How better informed are the institutional investors?

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\begin{abstract}
We extend the EKOP model and estimate the probability of informed trading of institutions (SPIN) and individuals (DPIN) respectively. Using a unique dataset of Chinese stock market, we confirm that institutions are better informed by documenting a significantly higher SPIN.
\end{abstract}

\section{1. Introduction}

An important topic in market microstructure is the relationship between informed and uninformed trading activities. Realizing that the market maker will lose through trading with informed investors, Kyle (1985) constructs a sophisticated model to explain how market makers carefully set bid-ask spread to offset the potential loss brought forth by informed traders. He predicts that investors attempt to camouflage their trades by spreading them over time. Admati and Pfleiderer (1988) argue that investors tend to trade when volume is high. Easley Kiefer, O'Hara and Paperman (1996) derive a method (EKOP model hereinafter) for estimating the probability of informed trade to explain the observed differences in spreads for active and infrequently traded stocks. Barclay and Warner (1993) postulate the stealth trading hypothesis, which predicts that private information will be released through trading and informed traders tend to concentrate on medium-size trades. These papers provide both theoretical and empirical evidence that some traders are better informed than others and informed traders exploit their information advantage and choose optimal trading strategy to profit from uninformed investors.

However, none of these papers can answer the question: "How better informed are the institutional investors compared with individual investors?" Employing an extended EKOP model, we can theoretically estimate the ratio of informed trades within institutional investors and individual investors. On the empirical side, we use a unique dataset from Chinese Stock market and document that about 24\% of trades initiated by institutional investors are 'informed' judged by the extended EKOP model. In contrast to that, only about 16\% of the trades initiated by individuals are informed.

\section{2. The model}

The method here is an extension of EKOP model: Investors trade a single risky asset and money with a market maker over \(t = 1, \cdots, T\) trading days. Within any trading day, time is continuous, and it is indexed by \(t \in [0, T]\). The market maker stands ready to buy or sell one unit of the asset at his posted bid and ask prices at any time. Because he is competitive and risk-neutral, these prices are the expected value of the asset conditional on his information at the time of trade.

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Prior to the beginning of any trading day, nature determines whether an information event occurs. Information events are independently distributed and occur with probability \( \alpha \). These events are good news with probability \( 1 - \delta \), or bad news with probability \( \delta \). After the end of trading on any day, and before nature moves again, the full information value of the asset is realized.

Trade arises from both informed traders (those who have seen any signal) and uninformed traders. Suppose there are four kinds of traders, namely informed institutions, uninformed institutions, informed individuals and uninformed individuals. On any day, arrivals of uninformed investors are determined by independent Poisson processes. Uninformed investors arrive at rate \( \mu \) for buying or selling, with fraction of trading volume \( \varphi \), \( 1 - \varphi \) respectively for informed individuals and institutions. The tree given in Fig. 1 describes this trading process. At the first node of the tree, nature selects whether an information event occurs. If an event occurs, nature then determines if it is good news or bad news. In this model, \( B_{1t}, B_{2t} \) denote the buy volume for individuals and institutions respectively, and \( S_{1t}, S_{2t} \) denote the sell volume for individuals and institutions respectively. Thus the likelihood function \( \theta = (\alpha, \delta, \beta, \varphi, \epsilon, \mu) \)

\[
L(B_1, B_2, S_1, S_2 | \theta) = (1-\alpha) \left( e^{-\mu(1-\beta)S_1} B_1 \right)^{B_1} \left( e^{-1-\beta)S_2} B_2 \right)^{B_2} \frac{e^{-\epsilon(1-\beta)S_1} S_1^{\beta}}{S_1!} e^{-\mu(1-\beta)S_2} S_2^{\beta} \frac{e^{-\mu(1-\beta)S_2} S_2^{\beta}}{S_2!} \\
+ \alpha \delta \left( e^{-\mu(1-\beta)S_1} B_1 \right)^{B_1} \left( e^{-1-\beta)S_2} B_2 \right)^{B_2} \frac{e^{-\mu(1-\beta)S_1} S_1^{\beta}}{S_1!} e^{-\mu(1-\beta)S_2} S_2^{\beta} \frac{e^{-\mu(1-\beta)S_2} S_2^{\beta}}{S_2!} \\
+ \alpha (1-\delta) e^{-\mu(1-\beta)S_1} S_1^{\beta} \left( e^{-\mu(1-\beta)S_2} B_2 \right)^{B_2} \frac{e^{-\mu(1-\beta)S_1} S_1^{\beta}}{S_1!} e^{-\mu(1-\beta)S_2} S_2^{\beta} \frac{e^{-\mu(1-\beta)S_2} S_2^{\beta}}{S_2!}.
\]

Assume days are independent; the likelihood of observing the data \( D = (B_{1t}, B_{2t}, S_{1t}, S_{2t})_{t=1}^T \) over \( T \) days is just the product of the daily likelihoods

\[
L(D | \theta) = \prod_{t=1}^T L(B_1, B_2, S_1, S_2 | \theta).
\]

\[\text{Fig. 1. Probability tree of the trading model.}\]
The (EKOP) PIN value is thus defined as:

\[
PIN = \frac{\alpha \mu}{2c + \alpha \mu}
\]

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**Table 1**

Descriptive statistics of daily trading. Table 1 shows the daily cross-sectional statistics of individual and institution trading, including number of participating investors, share volume, RMB Yuan volume, and number of trades per stock per day.

