Another look at Breadth of Ownership and Stock Returns

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April 2005
The talk

• Empirical Issue.
• Theory on short sales constraints and asset prices.
• US results.
• Norwegian Data.
• Empirical results.
  • Type of equity owner
  • Horizon
• Conclusion
Empirical issue

General:
Does changes in number of equity owners long in a stock predict future stock returns

Specific:
When mutual funds are leaving a stock, does this predict negative returns?

Found in US data.
Revisit with Norwegian data.

Why interesting?

- Important feature of financial markets: Information aggregation
- Results: Relevant for how stock market aggregate information.
Theoretical Framework

General Issue
Stock pricing with two basic assumptions
  • Differences of opinion. (Non-homogeneous expectations)
  • Constraints on short sales.

Argue:
With these two assumptions:
Stocks are overpriced when the short sale constraint is binding
(Binding Short Sales Constraint:
Stock market participants wants to take a short position, but cannot).
Theory: Overpriced stock?

(Survey: Rubinstein [2004].)
How to get a binding short sales constraint to imply higher stock prices?
Intuition opposite:
A stock with a binding short-sales constraints:
Less investors, smaller market
Demand a rebate to buy the stock
→ Lower price!
Theory, pricing without both assumptions

Start with classical case: Homogeneous expectations, no short sales constraints.

- Capital Asset Pricing Model (CAPM). (Sharpe-Lintner-Mossin)
  Wealth split between risk free asset and (risky) market portfolio
  All investors will want to have some of their wealth in a risky asset (Arrow).
  → A long position in the market portfolio.
  Nobody shorts the market.
Theory, pricing with only one assumption

Add

- [Only] Differences of opinion. Add a mean preserving spread to investor signals. Stock prices will
  - Not change with log utility. [Rubinstein, 1974].
  - Decrease with other utility specs. [Varian, 1985].

- [Only] Market Segmentation (homogeneous beliefs) Stock prices
  - Decrease when the size of the market decreases. [Merton, 1987].
Theory: pricing with both assumptions

- Combine Differences of opinion and market segmentation
  Stock prices
  - Increase when size of market decreases (when short sales constraints are binding). Miller [1977].

Intuition:
  - Pessimists: Stock over-valued, sell (short).
  - Optimists: Stock undervalued, buy.

Unrestricted price reflects view of both types.
Add short sales restrictions.
  - Pessimists can not sell (enough).
  - Price reflects the view of optimists.
  - Price is higher with short sales constraints.

Note
  - All stocks with binding short sales constraints will be overpriced.
  - Other stocks will be correctly priced.
  - Stock prices are too high on average.
Classical economics

Diagram showing the relationship between price, demand, supply, and quantity.
Add constraint
Theory, development of Miller intuition

However: The Miller [1977] intuition is not consistent with rational expectations. (Winners curse problem)
Development: Diamond and Verrecchia [1987].

- Investors take into account that they know pessimists are not in the market.
- Bid down prices such that they are on average correct.
- Prices do not necessarily reflect actual information when it is realized.

Asymmetric response.

- Good news incorporated immediately.
- Bad news can be delayed, but then lead to large falls (crashes) when it is revealed. Hong and Stein [2003]
Miller developed
Empirical implications

Miller intuition:
Stocks with many “pessimists” are overpriced, but will eventually be correctly priced.
Implication for returns: Lower future returns.
Suggest test

• Is there a (crossectional) link between a measure of pessimism and (subsequent) asset returns?

Empirical tests of this idea: Need a measure of “degree of pessimism among investors”
Actual implementations

Group test by which assumption they look at

- Dispersion of beliefs
  - Dispersion of analysts forecasts. [Diether et al., 2002], [Verardo, 2002]
- Market data, short sales constraint
  - Short interest in the stock market. [Figlewski, 1981].
  - Number of put options outstanding. [Figlewski and Webb, 1993].
  - Price of short trading. [Jones and Lamont, 2002].
  - Breadth of ownership. (Number of owners) [Chen et al., 2002].
Breadth of ownership.

