Expectations, Liquidity, and Short-term Trading

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Introduction

- Short term speculation ranks high on the regulatory agenda:
  (a) Flash-Crash, the debate over short termism and the Tobin tax,…
  (b) What is the impact of short termism on market liquidity?
  (c) Keynesian “Beauty Contest” which yields prices that overweight public information (Allen, Morris, and Shin (2006)).

- This paper:
  (a) Informed investors have a short-term horizon, and have private information.
  (b) Market makers are risk averse.
  (c) Liquidity traders’ positions in the first and second period are positively correlated (Hendershott and Seasholes (2009), Chordia and Subrahmanyanam (2004)).

Under these conditions multiple equilibria with self-fulfilling liquidity arise in a finite horizon market.
Liquidity trading persistence has \textit{two} effects on investors’ response to private information:

(a) Possibility of favorable (as opposed to adverse) selection in the second period → Lower uncertainty on liquidation price → stronger reaction to private information in the first period.

(b) Make investors use private signal to predict the impact of fundamentals \textit{and} first period liquidity trading on the second period price.
### Timeline

Let $x_n \equiv \int_0^1 x_{in} \, di$.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td>− Liquidity traders submit $\theta_1 = u_1$.</td>
<td>− Liquidity traders submit $\theta_2 = u_2 + \beta \theta_1$.</td>
<td>− The asset is liquidated $\nu$.</td>
</tr>
<tr>
<td>− 1st period informed investors submit $x_1$.</td>
<td>− 2nd period informed investors submit $x_2$.</td>
<td></td>
</tr>
<tr>
<td>− Market clears: $x_1 + \theta_1 = 0$.</td>
<td>− 1st period investors revert.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>− Market clears: $\Delta x_2 + \Delta \theta_2 = 0$.</td>
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Favorable Selection

Suppose investors sell the asset, to accommodate liquidity traders’ demand

- If they trade very aggressively on private information, they move the first period price close to the fundamentals.
- With persistence, liquidity traders demand the asset in the second period when first period investors liquidate their short position, also demanding the asset.
- Then the information based demand of first period investors offsets the information based sale of the asset of second period investors, reducing informational impact of the latter on the price.

This effect can be very strong, ↑ liquidity of second period market, ↑ predictability of the liquidation price for first period investors, and ↑ aggressiveness on private information.
Use of Private Information

Investors use private information to forecast the impact of liquidity trading and fundamentals on the liquidation price:

- Persistence $\implies$ part of tomorrows’ liquidity traders’ demand can be inferred from today’s price.
- For given price, the higher is the estimated demand of liquidity traders, the lower is the fundamentals.
- Investors lower their response to private information; this effect is stronger, the more prices are driven by liquidity trading.

Investors exploit a private learning channel (as in Amador and Weill (2010), and Manzano and Vives (2011)) to read liquidity traders’ demand from the first period price and anticipate its impact on the second period price.
Multiplicty

The equilibrium with low liquidity:

- The less the second period price reflects the fundamentals, the lower is response to private information.
- First period price reflects more liquidity trading, and less private information.
- The private learning channel from prices → lower use of private information → the effect of private information impounded in the price by second period investors prevails over that coming from first period investors.
- Stronger price impact of second period news, higher first period investors’ uncertainty over the liquidation price, further lowering their response to private information.

In this equilibrium, the response to first period private information is low, the second period market is thin, and prices are poorly informationally efficient.
Introduction

Multiplicity

The equilibrium with high liquidity:

- The more the second period price reflects the fundamentals, the higher is response to private information.
- First period price reflects less liquidity trading, and more private information.
- The private learning channel from prices $\implies$ higher use of private information $\implies$ the effect of private information impounded in the price by second period investors is swamped by that coming from first period investors.
- Weaker price impact of second period news, lower first period investors’ uncertainty over the liquidation price, further increasing their response to private information.

In this equilibrium, the response to first period private information is high, the second period market is thick, and prices are highly informationally efficient.
Equilibrium Analysis

Let \( a_1 \) denote the average response to private information in the first period, and \( \psi(a_1) \), the best response of an investor to \( a_1 \):

![Equilibrium determination and stability. The figure displays the best reply function (solid line) and the 45-degree line (dotted line). Equilibria obtain at the points where the two intersect. The vertical line (drawn at the point \( \hat{a}_1 = 4 \)) shows the value of \( a_1 \) for which the best reply mapping is discontinuous. Parameters’ values are as follows: \( \tau_v = \tau_u = \tau_\varepsilon = 1 \), and \( \varepsilon = 5 \). For these values the equilibria are \( a_1^{\ast LIE} = 0.438 \) and \( a_1^{\ast HIE} = 4.561 \). Inspection of the equilibria shows that \( |\psi(a_1^{\ast LIE})| < 1 \), while \( |\psi(a_1^{\ast HIE})| > 1 \).

