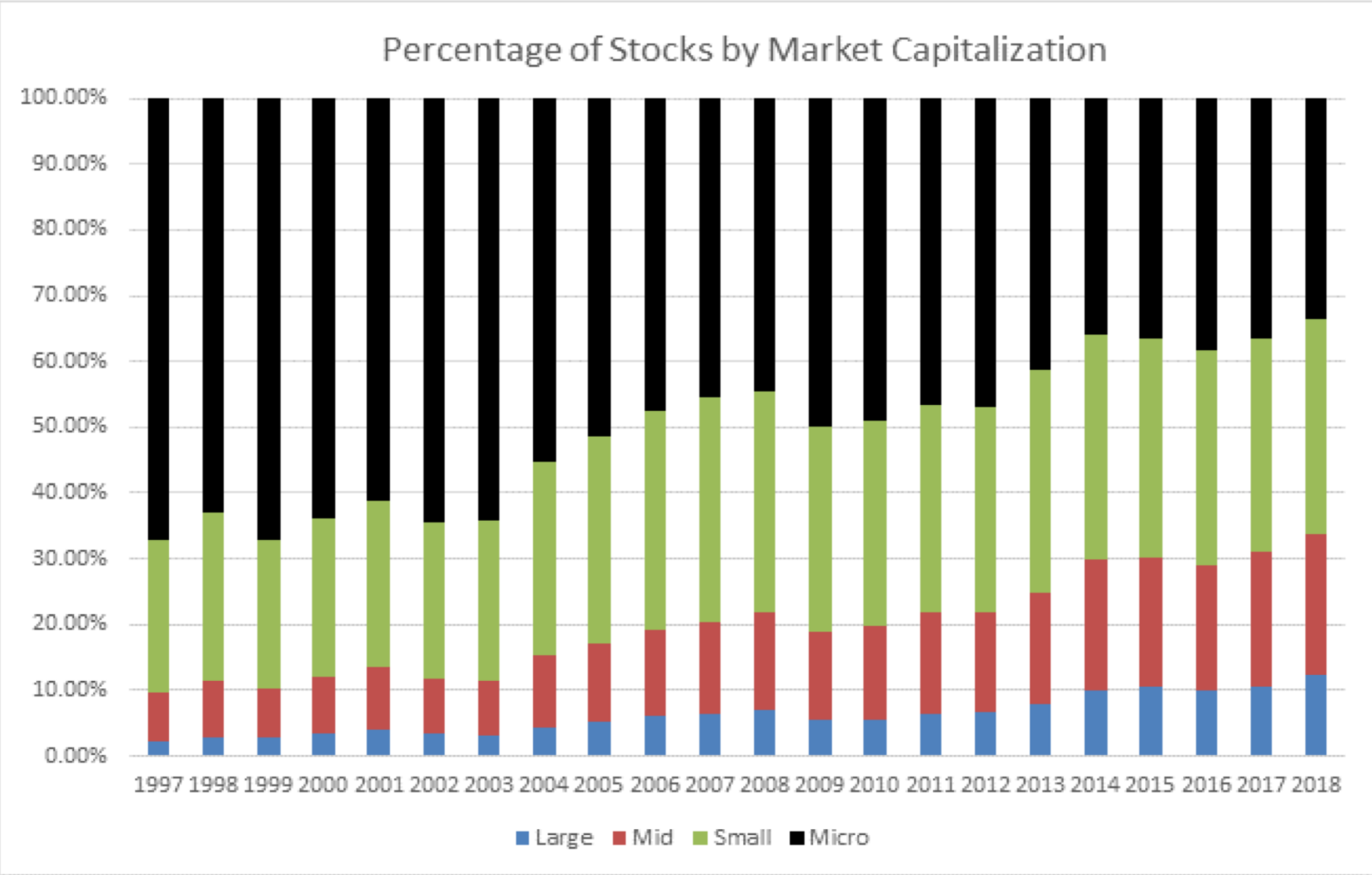
Changing Compositions of Sample Through Time



Micro-cap: $50 million - $300 million

Nano-cap: Under $50 million

Composition of Securities has changed over the sample period



Micro-cap – Under $300 million

Small cap: $300 million - $2 billion

Mid cap: $2 billion - $10 billion

Large cap: $10 billion or greater

Impact of Firm Size

"Anomaly Time" ranks observations into percentiles based on NYSE breakpoints and finds stronger anomalies for all groups when information release dates are considered

Large above 50th NYSE percentile

Small 20th – 50th NYSE percentile

Micro bottom 20th NYSE percentile

Table 11: Super Anomaly Returns: Size Breaks

The table examines returns to the super anomaly, broken out into size subsamples using the breakpoints in Fama and French (2012). The super portfolio is constructed as the equally-weighted average return across the nine individual anomaly portfolios. Large stocks are stocks with market capitalization greater than or equal to the 50th percentile of NYSE breakpoints from Kenneth French's website, Small stocks are those with market capitalization greater than or equal to the 20th percentile but less than the 50th percentile, and Micro stocks are those with market capitalization below the 20th percentile. Panel A shows returns in event time across a variety of horizons (columns) and size portfolios (rows), with p-values shown below the returns in parentheses. Panel B shows returns in calendar time for portfolios split by size; column 1 shows returns to an annual rebalancing strategy, column 2 shows returns to a daily rebalancing strategy, column 3 shows the difference between the two approaches and column 4 displays the p-value from a t-test of differences.

