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# Overview of market ecology studies

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# Outline

I will review previous results obtained in the financial literature about trading profiles of individual and institutional investors detected in different markets by using different data sources recorded at different time horizons.

I will briefly cite the data we use in our empirical investigation of market ecology studies and the scientific question we attempt to answer.



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# Trading profiles in financial markets

Heterogeneity of traders is observed and hypothesized in different financial studies.

In microstructure studies at least three kind of traders are considered:

- informed traders,
- uninformed traders,
- dealer or market maker.



# Institutional and individual investors

Finance studies also distinguish between

- institutional investors
- and
- individual investors.



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## Momentum and contrarian strategies

Momentum investors are buying stocks that were past winners.

A contrarian strategy consists of buying stocks that have been losers (or selling short stocks that have been winners).

The contrarian strategy is formulated on the assumption that the stock market overreacts and a contrarian investor can exploit the inefficiency related to market overreaction by reverting stock prices to fundamental values.

Empirical investigations performed in different markets have shown that institutional investors are preferentially momentum investors whereas individual investors usually prefer a contrarian strategy.



# The trading profile of institutional investors

They are large institutions moving a large amount of the market.

At the US equity markets in the eighties<sup>¶</sup> they were by large majority (77%) characterized by a momentum resulting strategies.

The size of the institutions imposes to trade orders as “packages” or “hidden orders” to minimize market impact<sup>§</sup>.

<sup>¶</sup>M.Grinnblatt et al, American Economic Review 85, 1088-1105 (1995)

<sup>§</sup>L.K.C. Chan et al, J. of Finance LI, 1681-1713 (1996)



## Grinblatt, Titman and Wermers (1995)

They investigated the trading pattern of fund managers by examining the quarterly holdings of 155 mutual funds (information from CDA Investment Technologies and CRSP data) over the 1975-1984 period.

The large majority of funds (77%) had a momentum investment profile.

Authors found relatively weak evidence that funds tended to buy and sell the same stocks at the same time (herding).

¶M.Grinnblatt et al, American Economic Review 85, 1088-1105 (1995)



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## Chan and Lakonishok (1995)

The trading of “packages” or “hidden orders” executed by institutional investors were studied by investigating all trades executed by 37 large investment management firms from July 1986 to December 1988. These data were collected by SEI Corp., a consulting organization in the area of financial services.

It is worth noting that they use manager’s trading history to reconstruct the manager’s trading packages in each stock. The markets considered are NYSE and AMEX and trades cover about 5 percent of the total value of trading of the two exchanges over this period.

§L.K.C. Chan et al, J. of Finance LI, 1681-1713 (1996)





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## A more recent empirical study on “packages”

The trading of “packages” or “hidden orders” executed by institutional investors has also been studied in the Australian Stock Exchange<sup>¶</sup>.

Authors have investigated the daily investment of 34 active Australian equity managers. Data were provided directly by the managers and includes transaction in equity stocks, futures contracts and options securities. The sample period is from Jan 2, 1995 to Dec 31, 2001. From the information provided authors extract information about “packages” traded by the fund managers.

<sup>¶</sup>D.R.Gallagher and A. Looi, Accounting and Finance 46, 125-147 (2006).



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## Foreign and domestic investors

A study<sup>¶</sup> about positive feedback trading and herding by foreign investors was performed by considering Korean market in the period before and at the Korea's economic crisis of 1997.

Researchers observe strong evidence of positive feedback trading and herding by foreign investors before the period of Korea's economic crises. They also find that there is no evidence that herding is more important during the crisis period.

They classify investors in three groups: (i) Foreign investors; (ii) Korean institutional investors and (iii) Korean individual investors.

<sup>¶</sup>H. Choe et al, J. of Financial Economics 54, 227-264 (1999).



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## Choe, Kho and Stulz

Foreign investors are mainly positive feedback traders (momentum) and positive feedback is driven by individual stock returns.

Korean individual investors are mainly contrarian with respect to individual stock returns (but perhaps positive feedback traders with respect to market return).

Korean institutional investors are momentum traders for individual stocks and contrarian with respect to the market.

Authors use daily and intradaily data from Dec 2, 1996 to Dec 27, 1997 of 414 stocks listed at the KSE

¶H. Choe et al, J. of Financial Economics 54, 227-264 (1999).



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## Data from Finland

A similar study was done by Grinblatt and Keloharju<sup>¶</sup>. They investigated the central register of shareholdings for Finnish Central Securities Depository, a comprehensive data source. This data set reports individual and institutional holdings and stock trades on a daily basis.

