Market Power and Price Informativeness

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Motivation

Levels and concentration of institutional ownership have increased recently.
Motivation

Passive funds have grown in popularity

**Percentage of equity mutual funds’ total net assets; year-end, 2001–2016**

![Bar chart showing percentage of equity mutual funds’ total net assets from 2001 to 2016.](image)

**Figure:** Investment Company Institute Fact Book
**Motivation**

- **Active investors typically associated with:**
  - Increased ability to gather information
- **Large investors typically associated with:**
  - Increased awareness of their power to affect prices
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• Active investors typically associated with:
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• Question
  ○ What is the effect of market structure on price informativeness?
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  ○ What is the effect of market structure on price informativeness?

• Relevance
  ○ Important to understand price discovery in financial markets
  ○ Important to understand efficient allocation of capital to firms
**Approach**

- **Model**: portfolio choice with endogenous information acquisition  
  van Nieuwerburgh & Veldkamp; Kacperczyk, Nosal & Stevens  
  - Some investors are smart  
    and can do research on shocks to an asset’s value  
- Our novel take:  
  - Some investors are large  
    and internalize effects of trades *and* information processing on prices  
- **Endogenous allocation** of learning and holdings across assets  
  
  Results:  
  1. Endogenous learning affects the impact of changes in size distribution  
  2. Institutional ownership ↑↓ PI  
  3. Institutional concentration ↓ PI  
  4. Moving AUM from Active to Passive ↓ PI through two channels
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- **Results:**
  1. Endogenous learning affects the impact of changes in size distribution
  2. Institutional ownership $\uparrow \downarrow PI$
  3. Institutional concentration $\downarrow PI$
  4. Moving AUM from Active to Passive $\downarrow PI$ through two channels
Model: Building Blocks

- Assets
  - 1 riskless with payoff $r$, unlimited supply
  - $N$ risky with payoffs $z_i \sim \mathcal{N}(\bar{z}, \sigma^2_i)$; supply $x_i \sim \mathcal{N}(\bar{x}, \sigma^2_x)$
  - Shocks are i.i.d. across assets
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- **Continuum of investors with common risk aversion $\rho$**
  - Mean-variance preferences over end of period wealth
  - $\lambda_0$: atomistic competitive fringe with capacity $K_h \geq 0$
  - $1 - \lambda_0$: $L$ non-atomistic oligopolists $j$ with capacity $K_j > K_h \ \forall j$
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- Optimization
  - Choose endogenous signals $s_{ki}$ about $z_i$, s.t. $I(s_k, z) \leq K$
  - Given $s_{ki}$, update beliefs, choose portfolio allocations $q_{ki}$
Model: Timing

Linear pricing: \( p_i = a_i + b_i z_i - c_i x_i - \sum_j d_{ij} \zeta_{ij} \)
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1. Fringe and oligopolists make information decisions
   - Oligopolists: Nash equilibrium
   - Fringe take oligopolists’ choices as given
   - Each oligopolist internalizes the effect of her learning on the fringe
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2. Fringe and oligopolists make portfolio decisions
   - Choose \( q_{ji} \)'s simultaneously to maximize mean-variance preferences
   - Fringe take oligopolists’ choices as given
   - Each oligopolist internalizes the effect of her decision on the fringe
Ex-ante choice of signal structure can be expressed as maximizing

\[ E[U_j] = \sum_i \frac{\sigma_i^2}{\hat{\sigma}_{hi}^2} G_i \]

subject to entropy constraint

\[ \prod_i \frac{\sigma_i^2}{\hat{\sigma}_{hi}^2} \leq e^{2K_h} \]

**Model:** Fringe Information Choices

- \( \hat{\sigma}_{hi}^2 \) is the choice variable: residual uncertainty
- The gain \( G_i \) from asset \( i \) is not investor specific

Convex Objective

\[ + \]

Convex Constraint

\[ = \]

