Asymmetric Arbitrage

Overpriced Securities + Unable to Short = Negative Expected Return

Underpriced Securities + Unable to Long = Positive Expected Return

Asymmetric Arbitrage

Arbitrage Asymmetry and the Idiosyncratic Volatility Puzzle
Stambaugh, Yu, and Yuan (2015)
Mispricing & Idiosyncratic Volatility

Overpriced
- High Accruals
- Unprofitable
- Negative Momentum
- High Asset Growth
- High Net Stock Issuance

Underpriced
- Low Accruals
- Profitable
- Positive Momentum
- Low Asset Growth
- Low Net Stock Issuance
### Simple Average Ranking Construction

1. Found the individual percentile ranking of each anomaly for every security.
2. Took the average of percentiles to find the total average mispricing percentile for every security.
3. Sorted securities based on the average percentile ranking.
4. Selected the top decile of securities based on mispricing anomaly ranking.

<table>
<thead>
<tr>
<th>Ticker</th>
<th>Accruals</th>
<th>Asset Growth</th>
<th>Momentum</th>
<th>Net Issuance</th>
<th>Profitability</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>30%</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>Company B</td>
<td>20%</td>
<td>30%</td>
<td>20%</td>
<td>20%</td>
<td>30%</td>
<td>24%</td>
</tr>
<tr>
<td>Company C</td>
<td>30%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
<td>20%</td>
<td>16%</td>
</tr>
</tbody>
</table>
• Market variance unattributed to variance of market return of iShares Russell 3000 ETF
• Magnitude of mispricing much greater amongst securities with high IVOL as a result of arbitrage risk

\[ R = \alpha_i + \beta_i (R_{mkt}) + \epsilon_i \]

\[ IVOL = \sum (\epsilon_i)^2 \]
Strategy Implementation
1st Criterion: Firms domiciled in the U.S.

2nd Criterion: Market Cap > $1B

3rd Criterion: Long Only Portfolio

4th Criterion: Maximum of 10% in one company and 25% in one sector

Investable Universe

SIM Fund Portfolio

Charter Constraints
Investment Process

01 Security Weight
50 bps floor
500 bps ceiling

02 Market Cap Weight

02 Sector Weight
25% ceiling

04 Exclusions
Excluded firms with pending M&A activity and performed news checks on each individual security
Example 1 – Security we rejected/sold

Example 2 – Security we held though it fell

Example 3 – Security we bought

Rebalance Process - Hold
Market Cap Weights

Portfolio

IWM

IWV

Custom

Legend:
- Large Cap
- Mid Cap
- Small Cap
Sector Comparison - Financials

**Financials Weight**

- Portfolio: 1.73%
- IWM: 19.35%
- IYW: 15.18%
- Custom: 6.6%

**Financials Contributed Return**

- Portfolio: 0.02%
- IWM: 1.44%
- IYW: 1.28%
- Custom: 0.5%
Portfolio Returns – Financials
## Financials - Alternate Gross Profit Calculations

<table>
<thead>
<tr>
<th></th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real Estate</strong></td>
<td>( \frac{(\text{Revenue} - \text{Adjusted Operating Expenses} + \text{Depreciation})}{\text{Total Assets}} )</td>
</tr>
<tr>
<td><strong>Insurance</strong></td>
<td>( \frac{(\text{Investment Income} + \text{Net Premiums} - \text{Total Claims} + \text{Underwriting Expense})}{(\text{Investable Assets} + \text{Accounts Receivable})} )</td>
</tr>
<tr>
<td><strong>Investment (Banks, etc.)</strong></td>
<td>( \frac{\text{Net Interest Income}}{\text{Total Investable Assets}} )</td>
</tr>
</tbody>
</table>
Sector Comparison

**Weight**

- **Consumer Discretionary**: 20.63%
  - Portfolio
  - IWM
- **Consumer Staples**: 5.93%
  - Portfolio
  - IWM
- **Energy**: 12.33%
  - Portfolio
  - IWM