We have previously seen that holding of U.S. mutual funds and U.S. pension funds are typically performed by analyzing quarterly data.

Data consists of each owner's stock exchange trades from Dec 27, 1994 through Dec 30, 1996.

<sup>¶</sup>M.Grinnblatt and M.Keloharju, J. of Financial Economics 55, 43-67 (2000)



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## Grinblatt and Keloharju

They find that:

- foreign investors tend to be momentum investors;
- individual investors tend to be contrarian;
- domestic institutional investor tend to present a mixed behavior.

A resulting strategy can therefore be associated with the investment profile of these three groups of investors.



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## Analysis of the Taiwan market

Studies performed by Barber, Lee, Liu and Odean<sup>¶</sup> have the performance of individual and institutional investors at the Taiwan Stock Exchange. Both with respect to individual day traders and to portfolio selection.

Data allow authors to identify trades made by individuals and by institutions, which fall into one of four categories (corporations, dealers, foreigners, or mutual funds).

To analyze who gains and loses from trade, they construct portfolios that mimic the purchases and sales of each investor group during the time period 1995 to 1999.

<sup>¶</sup> B.M.Barber, Y.-T.Lee, Y.-J.Liu and T.Odean, Do Individual Day Traders Make Money? Evidence from Taiwan (<http://papers.ssrn.com> 2004).

<sup>¶</sup> B.M.Barber, Y.-T.Lee, Y.-J.Liu and T.Odean, Just How Much Do Individual Investors Lose by Trading? (<http://papers.ssrn.com> 2005).



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## Intraday data: a Nasdaq study

Griffin et al<sup>§</sup> study daily and intradaily cross-sectional relation between stock returns and the trading of individual and institutional investors in Nasdaq 100 securities.

They observe that most brokerage houses specialize in dealing with either institutional or individual clients.

Data consists of all the trades and quotes in Nasdaq 100 stocks from May 1, 2000 to February 28, 2001.

They have information to assign trading volume to brokerage houses:

- primarily dealing with individual investors;
- primarily dealing with institutional investors;
- acting as market makers.

<sup>§</sup>J.M.Griffin et al, J. of Finance LVIII, 2285-2320 (2003)



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## Griffin, Harris and Topaloglu

They observe that institutional trading largely follows past stock returns both at a daily and at an intradaily time horizon.

The reverse is not observed. Inventory variation does not predict stock return.





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## Conditional predictability

Empirical investigations performed by using proprietary trade data information obtained from the Korean Stock Exchange (Choe et al 1999) and from NASDAQ (Griffin et al 2003) shown that stock returns have some ability to forecast inventory variation of groups of investors whereas the evidence of return predictability on the basis of investor inventory variation is negligible both at a daily and intradaily time horizon.



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# Our empirical market ecology study

The research collaboration:

- **Fabrizio Lillo**
- **Esteban Moro**
- **Gabriella Vaglica**
- **R.N.M.**

¶G.Vaglica, F. Lillo, E.Moro, and R.N.Mantegna, Scaling laws of strategic behavior and size heterogeneity in agent dynamics, Physical Review E 77, 036110-1 036110-6 (2008).

§F.Lillo, E. Moro, G. Vaglica and R.N.Mantegna, New Journal of Physics 10, 043019 (2008).



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## Motivations

- We consider an entire market (the Spanish Stock Market) and we look for resulting strategies of the market members over a long time period (4 years).
- We study the inventory variation on short time horizons (at daily and intradaily time horizons) to detect “resulting strategies” and on long time horizon to detect “packages” or “hidden orders” traded in the market.
- We assume market members present specialization similar to the one observed for brokerage firms investigated at Nasdaq.



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## The trading profile of market members

This kind of study is possible by investigating the database of the Spanish Stock Market which is containing the information on trading market members doing each transaction.

This approach is different from previous studies that have been focused on the trading profile of large institutional investors, individual investors and specialists or market makers.

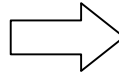
Our study simultaneously monitors the trading activity of all most active market members trading in the market a specific liquid stock.



