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

<table>
<thead>
<tr>
<th>EMH</th>
<th>Behavioral Theories</th>
</tr>
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<tr>
<td>Abnormal Returns are <em>fake</em> due to:</td>
<td>Investors can under- or over-react to information</td>
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<td>- Risk factors</td>
<td>- Investors <em>fixate</em> on earnings</td>
</tr>
<tr>
<td>- t-Hacking/selection bias</td>
<td>- Investors have <em>limited</em> attention</td>
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<td>- Look-ahead biases</td>
<td>- Retail investors are <em>naïve/overconfident</em></td>
</tr>
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**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
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<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>• <em>Investor Recognition</em>: invest in a subset of securities</td>
<td></td>
</tr>
<tr>
<td>• <em>Taxes, transaction costs, short-selling</em> restrictions impact prices</td>
<td></td>
</tr>
<tr>
<td>• <em>Market depth</em> limit ability to earn returns</td>
<td></td>
</tr>
<tr>
<td>• <em>Regulatory restrictions</em>, incentives, mandates - limit influence of institutional investors</td>
<td></td>
</tr>
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Why do “Anomalies” exist? Three perspectives

**EMH**

Returns are *fake* due to:
- Factor mispricing
- t-Hacking/selection biases
- 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

**Anomalies are Real**

Supports these theories

**Market Frictions**

- *Investor Recognition*: invest in 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

Anomaly Time
Why do “Anomalies” exist? Three perspectives

**EMH**

- Returns are *fake* due to:
  - Flawed Risk Models
  - t-Hacking/selection bias
  - Look-ahead biases

**Behavioral Theories**

- Investors can under- or over-react to information
  - Investors have *limited* attention
  - Retail investors are *naïve/overconfident*

---

**Anomaly Time**

- *Anomalies are Real*
- *Supports these theories*

**Market Frictions**

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

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*Supports Frictions: Need to Trade Quickly*
Why do “Anomalies” exist? Three perspectives

**EMH**

Returns are *fake* due to:
- Price Discovery
- 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*

**Markets: Frictions & Anomalies**

- **Markets have become more efficient**
- **Investor Recognition**: invest in a subset of securities
- **Taxes, transaction costs, short-selling restrictions** impact prices
- **Market depth** limits ability to earn returns
- **Regulatory restrictions, incentives, mandates** limit influence of institutional investors

**Anomaly Time**

- **Supports these theories**
- **Supports Frictions**: Need to Trade Quickly

**Anomalies are Real**

- EMH vs. Behavioral Theories

Supports these theories: Need to Trade Quickly

Why do “Anomalies” exist? Three perspectives
Why do “Anomalies” exist? Three perspectives

**EMH**

Returns are *fake* due to:
- Risk factors
- \( t \)-Hacking/selection biases
- Look-ahead biases

Anomalies are Real

**Behavioral Theories**

Investors can under- or over-react to information:
- Investors fixate on earnings
- Investors have limited attention
- Retail investors are naïve/overconfident

Supports these theories

**Market Frictions**

Markets have become more efficient:
- Investor Recognition: invest in a subset of securities
- Taxes, transaction costs, short-selling restrictions impact prices
- Market depth limits ability to earn returns
- Regulatory restrictions, incentives, mandates limit influence of institutional investors

Supports Frictions: Need to Trade Quickly

**Anomaly Time**

Anomalies are Real

Supports these theories
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

<table>
<thead>
<tr>
<th>Anomaly</th>
<th>Compound Returns Earned After Release of Information</th>
<th>Mean Annualized Return Earned Over Span of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Days</td>
<td>Days</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Super</td>
<td>0.98</td>
<td>2.13</td>
</tr>
<tr>
<td></td>
<td>(.000)</td>
<td>(.000)</td>
</tr>
<tr>
<td>Accruals</td>
<td>0.79</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>(.000)</td>
<td>(.085)</td>
</tr>
<tr>
<td>Asset Growth</td>
<td>2.29</td>
<td>5.56</td>
</tr>
<tr>
<td></td>
<td>(.000)</td>
<td>(.000)</td>
</tr>
<tr>
<td>Gross Profitability</td>
<td>1.04</td>
<td>1.60</td>
</tr>
<tr>
<td></td>
<td>(.000)</td>
<td>(.000)</td>
</tr>
<tr>
<td>Inventory Growth</td>
<td>1.10</td>
<td>2.78</td>
</tr>
<tr>
<td></td>
<td>(.000)</td>
<td>(.000)</td>
</tr>
<tr>
<td>Net Working Capital</td>
<td>0.76</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>(.000)</td>
<td>(.048)</td>
</tr>
<tr>
<td>Operating Leverage</td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(.731)</td>
<td>(.985)</td>
</tr>
<tr>
<td>Profit Margin</td>
<td>0.36</td>
<td>0.66</td>
</tr>
<tr>
<td></td>
<td>(.038)</td>
<td>(.066)</td>
</tr>
<tr>
<td>ROE</td>
<td>0.66</td>
<td>1.39</td>
</tr>
<tr>
<td></td>
<td>(.000)</td>
<td>(.000)</td>
</tr>
<tr>
<td>Sustainable Growth</td>
<td>1.59</td>
<td>5.07</td>
</tr>
<tr>
<td></td>
<td>(.000)</td>
<td>(.000)</td>
</tr>
</tbody>
</table>