Individual Corner Solution
**Model: Information Choices**

- Standard result: Fringe traders each specialize in their learning

- Given signals, oligopolists solve a portfolio allocation problem
  - Oligopolists’ beliefs about \( z_i \sim \mathcal{N}(\mu_{ij}, \sigma_{ij}^2) \)
  - Mean-variance optimization gives
    \[
    q_{ij} = \frac{1}{\rho} \frac{\mu_{ij} - rp_i(q_{ij})}{\sigma_{ij}^2 + r \frac{dp_i(q_{ij})}{dq_{ij}}} \quad \text{where}
    \]

\[
    r \frac{dp_i(q_{ij})}{dq_{ij}} = \lambda_{ij} \rho \sigma_i^2
\]

and
\[
    \lambda_{ij} = \frac{\lambda_j}{\lambda_0(1+m_h(e^{2K_h}-1))}. \quad \text{Zero if no market power}
\]
**Price Informativeness: Oligopolists and a Smart Fringe**

\[ PI_i = PI(\omega_{ji}, \varphi_{hi}, W_{ji}, \alpha_{ji}) \]

- \( \omega_{ji} \equiv \frac{Q_{ji}}{\sum_k Q_{ki}} \): Expected share of asset \( i \) held by oligopolist \( j \)

- \( \varphi_{hi} = \frac{\Phi_{hi}}{r(1+\Phi_{hi})} \): Fringe’s information contribution

- \( W_i \equiv \frac{\partial \lambda_1 q_i(\hat{\mu}_i)}{\partial \hat{\mu}_i} \): Pass-through of information to quantities
Price Informativeness: Oligopolists and a Smart Fringe

- Price informativeness is

\[ PI_i = \frac{\sigma_i \left( \sum_j \omega_{ji} \frac{\alpha_{ji} - 1}{\alpha_{ji}} + \varphi_{hi} \right)}{\sqrt{\left( \sum_j \omega_{ji} \frac{\alpha_{ji} - 1}{\alpha_{ji}} + \varphi_{hi} \right)^2 + \frac{1}{(\sum_j W_{ji})^2} \frac{\sigma_{x_i}^2}{\sigma_i^2} + \sum_j \omega_{ji}^2 \frac{\alpha_{ji} - 1}{\alpha_{ji}^2}}} \]
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1. \( \sum_j \omega_{ji} \frac{\alpha_{ji} - 1}{\alpha_{ji}} + \varphi_{hi} \): average, ownership-weighted information increases \( PI \)
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2. \( W_{ji} \) information pass-through to quantities increases \( PI \)
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1. \( \sum_j \omega_{ji} \frac{\alpha_j - 1}{\alpha_{ji}} + \varphi_{hi} \): average, ownership-weighted information
2. \( W_{ji} \): information pass-through to quantities
3. \( \sum_j \omega_{ji}^2 \frac{\alpha_j - 1}{\alpha_{ji}^2} \): Learning-weighted HHI decreases PI
Price Informativeness: Oligopolists and a Smart Fringe

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\]

- For fixed information structure (\(\alpha_s\)), to increase PI
  - \(\sum_j \omega_{ji} \frac{\alpha_i - 1}{\alpha_{ji}}\): put all ownership only on highest \(\alpha\)
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  - \(\sum_j \omega_{ji} \frac{\alpha_{ji} - 1}{\alpha_{ji}}\): put all ownership only on highest \(\alpha\)
  
  - But, concentrated ownership hurts PI through \(\sum_j \omega_{ji}^2 \frac{\alpha_{ji} - 1}{\alpha_{ji}^2}\)

- Changing distribution of \(\alpha_{ji}\) determines the costs/benefits of institutional ownership and concentration

  - Crucial impact of endogenous adjustment of learning—need simulation to understand interactions of learning
Numerical Analysis: Parameter Values

