Undergraduate Student Investment Management Fund

Fall 2016 Presentation
IVOL Background

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<td>Is not priced</td>
<td>CAPM</td>
<td></td>
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<tr>
<td>Is priced and has a positive returns</td>
<td></td>
<td>Levy</td>
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<td>Found a negative premium</td>
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<td>Merton</td>
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<tr>
<td>Mispricing &amp; Arbitrage Constraints</td>
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<td></td>
<td></td>
<td>Ang et al</td>
<td>Stambaugh et al</td>
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</table>
Mispricing Anomalies

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

Mispricing

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

Underpriced Security
- Low Accruals
- Low Asset Growth
- Positive Momentum
- Profitable
- Low Net Stock Issuance
Arbitrage Constraints

- Securities with higher IVOL have higher constraints to arbitrage
- Mispricing not completely eliminated by arbitrage

Margin Calls Closing Short Positions + Size correlated with IVOL + Redemption Risk
Arbitrage Constraints

AEIS vs IWV Returns

OMI vs IWV Returns
## Arbitrage Constraints

<table>
<thead>
<tr>
<th></th>
<th>Price</th>
<th>Shares</th>
<th>Short Sale Value</th>
<th>Initial Margin Requirement (50%)</th>
<th>Total Margin Posted</th>
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<td>AEIS</td>
<td>$44.09</td>
<td>227</td>
<td>$10,008</td>
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<td>OMI</td>
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<td>295</td>
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## Arbitrage Constraints

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<thead>
<tr>
<th></th>
<th>Price</th>
<th>Short Sale Value</th>
<th>Maintenance Margin (40%)</th>
<th>Total Margin Required</th>
<th>Margin Posted</th>
<th>Margin to Spare</th>
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<td><strong>AEIS</strong></td>
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<tr>
<td>8/29</td>
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<td>$10,008.43</td>
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<td>$33.93</td>
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<td>$13,971.79</td>
<td>$15,014.03</td>
<td>$1,042.24</td>
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</table>
Arbitrage Risk

• Limits of arbitrage restrict ability of investors to enter and/or hold profitable short position
• Higher IVOL suggests difficulty in maintaining short position
Arbitrage Asymmetry

- Arbitrage eliminates more underpricing than overpricing
- Greater amount of arbitrage capital in long positions versus short positions
- The negative IVOL effect among overpriced stocks is greater than the positive IVOL effect among underpriced stocks

Arbitrage Asymmetry and the Idiosyncratic Volatility Puzzle
Stambaugh, Yu, and Yuan (2015)
Strategy Implementation
Charter Constraints

- Firms domiciled in the U.S.
- Market cap > $1B
- Long-only portfolio
- Maximum of 10% in one company and 25% in one sector
Accruals

- 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

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

\[
\text{Asset Growth} = \frac{(\text{Total Assets}_t - \text{Total Assets}_{t-1})}{\text{Total Assets}_{t-1}}
\]
Momentum

• “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 = \( (R_{t-1})(R_{t-2}) \ldots (R_{t-13}) - 1 \)

*Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency*  
Jegadeesh and Titman (1993)
Gross Profitability

- Firms with high gross profit are expected to generate abnormally high future returns
- Invest in companies with high profitability
- Number of securities: 1,642

\[
\text{Gross Profitability} = \frac{(\text{Revenue} - \text{Cost of Goods Sold})}{\text{Total Assets}}
\]

*The Other Side of Value: The Gross Profitability Premium*
Novy-Marx (2013)
Net Issuance

- Management tends to repurchase shares when stock is undervalued
- Invest in companies with lower net issuance
- Number of securities: 2,592

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

Share Issuance and Cross-Sectional Returns
Pontiff and Woodgate (2008)
Aggregate Ranking Construction

- Found the individual percentile ranking of each anomaly for every security
- Took the average of percentiles to find the total average mispricing percentile for every security
- Sorted securities based on the average percentile ranking
- 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>Aggregate</th>
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<tr>
<td>Company A</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>30%</td>
<td>10%</td>
<td>20%</td>
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<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>
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</table>
Idiosyncratic Volatility (IVOL)