**Contributed Return**

- **Consumer Discretionary**: 0.88%
  - Portfolio
  - IWM
- **Consumer Staples**: 0.58%
  - Portfolio
  - IWM
- **Energy**: 1.85%
  - Portfolio
  - IWM
Sector Comparison
Worst Performers

<table>
<thead>
<tr>
<th>Company</th>
<th>Loss Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sally Beauty Holdings</td>
<td>-0.4%</td>
</tr>
<tr>
<td>Consol Energy</td>
<td>-0.5%</td>
</tr>
<tr>
<td>QEP Resources Inc</td>
<td>-0.5%</td>
</tr>
<tr>
<td>Nordstrom Inc.</td>
<td>-0.7%</td>
</tr>
</tbody>
</table>

Total Portfolio Loss Contribution
Our Experiences

+ 

Moving Forward
Underperforming Securities

+

Anomalies
Consol Energy Inc. (CNX)

Q4 Earnings Report: Missed EPS (1.40)

Hires BoA and Credit Suisse, potential sale of Coal Business
Las Vegas Sands (LVS)

21-Nov-16: ATM withdrawal restrictions in Macau
21-Dec-16: $0.72 Dividend
20-Jan-17: Missed earnings by $0.04
19-Feb-17: 
21-Mar-17: $0.73 Dividend
Nordstrom (JWN)

- 21-Nov-16
- 26-Nov-16
- 1-Dec-16
- 6-Dec-16
- 11-Dec-16
- 16-Dec-16
- 21-Dec-16
- 26-Dec-16

$0.37 Dividend
Release chat box online
JPM downgrades to sell
Sally Beauty Holdings (SBH)
## Anomaly Correlations

### Panel A. Correlations: long minus short

<table>
<thead>
<tr>
<th>Anomaly</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
<th>(12)</th>
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<tbody>
<tr>
<td>Failure Probability</td>
<td>1.00</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ciskoid’s C (distress)</td>
<td>0.47</td>
<td>0.60</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Net stock issues</td>
<td>0.27</td>
<td>0.20</td>
<td>1.00</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Composite equity issues</td>
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<td>0.21</td>
<td>0.42</td>
<td>1.00</td>
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<td></td>
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<tr>
<td>Total accruals</td>
<td>0.15</td>
<td>0.08</td>
<td>0.15</td>
<td>0.11</td>
<td>1.00</td>
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<tr>
<td>Net operating assets</td>
<td>0.09</td>
<td>0.16</td>
<td>0.22</td>
<td>0.30</td>
<td>0.26</td>
<td>1.00</td>
<td></td>
<td></td>
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<tr>
<td>Momentum</td>
<td>0.62</td>
<td>0.18</td>
<td>0.22</td>
<td>0.25</td>
<td>0.15</td>
<td>0.14</td>
<td>1.00</td>
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<tr>
<td>Gross profitibility</td>
<td>0.36</td>
<td>0.34</td>
<td>0.21</td>
<td>0.01</td>
<td>0.12</td>
<td>0.13</td>
<td>0.10</td>
<td>1.00</td>
<td></td>
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<tr>
<td>Asset growth</td>
<td>0.09</td>
<td>0.03</td>
<td>0.36</td>
<td>0.22</td>
<td>0.22</td>
<td>0.36</td>
<td>0.17</td>
<td>-0.01</td>
<td>1.00</td>
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<tr>
<td>Return on assets</td>
<td>0.58</td>
<td>0.41</td>
<td>0.64</td>
<td>0.01</td>
<td>0.03</td>
<td>0.02</td>
<td>0.31</td>
<td>0.38</td>
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<td>Investment-to-assets</td>
<td>-0.02</td>
<td>-0.01</td>
<td>0.19</td>
<td>0.12</td>
<td>0.34</td>
<td>0.32</td>
<td>0.08</td>
<td>-0.08</td>
<td>0.51</td>
<td>-0.08</td>
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<tr>
<td>Combination</td>
<td>0.77</td>
<td>0.52</td>
<td>0.52</td>
<td>0.39</td>
<td>0.42</td>
<td>0.42</td>
<td>0.68</td>
<td>0.43</td>
<td>0.44</td>
<td>0.56</td>
<td>0.35</td>
<td>1.00</td>
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</table>