<table>
<thead>
<tr>
<th>Initiated by</th>
<th>Number of participating investors</th>
<th>Share volume (shares)</th>
<th>RMB Yuan volume</th>
<th>Number of trades</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Buyer</td>
<td>Individual</td>
<td>Buyer</td>
<td>Individual</td>
</tr>
<tr>
<td>Mean</td>
<td>16.8965</td>
<td>9.5456</td>
<td>234.18</td>
<td>227.23</td>
</tr>
<tr>
<td>Median</td>
<td>9.3153</td>
<td>7.7342</td>
<td>177.55</td>
<td>170.13</td>
</tr>
<tr>
<td>Std</td>
<td>45.8453</td>
<td>8.6739</td>
<td>192.83</td>
<td>203.15</td>
</tr>
<tr>
<td>25 pct</td>
<td>6.0546</td>
<td>5.2707</td>
<td>127.56</td>
<td>119.58</td>
</tr>
<tr>
<td>75 pct</td>
<td>14.3576</td>
<td>10.7048</td>
<td>278.44</td>
<td>266.28</td>
</tr>
</tbody>
</table>

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**Fig. 2.** Private information parameters. Note: \( \epsilon \) is the arrival rate of uninformed traders; \( \mu \) is the probability of an information event; volume is the daily trading volume; \( \alpha \) is the probability of an information event; \( \beta \) is the proportion of uninformed individual trades to total uninformed trades; \( \varphi \) is the proportion of informed individual trades to total informed trades.
Note: *, ** and *** indicate significance level of 10%, 5% and 1% respectively.

The PIN for institutional trades (SPIN hereinafter) is defined as:

$$\text{SPIN} = \frac{\alpha(1 - \phi)\mu}{2\epsilon(1 - \phi)\mu}.$$  \hspace{1cm} (4)

And the PIN for individual trades (DPIN hereinafter) is defined as:

$$\text{DPIN} = \frac{\epsilon\phi\mu}{2\epsilon\mu + \epsilon\phi\mu}.$$  \hspace{1cm} (5)

3. Data and empirical results

3.1. The data

In this paper we use all the main board stocks traded on the Shenzhen Stock Exchange, China, during the time period Jan 2005 to Apr. 2007. For each stock, we have the detailed records of each trade during the sample period, including each investor’s identification type (individual or institution), and thus we are able to precisely identify whether a trade is initiated by the buyer or the seller. According to the identity of initiator, we can assign each trade into one of the four categories: institutional buy, institutional sell, individual buy, and individual sell. Table 1 shows the daily cross-sectional statistics of individual and institution trading per stock, including number of participating investors, share volume, RMB Yuan volume, and number of trades.

3.2. Parameter estimation

We maximize the likelihood function given in Eq. (1) with respect to the parameter space $\theta = [\epsilon, \mu, \phi, \alpha, \beta, \psi]$. We allow the parameters to vary across stock and time, so we can have a separate likelihood function for each stock in each period. In Fig. 2, we plot a time series of the parameter estimates using the updated EKOP model as indicated in Eq. (1), as well as the PIN, the SPIN and the DPIN defined by Eqs. (3)–(5) respectively. The parameters $\epsilon$ and $\mu$ are not stationary. These parameters are related to the trading frequency. So we can observe that they are trending upwards as the number of transactions increases over the seasons. Correspondingly, the trading volume increases, too. On the other hand, the $\alpha$, $\beta$ and $\psi$, as well as the PIN, SPIN and DPIN are stationary over time.

Table 2 shows the PIN, SPIN and DPIN during the full sample period and in each sub-sample. Consistent with the last figure of Fig. 2, we can see that in the whole sample period, the aggregate PIN value is 16.53%, meaning that about 16.5% of the total trades are informed while others can be seen as uninformed. However, for all the trades initiated by institutional investors, about 24.27% of them are informed, which is well above the average ratio of informed individuals (16.01%). The gap between SPIN and PIN is 7.74%, and that between PIN and DPIN is only 0.52%, however, both of them are significantly higher than those initiated by individuals (16.01%). The result is consistent with the street lore that institutional investors are informed (e.g., Chakravarty, 2001), and the fact that institutional investors can gain much more profits than individuals (e.g., Barber et al., 2009).

4. Conclusions

This paper extends EKOP model for estimating the PIN and DPIN respectively. Using a unique dataset of Chinese Stock Market, we document that 24.27% of the trades initiated by institutional investors can actually be considered as informed, which is significantly higher than those initiated by individuals (16.01%). The result is consistent with the street lore that institutional investors are informed (e.g., Chakravarty, 2001), and the fact that institutional investors can gain much more profits than individuals (e.g., Barber et al., 2009).

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References