Chen et al. [2002].
Idea:
When more gets pessimistic about a stock, they want to sell(short).
When they can’t short, the lowest can get is to reduce holdings to zero.
Implication: The numbers of owners is inversely related to the degree of pessimism.
Cases where new information has hit the market: changes in breadth.
(Levels of breadth also related to firm size)
Miller interpretation:
- A decrease in number of owners is due to an increase in pessimism.
  → Predict lower returns.
Breadth of ownership, US results

Data limitation: Quarterly data on mutual funds holdings.
- CHS: $\Delta$BREADTH – Change in number of mutual funds long in a stock.

Finding: Low $\Delta$Breadth predict low return next quarter. Interpreted as support for Miller.

Issues
- Limited to data on mutual funds. Open to alternative interpretation: Mutual funds are better informed, get out before “penny drops” for the rest.
- Quarterly observations: Is this really the relevant horizon?
Norwegian Data

- Ownership records for all owners.
- Stock exchange data

Norwegian Regulation of short sales:

- 1997 –. Short sales allowed, but most financials limitations on short positions.

Note: Put options always an alternative to shorting.
What can be done with the Norwegian data?

Expand on US study by considering two issues:

- **Type of owner**
  Not limited to mutual fund holdings, can consider alternative breadth measures using all owner’s holdings.

- **Horizon**
  Is information really long term?
  Higher frequencies (monthly)
Potential breadth measures

- Number of mutual fund owners.
- Number of financial owners (including mutual funds).
- Number of owners.
- Number of individual owners.
- Measures of ownership concentration (all owners’ pessimism not equal)
Are mutual funds representative?

Mutual funds representative:
- Decrease in mutual funds
- Decrease among other owners
- Increase in ownership concentration

Mutual funds better informed
- Decrease in breadth of mutual funds
- Not necessarily the case for other owners.
- Less increase in ownership concentration.
Does changes in breadth predict next quarter’s returns?

Methods:
- Portfolio grouping.
  - Actual returns.
  - Excess returns from an asset pricing model.
- [Fama and MacBeth, 1973] regressions.
Portfolios:

- Sort portfolios on $\Delta \text{Breadth}_{i,t}$.
- Calculate returns next period $r_{i,t+1}$. 
## Raw portfolio returns, One Quarter Later

<table>
<thead>
<tr>
<th>CHS:ΔBREADTH (quarterly)</th>
<th>ΔNo Financial Owners (quarterly)</th>
<th>ΔNo Owners ≥ 100 Shares (quarterly)</th>
<th>ΔNo Individual Owners ≥ 100 Shares (quarterly)</th>
<th>ΔHerfindahl Index (quarterly)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 (low)</td>
<td>3.84</td>
<td>4.95</td>
<td>4.34</td>
<td>5.73</td>
</tr>
<tr>
<td>P2</td>
<td>5.58</td>
<td>5.58</td>
<td>5.85</td>
<td>5.33</td>
</tr>
<tr>
<td>P3</td>
<td>6.53</td>
<td>5.98</td>
<td>4.81</td>
<td>3.75</td>
</tr>
<tr>
<td>P4</td>
<td>4.67</td>
<td>4.37</td>
<td>4.30</td>
<td>6.56</td>
</tr>
<tr>
<td>P5</td>
<td>4.43</td>
<td>4.76</td>
<td>7.67</td>
<td>5.27</td>
</tr>
<tr>
<td>P6 (high)</td>
<td>6.20</td>
<td>4.79</td>
<td>3.49</td>
<td>3.73</td>
</tr>
<tr>
<td>P1-P6</td>
<td>-2.364</td>
<td>0.157</td>
<td>0.847</td>
<td>2.000</td>
</tr>
<tr>
<td>pvalue</td>
<td>[0.06]</td>
<td>[0.89]</td>
<td>[0.42]</td>
<td>[0.14]</td>
</tr>
</tbody>
</table>
Asset Pricing Model Residuals

Fama French 3 factor model

\[ E[R_i] - R_f = b_i (E[R_m] - R_f) + s_i E[\text{SMB}] + h_i E[\text{HML}] \]