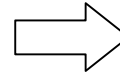
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# The Spanish Stock Market (BME)

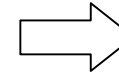
Madrid 1831  
Bilbao 1890  
Barcelona 1915  
Valencia 1970



CATS  
Computer Assisted  
Trading System  
1980



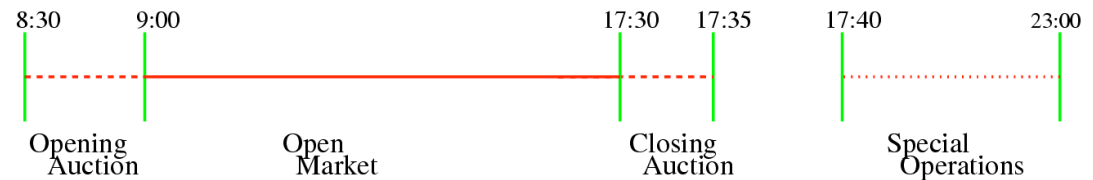
SIBE  
Stock Exchange  
Interconnection System  
1995



IBEX 35

## Trading Hours

- Market orders
- Market to limit orders
- Limit orders



## Information dissemination (SIBE)

- Trades, with price, volume and counterparties of the trade
- Order book, with the five best buy/sell positions
- Index (IBEX 35, LATIBEX, Nuevo Mercado) information

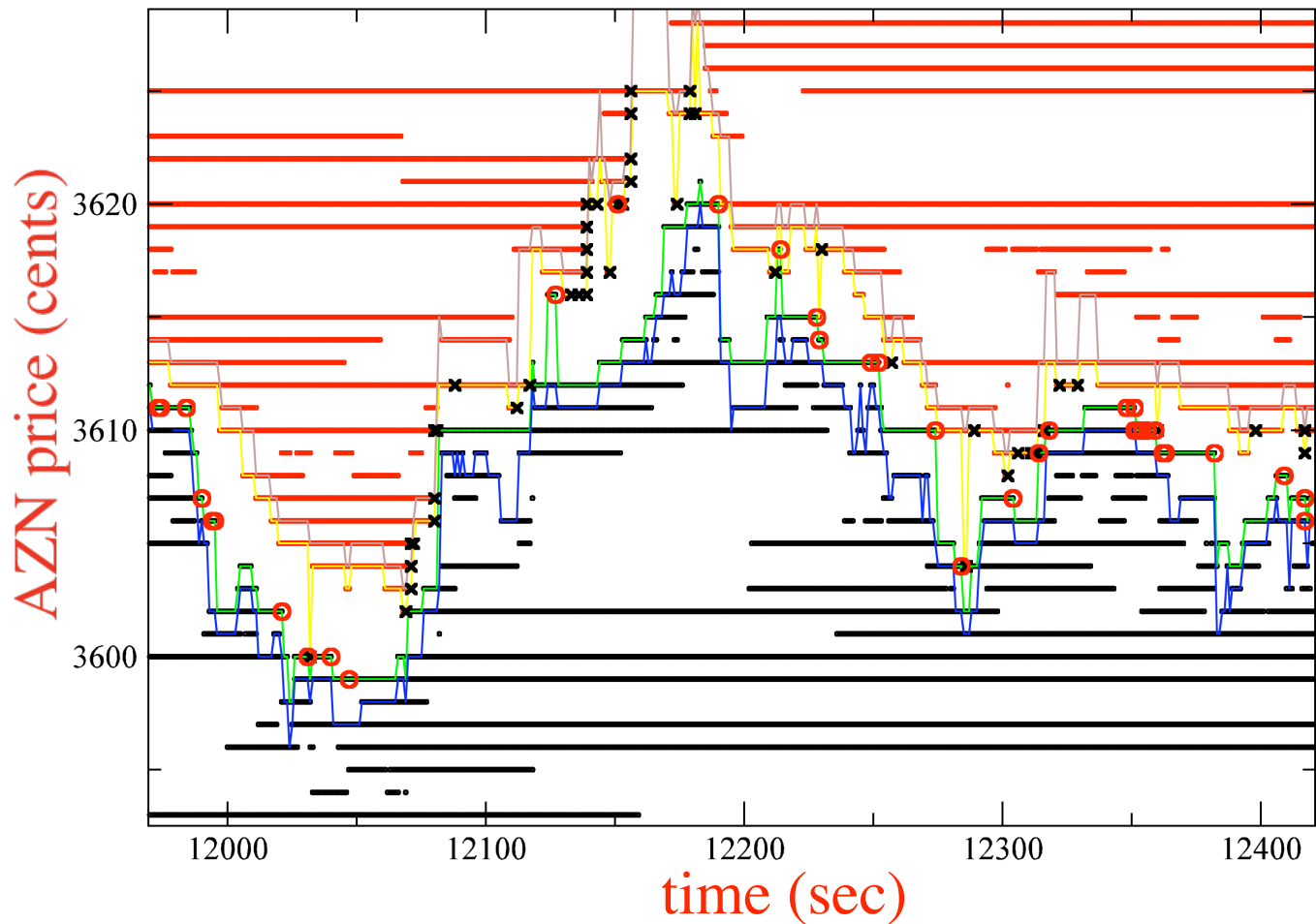
**In 2004 the BME was the eight in the world in market capitalization.**



