**An agent-based model of intra-day financial markets dynamics**

**Jacopo Staccioli**  
**Mauro Napoletano**

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**Leverage effects**

- ACFS
- Volatility

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**Basic Ingredients**

- Limit order book (price-time priority)
- Single long-lived security
- No fundamental news
- No dividend paid
- Fundamentalist vs. chartist traders
- No strategy switching

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**Novel Ingredients**

- Endogenous participation
- Automatic cancellation
- Strict global schedule (Euronext)

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**Trader Participation**

- Uniform: at each time step exactly one trader is activated, randomly selected from the population
- Endogenous: at each time step a trader is active if last observed (absolute) return is above a random trader-specific threshold, otherwise fall back to uniform with probability \( \phi \)

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**Automatic Cancellation**

- A limit order stored on the book is automatically cancelled from the book
  - At its expiration time
  - When a new order has different sign
  - When it is deemed unfavourable
  - New buy order at lower price
  - New sell order at higher price

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**Timeline (Euronext)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:15am - 9:00am</td>
<td>pre-opening</td>
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<tr>
<td>9:00am</td>
<td>opening auction</td>
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<td>9:00am - 5:30pm</td>
<td>main trading session</td>
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<tr>
<td>5:30pm - 5:35pm</td>
<td>pre-closing</td>
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<tr>
<td>5:35pm</td>
<td>closing auction</td>
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<tr>
<td>10 hours, 20 minutes</td>
<td>37,200 sec.</td>
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**Timing**

**Workflow**

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**Noise Traders**

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**Chartists - Fundamentalists**

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**Endogenous Activation**

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**Performance**

**Scenario**

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<th>FC</th>
<th>EA</th>
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**Results**

- A very parsimonious model is able to reproduce many of the established intraday stylised facts
- Imposing a strict global schedule helps mapping simulation time into calendar time
- Endogenous activation is necessary for reproducing the timing properties of actual financial markets

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**Extensions**

- Time feedback
- Leverage requirements
- Budget constraints
- Model calibration

**Contact**

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