<table>
<thead>
<tr>
<th>CHS: ( \Delta \text{BREADTH} ) (quarterly)</th>
<th>( \Delta \text{No Financial Owners} ) (quarterly)</th>
<th>( \Delta \text{No Owners} \geq 100 \text{ Shares} ) (quarterly)</th>
<th>( \Delta \text{No Individual Owners} \geq 100 \text{ Shares} ) (quarterly)</th>
<th>( \Delta \text{Herfindahl Index} ) (quarterly)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 (low)</td>
<td>-4.78</td>
<td>-3.86</td>
<td>-3.88</td>
<td>-3.07</td>
</tr>
<tr>
<td>P2</td>
<td>-2.78</td>
<td>-2.70</td>
<td>-3.22</td>
<td>-2.98</td>
</tr>
<tr>
<td>P3</td>
<td>-0.50</td>
<td>-0.78</td>
<td>-1.01</td>
<td>-2.15</td>
</tr>
<tr>
<td>P4</td>
<td>-0.76</td>
<td>-2.12</td>
<td>-1.74</td>
<td>-0.45</td>
</tr>
<tr>
<td>P5</td>
<td>-2.72</td>
<td>-2.81</td>
<td>-1.23</td>
<td>-2.56</td>
</tr>
<tr>
<td>P6 (high)</td>
<td>-3.51</td>
<td>-3.75</td>
<td>-4.83</td>
<td>-4.71</td>
</tr>
<tr>
<td>P1-P6</td>
<td>-1.266</td>
<td>-0.113</td>
<td>0.954</td>
<td>1.640</td>
</tr>
<tr>
<td>pvalue</td>
<td>[0.20]</td>
<td>[0.92]</td>
<td>[0.31]</td>
<td>[0.12]</td>
</tr>
</tbody>
</table>
### Fama MacBeth regressions

<table>
<thead>
<tr>
<th>Time:</th>
<th>( t - 1 )</th>
<th>( t )</th>
<th>( t + 1 )</th>
<th>( \ldots )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>( r_{1,t} )</td>
<td>( \mathbf{X}_{1,t} )</td>
<td>( r_{1,t+1} )</td>
<td>( \mathbf{X}_{1,t+1} )</td>
</tr>
<tr>
<td>2</td>
<td>( r_{2,t} )</td>
<td>( \mathbf{X}_{2,t} )</td>
<td>( r_{2,t+1} )</td>
<td>( \mathbf{X}_{2,t+1} )</td>
</tr>
<tr>
<td>\vdots</td>
<td>\vdots</td>
<td>\vdots</td>
<td>\vdots</td>
<td>\vdots</td>
</tr>
<tr>
<td>( n )</td>
<td>( r_{n,t} )</td>
<td>( \mathbf{X}_{n,t} )</td>
<td>( r_{n,t+1} )</td>
<td>( \mathbf{X}_{n,t+1} )</td>
</tr>
<tr>
<td>( r_t = \mathbf{X}_t \hat{\beta}_t )</td>
<td>( r_{t+1} = \mathbf{X}<em>{t+1} \hat{\beta}</em>{t+1} )</td>
<td>( \ldots )</td>
<td>( \rightarrow \text{average}(\hat{\beta}_t) )</td>
<td></td>
</tr>
</tbody>
</table>

### Fama MacBeth results

- Same signs as before on breadth variables.
- Not significant. (Few observations?)
- Firm size always significant.
The Horizon Issue: Next Month Returns

Find quarterly breadth changes to predict quarterly returns. Long horizon – what is the nature of the information? Corporate information: Should not this type of information be revealed faster?
Look at whether breadth changes in one month predict return next month.
Added benefit: More observations.
### Raw portfolio returns, One month later
*1989–1996*