### Panel B. Excess returns

<table>
<thead>
<tr>
<th>Anomaly</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
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<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
<th>(12)</th>
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</thead>
<tbody>
<tr>
<td>Long leg (mean)</td>
<td>0.94</td>
<td>0.51</td>
<td>0.70</td>
<td>0.62</td>
<td>0.72</td>
<td>0.71</td>
<td>1.11</td>
<td>0.69</td>
<td>1.00</td>
<td>0.64</td>
<td>0.91</td>
<td>0.76</td>
</tr>
<tr>
<td>Short leg (mean)</td>
<td>-0.01</td>
<td>-0.19</td>
<td>0.07</td>
<td>0.20</td>
<td>0.13</td>
<td>0.06</td>
<td>-0.45</td>
<td>0.29</td>
<td>0.04</td>
<td>-0.34</td>
<td>0.15</td>
<td>-0.01</td>
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<tr>
<td>Long minus short (mean)</td>
<td>0.95</td>
<td>0.70</td>
<td>0.63</td>
<td>0.42</td>
<td>0.58</td>
<td>0.65</td>
<td>1.56</td>
<td>0.60</td>
<td>0.96</td>
<td>0.98</td>
<td>0.75</td>
<td>0.77</td>
</tr>
<tr>
<td>Long leg (t-statistic)</td>
<td>3.97</td>
<td>2.18</td>
<td>3.66</td>
<td>3.47</td>
<td>2.54</td>
<td>2.98</td>
<td>3.81</td>
<td>3.20</td>
<td>3.82</td>
<td>2.56</td>
<td>3.65</td>
<td>3.57</td>
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<tr>
<td>Short leg (t-statistic)</td>
<td>-0.01</td>
<td>-0.51</td>
<td>0.27</td>
<td>0.79</td>
<td>0.40</td>
<td>0.22</td>
<td>-1.23</td>
<td>1.33</td>
<td>0.14</td>
<td>-0.88</td>
<td>0.57</td>
<td>-0.05</td>
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<tr>
<td>Long minus short (t-statistic)</td>
<td>2.55</td>
<td>2.83</td>
<td>5.11</td>
<td>2.59</td>
<td>3.11</td>
<td>4.41</td>
<td>5.45</td>
<td>2.45</td>
<td>3.34</td>
<td>3.33</td>
<td>5.22</td>
<td>6.91</td>
</tr>
</tbody>
</table>