Panel A: Returns in Event Time

	Compound Returns Earned After Release of Annual Information			Average Annualized Return Earned Over Span of Days		
	(1)	(2)	(3)	(4)	(5)	(6)
Size	30 Days	120 Days	240 Days	1 - 30 Days	31 - 120 Days	121 - 240 Days
All	0.98	2.13	1.97	7.87	3.31	0.37
	(.000)	(.000)	(.000)	(.000)	(.000)	(.328)
Large	0.53	0.91	0.89	4.24	3.41	2.01
	(.000)	(.000)	(.005)	(.000)	(.000)	(.000)
Small	0.85	1.27	0.66	6.78	3.09	0.75
	(.000)	(.000)	(.134)	(.000)	(.000)	(.336)
Micro	0.95	1.63	0.69	7.60	2.71	-1.07
	(.000)	(.000)	(.093)	(.000)	(.000)	(.085)

Panel B: Returns in Calendar Time

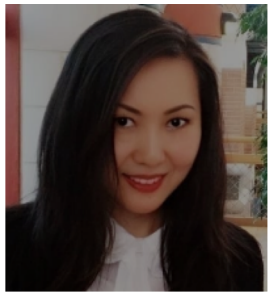
	Annualized Average Daily Returns in Percent			
	(1)	(2)	(3)	(4)
Size	Annual Rebalancing	Daily Rebalancing	Difference (2-1)	p-value
All	1.44	8.37	6.92	.000
Large	4.77	10.95	6.18	.002
Small	5.32	7.60	2.28	.300
Micro	-1.95	6.96	8.91	.000

Behavioral Theories | Market Friction

Changing Market Composition and Implications for "Anomaly time"

- *How has the concentration of returns changed over time for **fixed market value** groups?*
- *Do **Quantitative Investors focus on large market value stocks** and so we observed more delayed pricing for small market value stocks in earlier and later time period?*
- *LOST STOCKS: Did the Micro and Nano stocks get* priced ***inefficiently*** in past, but now are no longer in the sample?...
  - Now being valued *(inefficiently) by Private Equity?*

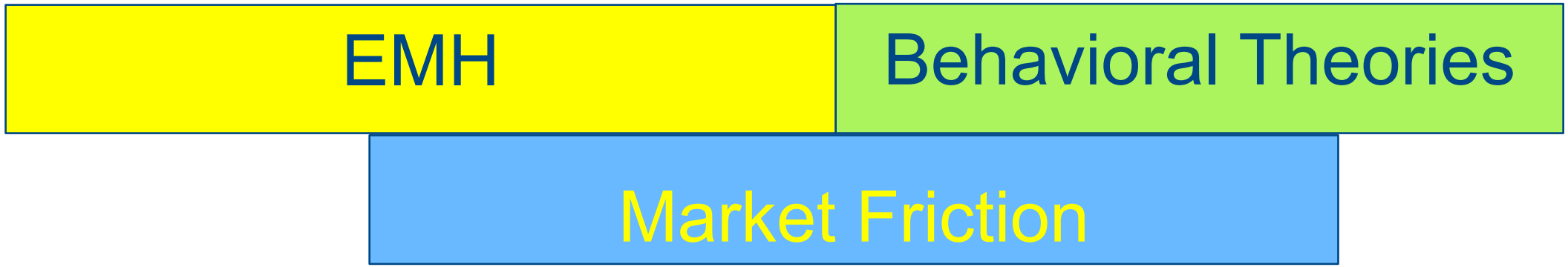
Changing Market Composition and Implications for "Anomaly time"



4. *Growth in technology sector during 2008 – 2017 time period*

- Technology stocks have *negative working capital* (e.g., Chu (2019))
- "***Accrual***" anomaly, "***inventory***" anomaly, "***working capital***" anomaly, "***asset growth***" are not applicable for many firms in technology since as they grow, working capital decreases (i.e., overvaluation due to inflated accruals is not an issue for this sector)
- Does this impact observed abnormal returns in recent period?

Summary



- ***"Anomaly Time"***: *Interesting paper that has implications for better understanding conformity of stock prices to EMH; impact of market frictions on prices (information releases and ability to trade); and the importance of investor behavioral theories.*
- ***Nice paper!***