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# The Spanish market is a double auction market

A schematic representation of the order book:



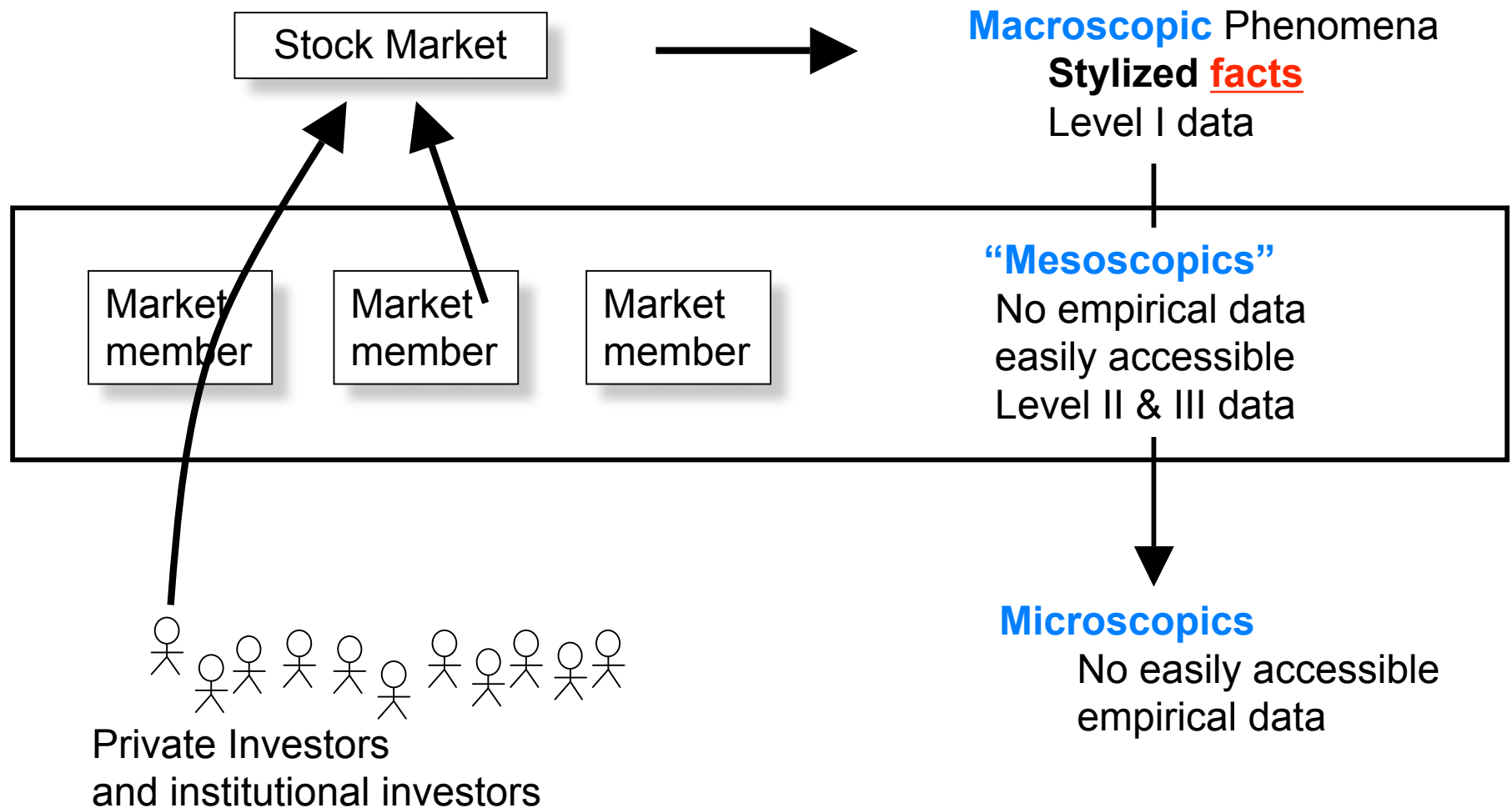
- sell limit orders
- buy limit orders
- sell market orders
- x buy market orders

| first buy gap | spread | first sell gap |



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# The different levels of a financial market