The HIE is unstable.
## Implications

<table>
<thead>
<tr>
<th></th>
<th>No Persistence</th>
<th>Persistence</th>
<th>LIE</th>
<th>HIE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliance on public information</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>Liquidity</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Price impact (period 2)</td>
<td>+</td>
<td>+</td>
<td>−</td>
<td></td>
</tr>
<tr>
<td>Price informativeness</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Risky asset (period 2)</td>
<td>Normal</td>
<td>Normal</td>
<td>Giffen</td>
<td></td>
</tr>
<tr>
<td>Expected volume of informational trading</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Return correlation at long horizons</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td></td>
</tr>
<tr>
<td>Return correlation at short horizons</td>
<td>−</td>
<td>±</td>
<td>+</td>
<td></td>
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</table>
Numerical simulations

Generate 100 independent, normally distributed shocks for $v$, $u_1$, and $u_2$. Then, construct the sequence of prices $\{p_1, p_2\}$, liquidity traders’ orders $\{\theta_1, \theta_2\}$, and intercept of the net aggregate demand $\{z_1, z_2\}$ and compare the average results in the two equilibria.

Prices, liquidity traders’ orders and informational innovations in the LIE ($a_1^* = .012$):

Order imbalances predict returns (Andrade et al (2008)), but have a small informational content (Easley et al (2008)).
Numerical simulations

Generate 100 independent, normally distributed shocks for $v$, $u_1$, and $u_2$. Then, construct the sequence of prices $\{p_1, p_2\}$, liquidity traders’ orders $\{\theta_1, \theta_2\}$, and intercept of the net aggregate demand $\{z_1, z_2\}$ and compare the average results in the two equilibria.

Prices, liquidity traders’ orders and informational innovations in the HIE ($a_{1^{**}} = 41.48$):

Order imbalances predict returns (Andrade et al (2008)), but have a small informational content (Easley et al (2008)).
Extensions

Differential private signal precisions

Suppose in period 1 and 2 investors receive an informative signal.

Same informativeness in both periods, \( a_1 > 0 \) in both equilibria:
Extensions

Differential private signal precisions

Suppose in period 1 and 2 investors receive an informative signal.

Only informative signal at 1, $a_1 > 0$ only in the HIE:
Extensions

Public signal

Suppose second period investors observe a public signal.

1. Three equilibria arise.
2. The HIE can become stable.

\[ \psi(a_1) \]

\[ a_1 \]

\[ \psi(a_1) \]

\[ a_1 \]
Extensions
Residual uncertainty

Suppose the final payoff is $\hat{v} = v + \delta$, with $\delta \sim N(0, \tau_{\delta}^{-1})$ orthogonal to all the random variables in the market. Then,
Asset pricing implications
Momentum and reversal: mean price path

Differently from behavioral finance literature we link momentum to fast price adjustment to the fundamental value. To illustrate this fact, in Figure 6 we plot the mean price paths along the LIE (thick line), the HIE (thin line), and assuming that first period investors react to private information as if they were in a static market (dotted line). From the plot it is apparent that in the HIE the price displays a faster adjustment to the full information value than in the LIE (and the static equilibrium). This shows that the occurrence of momentum is not at odds with price (informational) efficiency.

Mean price paths along the LIE (thick line), the HIE (thin line), and assuming that first period investors react to private information as if they were in a static market (i.e. setting \( a_1 = \gamma \tau^\varepsilon \))
Asset pricing implications
Momentum and reversal: Numerical example

Suppose $\tau_v = \tau_u = \tau_\epsilon = 1$, and $\beta = 4/5$ (1/5 of $\theta_1$ reverts in period 2):

1. If $\gamma = 1$
   \[
   \text{Corr}[v - p_2, p_2 - p_1] = \begin{cases} 
   -0.07 & a_1 = a_1^*
   \\ 
   0.32 & a_1 = a_1^{**}
   \\ 
   -0.09 & \tau_\epsilon = 0
   \end{cases}
   \]

2. If $\gamma = 1/2$
   \[
   \text{Corr}[v - p_2, p_2 - p_1] = \begin{cases} 
   0.11 & a_1 = a_1^*
   \\ 
   0.54 & a_1 = a_1^{**}
   \\ 
   0.39 & \tau_\epsilon = 0
   \end{cases}
   \]
Conclusions

When a market is populated by short term investors:

- With persistence in liquidity trading and heterogeneous information, short term horizons:
  
  (a) Possibility of favorable selection.
  
  (b) Private learning channel from the first period price.

This yields multiple equilibria which can be ranked in terms of liquidity.

- Implications for reliance on public and private information, and price informativeness.

- Stabilizing effect of exogenous public information.

- Implications for asset pricing: momentum, volume and return predictability.
Thanks!