<table>
<thead>
<tr>
<th>CHS: ΔBREADTH</th>
<th>ΔNo Financial Owners</th>
<th>ΔNo Owners ≥ 100 Shares</th>
<th>ΔNo Individual Owners ≥ 100 Shares</th>
<th>ΔHerfindahl Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 (low)</td>
<td>1.75</td>
<td>2.74</td>
<td>2.25</td>
<td>2.96</td>
</tr>
<tr>
<td>P2</td>
<td>1.65</td>
<td>2.84</td>
<td>3.00</td>
<td>2.49</td>
</tr>
<tr>
<td>P3</td>
<td>1.43</td>
<td>4.02</td>
<td>3.18</td>
<td>3.23</td>
</tr>
<tr>
<td>P4</td>
<td>1.01</td>
<td>3.57</td>
<td>4.19</td>
<td>4.28</td>
</tr>
<tr>
<td>P5</td>
<td>1.31</td>
<td>2.73</td>
<td>3.22</td>
<td>2.73</td>
</tr>
<tr>
<td>P6 (high)</td>
<td>1.34</td>
<td>2.92</td>
<td>2.98</td>
<td>3.04</td>
</tr>
<tr>
<td>P1-P6</td>
<td>0.403</td>
<td>-0.178</td>
<td>-0.730</td>
<td>-0.089</td>
</tr>
<tr>
<td>pvalue</td>
<td>[0.47]</td>
<td>[0.71]</td>
<td>[0.37]</td>
<td>[0.91]</td>
</tr>
</tbody>
</table>
### Raw portfolio returns, One month later 1997–2003

<table>
<thead>
<tr>
<th>CHS:ΔBREADTH</th>
<th>ΔNo Financial Owners</th>
<th>ΔNo Owners ≥ 100 Shares</th>
<th>ΔNo Individual Owners ≥ 100 Shares</th>
<th>ΔHerfindahl Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 (low)</td>
<td>0.14</td>
<td>0.30</td>
<td>0.39</td>
<td>0.53</td>
</tr>
<tr>
<td>P2</td>
<td>0.97</td>
<td>1.13</td>
<td>1.05</td>
<td>0.82</td>
</tr>
<tr>
<td>P3</td>
<td>1.24</td>
<td>0.91</td>
<td>0.71</td>
<td>1.12</td>
</tr>
<tr>
<td>P4</td>
<td>1.06</td>
<td>0.78</td>
<td>1.29</td>
<td>0.99</td>
</tr>
<tr>
<td>P5</td>
<td>1.02</td>
<td>1.05</td>
<td>1.01</td>
<td>0.95</td>
</tr>
<tr>
<td>P6 (high)</td>
<td>1.31</td>
<td>1.25</td>
<td>1.04</td>
<td>1.04</td>
</tr>
<tr>
<td>P1-P6</td>
<td>-1.173</td>
<td>-0.943</td>
<td>-0.646</td>
<td>-0.506</td>
</tr>
<tr>
<td>pvalue</td>
<td>[0.01]</td>
<td>[0.02]</td>
<td>[0.22]</td>
<td>[0.34]</td>
</tr>
</tbody>
</table>
The quarterly effects not found over monthly horizons. Potential implication: Information relatively long lived, revealed only over quarterly horizons. Explore this: Information not revealed next month, but next quarter. But may some of it be revealed immediately?
Market Microstructure effects?

Mechanism for information production: Continuous trade, supply and demand.
Pessimists are trying to sell, can not do enough (want negative positions)
But: Some go from positive to zero.
Increase in number of sellers.
Need to decrease price in order to sell.
Looking for immediate information revelation

To achieve a reduction in breadth prices will have to fall while trading happens.
Do we see price changes within the same month that we see breadth changes?
Prediction: Pessimism - Lower price - lower returns.
Data issue: Careful about causality.
Alternative: Low returns lead to selling.
Same month returns