### Panel C. Benchmark-adjusted returns

<table>
<thead>
<tr>
<th>Anomaly</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
<th>(12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long leg (mean)</td>
<td>0.39</td>
<td>0.21</td>
<td>0.20</td>
<td>0.02</td>
<td>0.26</td>
<td>0.25</td>
<td>0.63</td>
<td>0.43</td>
<td>0.22</td>
<td>0.38</td>
<td>0.17</td>
<td>0.28</td>
</tr>
<tr>
<td>Short leg (mean)</td>
<td>-1.16</td>
<td>-0.93</td>
<td>-0.46</td>
<td>-0.41</td>
<td>-0.34</td>
<td>-0.51</td>
<td>-1.14</td>
<td>-0.23</td>
<td>-0.44</td>
<td>-0.90</td>
<td>-0.37</td>
<td>-0.60</td>
</tr>
<tr>
<td>Long minus short (mean)</td>
<td>1.55</td>
<td>0.13</td>
<td>0.56</td>
<td>0.43</td>
<td>0.61</td>
<td>0.76</td>
<td>1.77</td>
<td>0.66</td>
<td>0.66</td>
<td>1.29</td>
<td>0.54</td>
<td>0.87</td>
</tr>
<tr>
<td>Long leg (t-statistic)</td>
<td>3.39</td>
<td>3.37</td>
<td>3.87</td>
<td>0.29</td>
<td>1.85</td>
<td>2.27</td>
<td>4.95</td>
<td>4.42</td>
<td>1.76</td>
<td>4.40</td>
<td>1.59</td>
<td>7.66</td>
</tr>
<tr>
<td>Short leg (t-statistic)</td>
<td>-4.53</td>
<td>-6.17</td>
<td>-4.62</td>
<td>-3.85</td>
<td>-2.24</td>
<td>-4.75</td>
<td>-5.11</td>
<td>-2.19</td>
<td>-3.93</td>
<td>-4.20</td>
<td>-3.30</td>
<td>-7.07</td>
</tr>
<tr>
<td>Long minus short (t-statistic)</td>
<td>5.00</td>
<td>7.13</td>
<td>5.96</td>
<td>3.38</td>
<td>3.09</td>
<td>4.98</td>
<td>5.82</td>
<td>4.30</td>
<td>3.94</td>
<td>5.48</td>
<td>3.78</td>
<td>9.38</td>
</tr>
</tbody>
</table>
Accruals

Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings?
Sloan (1996)

Accruals = \( \frac{(\Delta CA - \Delta Cash) - (\Delta CL - \Delta STD - \Delta TP) - \Delta Dep)}{Average\ Total\ Assets} \)

- Companies with low accruals have a higher expected future return
- Invest in companies with the lowest accrual portion of earnings
- Number of securities: 1,714
Momentum

Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency

Jegadeesh and Titman (1993)

• “Winners continue to win and losers continue to lose.”
• Ranked on compounded monthly returns during September 2015 to September 2016
• Number of securities: 2,757

Momentum = \((R_{t-1})(R_{t-2})... (R_{t-13}) - 1\)
Asset Growth

- Firms that have high asset growth are less likely to perform well in future
- Invest in firms with low asset growth
- Number of securities: 2,212

\[
\text{Asset Growth} = \frac{(\text{Total Assets}_t - \text{Total Assets}_{t-1})}{\text{Total Assets}_{t-1}}
\]
• Firms with high gross profit are expected to generate abnormally high future returns
• Invest in companies with high profitability
• Number of securities: 1,642

\[
\text{Gross Profitability} = \frac{(\text{Revenue} - \text{Cost of Goods Sold})}{\text{Total Assets}}
\]
Management tends to repurchase shares when stock is undervalued
Invest in companies with lower net issuance
Number of securities: 2,592

Net Issuance = $\ln(\text{Adj. Shares Outstanding})_t - \ln(\text{Adj. Shares Outstanding})_{t-11}$
Idiosyncratic Volatility (IVOL)

Arbitrage Asymmetry and the Idiosyncratic Volatility Puzzle
Stambaugh, Yu, and Yuan (2015)

• High IVOL indicates high expected returns
• Calculated for 60 trading days from August 26, 2016 to November 17, 2016
• Number of securities: 2,843

\[ R = \alpha_i + \beta_i (R_{mkt} - R_i) + \epsilon_i \]

\[ \text{IVOL} = \sum (\epsilon_i)^2 \]
## Sector Attributions

<table>
<thead>
<tr>
<th>Sector</th>
<th>Weight (%)</th>
<th>Contributed Return (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Portfolio</td>
<td>IWM</td>
</tr>
<tr>
<td>Consumer Discretionary</td>
<td>20.53</td>
<td>12.33</td>
</tr>
<tr>
<td>Consumer Staples</td>
<td>5.93</td>
<td>2.91</td>
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<tr>
<td>Energy</td>
<td>12.1</td>
<td>3.56</td>
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<td>Financials</td>
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<td>Materials</td>
<td>11.52</td>
<td>5.04</td>
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