- Parameterize benchmark model to exhibit
  - Learning about all assets (by at least one investor)
  - Institutional ownership of approx. 60%
  - Market excess return of 7% (1980-2015 average)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean payoff, supply</td>
<td>$\bar{z}_i$, $\bar{x}_i$</td>
<td>10, 5 for all $i$</td>
</tr>
<tr>
<td>Number of assets, large traders</td>
<td>$N, L$</td>
<td>10, 6</td>
</tr>
<tr>
<td>Risk-free rate</td>
<td>$r$</td>
<td>2.5%</td>
</tr>
<tr>
<td>Volatility of noise shocks</td>
<td>$\sigma_{xi}$</td>
<td>0.41 for all $i$</td>
</tr>
<tr>
<td>Volatility of asset payoffs</td>
<td>$\sigma_i$</td>
<td>$\in [1, 1.5]$, linear distribution</td>
</tr>
<tr>
<td>Risk aversion</td>
<td>$\rho$</td>
<td>1.3</td>
</tr>
<tr>
<td>Information capacities</td>
<td>$K_h, {K_j}$</td>
<td>0, 4.5, constant</td>
</tr>
<tr>
<td>Investor masses</td>
<td>$\lambda_0, \lambda_l/\lambda_1$</td>
<td>0.45, [1, 4] linearly distributed</td>
</tr>
</tbody>
</table>
**Structural Experiment: Ownership**

- Varying industry size \((1 - \lambda_0)\)
  - Hump-shaped PI curve

**Price Informativeness**

![Graph showing price informativeness versus Equilibrium Price Informativeness](image-url)
**Structural Experiment: Concentration**

**Price Informativeness**
Two Key Mechanisms

1. Price Informativeness of an asset
   - Has decreasing marginal returns in any active agent’s learning
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1. Price Informativeness of an asset
   - Has decreasing marginal returns in any active agent’s learning

2. Traders with size have a concave problem. To reduce price impact:
   - They trade less as they get bigger (Agg PI -)
   - They spread their learning as they get bigger (Agg PI +)
Numerical Experiment

Price Informativeness

Size of Oligopoly Sector

Average

Average Fixed Cov

Average Fixed PassThru

Average Fixed Conc
Numerical Experiment

Price Informativeness

AUM Share of Largest Oligopolist

- Average PI
- Average Fixed Cov
- Average Fixed PassThru
- Average Fixed Conc

35% 54% 67% 75% 81% 86% 90% 93% 96% 98%
Threshold Levels and Capacity

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Price Informativeness
Threshold Levels and Volatility Ratio

Price Informativeness
Passive vs Active

1. Shift AUM from active to passive
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   ○ Less active ownership $\Rightarrow$ less active trade $\Rightarrow$ PI $\downarrow$
Passive vs Active

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   - Less active ownership $\Rightarrow$ less spreading of learning $\Rightarrow$ PI $\downarrow$
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   - Less active ownership $\Rightarrow$ less spreading of learning $\Rightarrow$ PI ↓
   - *Result:* Endogenous learning *amplifies* PI effects
Passive vs Active

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   - Less active ownership ⇒ less active trade ⇒ PI ↓
   - Less active ownership ⇒ less spreading of learning ⇒ PI ↓
   - Result: Endogenous learning amplifies PI effects
Passive vs Active: Fixing Total Oligopoly

Price Informativeness

Size of Passive Sector

- Average
- Average Fixed Cov
- Average Fixed PassThru
- Average Fixed Conc
Passive vs Active: Fixing Active Oligopoly

Price Informativeness

- Average
- Average Fixed Cov
- Average Fixed PassThru
- Average Fixed Conc

Size of Passive Sector
Endogenous Learning: Ownership

Benchmark $\lambda_s$

Fixed $\alpha$

$\lambda_0 = 0.05$

$\lambda_0 = 0.999$
Conclusion

• Channels that affect Price Informativeness:
  ◦ The covariance channel: How well does the price track fundamentals?
  ◦ The pass-through channel: How sensitive are quantities to information?
  ◦ The concentration channel: How diversified are active participants?

• Results:
  ◦ PI is non-monotonic in the size of the active sector
  ◦ PI is decreasing in the concentration of the active sector
  ◦ Endogenous info amplifies reductions in PI arising from passive growth

• Mechanisms:
  ◦ Decreasing returns to learning for each trader
  ◦ Decreasing returns to an asset’s PI per trader’s learning