<table>
<thead>
<tr>
<th>CHS: ΔBREADTH</th>
<th>ΔNo Financial Owners</th>
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<th>ΔNo Individual Owners ≥ 100 Shares</th>
<th>ΔHerfindahl Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 (low)</td>
<td>0.73</td>
<td>2.13</td>
<td>3.12</td>
<td>3.11</td>
</tr>
<tr>
<td>P2</td>
<td>0.53</td>
<td>0.90</td>
<td>1.76</td>
<td>1.76</td>
</tr>
<tr>
<td>P3</td>
<td>0.74</td>
<td>1.13</td>
<td>0.98</td>
<td>1.12</td>
</tr>
<tr>
<td>P4</td>
<td>0.66</td>
<td>1.25</td>
<td>0.92</td>
<td>0.79</td>
</tr>
<tr>
<td>P5</td>
<td>1.79</td>
<td>2.07</td>
<td>1.72</td>
<td>1.96</td>
</tr>
<tr>
<td>P6 (high)</td>
<td>2.54</td>
<td>2.80</td>
<td>1.73</td>
<td>1.50</td>
</tr>
<tr>
<td>P1-P6</td>
<td>-1.813</td>
<td>-0.672</td>
<td>1.391</td>
<td>1.607</td>
</tr>
<tr>
<td>pvalue</td>
<td>[0.00]</td>
<td>[0.17]</td>
<td>[0.01]</td>
<td>[0.00]</td>
</tr>
</tbody>
</table>
Conclusion

The US breadth results of [Chen et al., 2002].
  • Interpreted as support for [Miller, 1977]
Our broader breadth measures.
  • Rather: The crossectional effect linked to mutual fund trading, not breadth per se.

Timing
  • Some long term information, only revealed on quarterly horizons, not monthly.
  • Data consistent with microstructure effects: some information revealed immediately through trading.


### Determinants of breadth

<table>
<thead>
<tr>
<th></th>
<th>CHS:ΔBREADTH</th>
<th>ΔNo Financial Owners</th>
<th>ΔNo Owners ≥ 100 Shares</th>
<th>ΔNo Individual Owners ≥ 100 Shares</th>
<th>ΔHerfindahl Index</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>constant</strong></td>
<td>-0.00020 (0.97)</td>
<td>-3.87014 (0.01)</td>
<td>-214.58737 (0.02)</td>
<td>-172.38443 (0.02)</td>
<td>-0.00144 (0.66)</td>
</tr>
<tr>
<td>Δ Mutual Fund Holdings</td>
<td>1.03718 (0.00)</td>
<td>136.06498 (0.00)</td>
<td>-87.40737 (0.86)</td>
<td>-153.88713 (0.74)</td>
<td>-0.29377 (0.00)</td>
</tr>
<tr>
<td>ln(Equity Value)</td>
<td>0.00002 (0.94)</td>
<td>0.19131 (0.01)</td>
<td>10.25889 (0.02)</td>
<td>8.26630 (0.02)</td>
<td>0.00004 (0.81)</td>
</tr>
<tr>
<td>$r_{i,t-12,t}$</td>
<td>0.00339 (0.00)</td>
<td>0.54645 (0.00)</td>
<td>-14.73352 (0.00)</td>
<td>-15.87941 (0.00)</td>
<td>0.00058 (0.21)</td>
</tr>
<tr>
<td>Monthly turnover</td>
<td>0.00946 (0.28)</td>
<td>6.24362 (0.00)</td>
<td>315.58451 (0.00)</td>
<td>274.17516 (0.00)</td>
<td>0.01398 (0.18)</td>
</tr>
<tr>
<td>BK/MKT</td>
<td>-0.00125 (0.03)</td>
<td>-0.15544 (0.14)</td>
<td>-0.21665 (0.96)</td>
<td>-0.13218 (0.97)</td>
<td>0.00164 (0.00)</td>
</tr>
<tr>
<td>E/P</td>
<td>-0.00212 (0.50)</td>
<td>0.63724 (0.45)</td>
<td>28.89738 (0.41)</td>
<td>22.14597 (0.47)</td>
<td>-0.00351 (0.24)</td>
</tr>
<tr>
<td><strong>average $R^2$</strong></td>
<td>0.30</td>
<td>0.24</td>
<td>0.17</td>
<td>0.19</td>
<td>0.21</td>
</tr>
<tr>
<td><strong>Number of periods</strong></td>
<td>129</td>
<td>129</td>
<td>129</td>
<td>129</td>
<td>126</td>
</tr>
</tbody>
</table>