- More accurate timing of INFORMATION RELEASE results in better identification of the abnormal returns.
Table 3: Returns First Five Days

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Super</td>
<td>0.03 (0.245)</td>
<td>0.12 (0.017)</td>
<td>0.07 (0.001)</td>
<td>0.23 (0.000)</td>
</tr>
<tr>
<td>Accruals</td>
<td>0.01 (0.899)</td>
<td>0.14 (0.276)</td>
<td>0.15 (0.002)</td>
<td>0.28 (0.008)</td>
</tr>
<tr>
<td>Asset Growth</td>
<td>0.17 (0.003)</td>
<td>0.46 (0.000)</td>
<td>0.15 (0.015)</td>
<td>0.62 (0.000)</td>
</tr>
<tr>
<td>Gross Profitability</td>
<td>-0.05 (0.456)</td>
<td>-0.05 (0.726)</td>
<td>0.01 (0.846)</td>
<td>0.05 (0.682)</td>
</tr>
<tr>
<td>Inventory Growth</td>
<td>0.11 (0.034)</td>
<td>0.22 (0.047)</td>
<td>0.14 (0.006)</td>
<td>0.46 (0.000)</td>
</tr>
<tr>
<td>Net Working Capital</td>
<td>0.05 (0.414)</td>
<td>0.15 (0.235)</td>
<td>0.18 (0.002)</td>
<td>0.39 (0.001)</td>
</tr>
<tr>
<td>Operating Leverage</td>
<td>0.01 (0.889)</td>
<td>0.06 (0.603)</td>
<td>0.09 (0.077)</td>
<td>0.29 (0.003)</td>
</tr>
<tr>
<td>Profit Margin</td>
<td>-0.08 (0.199)</td>
<td>-0.49 (0.000)</td>
<td>-0.09 (0.102)</td>
<td>-0.14 (0.195)</td>
</tr>
<tr>
<td>ROE</td>
<td>0.00 (0.965)</td>
<td>0.39 (0.002)</td>
<td>-0.02 (0.767)</td>
<td>-0.15 (0.227)</td>
</tr>
<tr>
<td>Sustainable Growth</td>
<td>0.07 (0.312)</td>
<td>0.27 (0.047)</td>
<td>0.08 (0.153)</td>
<td>0.36 (0.001)</td>
</tr>
</tbody>
</table>

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

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

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

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

Returns are *fake* due to:

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

Returns are *fake* due to:

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

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?
Sustainable Growth
Gross Profit – Gross Margin - Net Profit
Are correlated and similar “Anomalies”
EMH

Returns are *fake* due to:
- Risk factors
- t-Hacking/selection bias
- Look-ahead biases

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).
Facts about Formulaic Value Investing

U-Wen Kok, CFA, Jason Ribando, CFA & Richard Sloan
Pages 81-99 | Published online: 26 Dec 2018

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?
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?

Behavioral Theories

Investors can under- or over-react to information

- Investors fixate on earnings
- Investors have limited attention
- Retail investors are naïve/overconfident
Investors can under- or over-react to information

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

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

Investors can under- or over-react to information:
- Fixate on earnings
- Limited attention
- Retail investors are naïve/overconfident

Richardson, Sloan, Soliman, and Tuna (2006)

Total Accruals = Δ [Net Operating Assets]


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

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

Hedge returns from day of information release

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?
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
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

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

YEAR 2018

0% 1% 2% 3% 4% 5% 6% 7% 8%

0.00% 1.00% 2.00% 3.00% 4.00% 5.00% 6.00% 7.00% 8.00%

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

EARNINGS ANNOUNCEMENTS BY DAY OF THE WEEK

Year 2000
Year 2018

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

Number of Compustat Firms Per Year

1998 - 2007

2008 - 2017
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

Number of Compustat Firms per Year by Market Cap

- **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

![Percentage of Stocks by Market Capitalization](chart.png)
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.

<table>
<thead>
<tr>
<th>Size</th>
<th>Compound Returns Earned After Release of Annual Information</th>
<th>Average Annualized Return Earned Over Span of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>All</td>
<td>0.98</td>
<td>2.13</td>
</tr>
<tr>
<td>Large</td>
<td>0.53</td>
<td>0.91</td>
</tr>
<tr>
<td>Small</td>
<td>0.85</td>
<td>1.27</td>
</tr>
<tr>
<td>Micro</td>
<td>0.95</td>
<td>1.53</td>
</tr>
</tbody>
</table>

Panel A: Returns in Event Time

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 B: Returns in Calendar Time

<table>
<thead>
<tr>
<th>Size</th>
<th>Annualized Average Daily Returns in Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>All</td>
<td>1.44</td>
</tr>
<tr>
<td>Large</td>
<td>4.77</td>
</tr>
<tr>
<td>Small</td>
<td>5.32</td>
</tr>
<tr>
<td>Micro</td>
<td>-1.95</td>
</tr>
</tbody>
</table>
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?
“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!