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

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

\[ \text{IVOL} = \sum (\epsilon_i)^2 \]
Portfolio Construction

![Graph showing IVOL Ranking vs. Aggregate Ranking]
Portfolio Construction

- Comprised of 44 securities
- Security Weighting: 50 bps floor / 5% ceiling
- Market-cap weighted
- Excluded firms with pending M&A activity and performed news checks on each individual security
Portfolio By Market Cap

IVOL Portfolio

- 1.2-2B: 20%
- 2-10B: 10%
- 10B-200B: 70%

Russell 3000

- 50M-300M: 3%
- 300M-2B: 7%
- 2-10B: 40%
- 10B-200B: 31%
- +200B: 19%
Portfolio By Sector

IVOL Portfolio

Russell 3000

25%
20%
11%
3%
12%
24%

25%
16%
12%

3%
18%
13%
12%
8%
7%
4%
3%
4%
3%

Consumer
Discretionary
Consumer Staples
Energy
Health Care
Industrials
Information
Technology
Returns

Portfolio Return: 0.75%
IWV Return: 0.23%

Notable Securities:
CLF Return: 19.92%
IGT Return: -10.04%
Thank you. We will now welcome questions.
### Anomaly Correlations

<table>
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<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>Panel A: Correlations: long minus short</td>
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<tr>
<td>(1) Failure Profitability</td>
<td>1.00</td>
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<td>(2) Option's O (distress)</td>
<td>0.47</td>
<td>1.00</td>
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<tr>
<td>(3) Net stock issues</td>
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<td>0.20</td>
<td>1.00</td>
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<tr>
<td>(4) Composite equity issues</td>
<td>0.20</td>
<td>0.11</td>
<td>0.43</td>
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<td>(5) Total accruals</td>
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<td>0.08</td>
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<tr>
<td>(6) Net operating assets</td>
<td>0.09</td>
<td>0.16</td>
<td>0.22</td>
<td>0.10</td>
<td>0.26</td>
<td>1.00</td>
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<td>(7) Momentum</td>
<td>0.62</td>
<td>0.18</td>
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<td>0.25</td>
<td>0.15</td>
<td>0.14</td>
<td>1.00</td>
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<td>(8) Gross profitability</td>
<td>0.36</td>
<td>0.34</td>
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<td>0.12</td>
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<td>0.19</td>
<td>1.00</td>
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<td>(9) Asset growth</td>
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<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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<td>(10) Treasur on assets</td>
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<td>-0.01</td>
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<td>(12) Combination</td>
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<td>Panel B: Excess returns</td>
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<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>
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<td>0.69</td>
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<td>0.64</td>
<td>0.91</td>
<td>0.76</td>
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<tr>
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<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>
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<td>-0.01</td>
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<tr>
<td>Long minus short (mean)</td>
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<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>0.40</td>
<td>0.96</td>
<td>0.98</td>
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<tr>
<td>Long leg (t-statistic)</td>
<td>3.97</td>
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<td>3.66</td>
<td>3.47</td>
<td>2.54</td>
<td>2.98</td>
<td>3.61</td>
<td>1.20</td>
<td>1.82</td>
<td>2.56</td>
<td>3.65</td>
<td>1.57</td>
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<td>-0.55</td>
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<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>5.34</td>
<td>3.53</td>
<td>5.22</td>
<td>6.91</td>
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<td>Panel C: Benchmark-adjusted returns</td>
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<tr>
<td>Long leg (mean)</td>
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<td>0.38</td>
<td>0.17</td>
<td>0.28</td>
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<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>
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<td>-0.44</td>
<td>-0.90</td>
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<tr>
<td>Long minus short (mean)</td>
<td>1.55</td>
<td>0.13</td>
<td>0.66</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>1.28</td>
<td>0.54</td>
<td>0.87</td>
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<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>Long minus short (t-statistic)</td>
<td>5.00</td>
<td>7.13</td>
<td>5.96</td>
<td>3.18</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>
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