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# Features of market members

- ❑ Market members are credit entities and investment firms which are members of the stock exchange and are entitled to trade in the market.
- ❑ Approx 200 market members at the BME (350/250 at the NYSE)
- ❑ We only study approximately 85 because:
  - ❑ Not all the members trade during the whole period
  - ❑ We have only chosen those members whose activity is continuous

Snapshot of Spanish  
Stock Market database

VALOR	VOLUMEN	PRECIO	SOCOM	SOCVEN	HORA	FECHA
TEF	236	2187	9405	9858	90108	01/06/2000
TEF	1764	2187	9405	9487	90108	01/06/2000
ANA	110	3800	9839	9855	90109	01/06/2000
CAN	37	2194	9839	9578	90109	01/06/2000
CAN	151	2200	9839	9412	90109	01/06/2000
VIS	214	700	9821	9561	90109	01/06/2000
SOL	286	1299	9839	9838	90110	01/06/2000
ALB	104	2710	9839	9843	90110	01/06/2000
ALB	29	2719	9839	9419	90110	01/06/2000
ACX	97	3689	9839	9843	90111	01/06/2000
AGS	120	1445	9839	9487	90111	01/06/2000
AGS	110	1448	9839	9485	90111	01/06/2000
ACS	107	2930	9839	9863	90111	01/06/2000
SCH	11226	1045	9858	9880	90112	01/06/2000
CTE	96	1935	9839	9832	90112	01/06/2000
CTE	50	1955	9839	9872	90112	01/06/2000
CTE	14	1958	9839	9426	90112	01/06/2000
FER	237	1296	9839	9560	90112	01/06/2000
SGC	50	3980	9820	9560	90113	01/06/2000
ACR	161	1139	9839	9487	90113	01/06/2000
ACR	47	1140	9839	9845	90113	01/06/2000
DRC	20	803	9839	9573	90114	01/06/2000
DRC	267	805	9839	9484	90114	01/06/2000
AUM	111	1649	9839	9474	90114	01/06/2000





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# Market members vs investors

Market members are not investors. A market member may act on behalf of many different investors.

Therefore it is not a priori obvious that one can extract resulting strategies from market members data, unless market members present a certain degree of specialization.

It is also not obvious that one can extract meaningful information about “packages” or “hidden orders” traded by them.



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## Data

We investigate 4 highly capitalized stocks:  
Telefonica (TEF), Banco Bilbao Vizcaya  
Argentaria (BBVA), Banco Santander Central  
Hispano (SAN) and Repsol (REP).

The investigated period is 2001-2004

We investigate market dynamics by focusing on the  
trading of each selected stock separately for each  
available calendar year.

By doing so we have up to 4x4 distinct sets of  
results



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# Investigated variable

□ **Inventory variation** = the value (i.e. price times volume) of an asset exchanged as a buyer minus the value exchanged as a seller in a given time interval.

$$v_i(t) \equiv \sum_{s=t}^{t+\tau} \varepsilon_i(s) p_i(s) V_i(s)$$

sign  
+1 for buys  
-1 for sells

price

volume



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## Scientific questions on specialization and herding

- Is it possible to detect “resulting strategies” associated with the trading profile of market members acting at the Spanish Stock market?
- are market members herding? if yes, do the herding characteristics depends on the resulting strategy the market member is following?
- is the stock return driving the inventory variation of market members or viceversa?

**Esteban's** talk will answer these questions and others.



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## Scientific questions on trading of “hidden orders”

- Is it possible to detect “hidden orders” traded by market members?
- which are the statistical properties of “hidden orders” traded in the market?
- is the heterogeneity of market members affecting the statistical properties of “hidden orders” and to what extent?

**Fabrizio's** talk will answer these questions and others.



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## Conclusions

Institutional investors and individual investors are characterized by different trading profiles in different markets and at different time horizons.

It is worth investigating whether stock returns predict future inventory variation or viceversa.

It is worth investigating whether “hidden orders” traded in a financial market can be detected and investigated starting from the time dynamics of inventory variations of market members.

A success in these direction might be additional steps towards the development of an empirically grounded agent based model of a financial market.



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OCS website: <http://ocs.unipa.it>



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