FiQuant Market Microstructure Simulator

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Overview

Requirements

- OS supported: Linux, Mac OS X, Windows
- Browsers supported: Chrome, Firefox, Safari, Opera
- Python 2.7
- Python packages can be installed using `pip` or `easyinstall`:
  - Veusz (for graph plotting)
  - Flask (to run a Web-server)
  - Blist (sorted collections used by ArbitrageTrader)
- Source code downloadable from SourceForge

Scheduler

- Main class for every discrete event simulation system.
- Maintains a set of actions to fulfill in future and launches them according their action times: from older ones to newer.

Interface:

- Event scheduling:
  - `schedule(actionTime, handler)`
  - `scheduleAfter(dt, handler)`
- Simulation control:
  - `workTill(limitTime)`
  - `advance(dt)`
  - `reset()`

Order book

- Represents a single asset traded in some market (Same asset traded in different markets would be represented by different order books)
- Matches incoming orders
- Stores unfulfilled limit orders in two order queues (`Asks` for sell orders and `Bids` for buy orders)
- Corrects limit order price with respect to tick size
- Imposes order processing fee
- Supports queries about order book structure
- Notifies listeners about trades and price changes

Order book for a remote trader

- Models a trader connected to a market by a communication channel with non-negligible latency
- Introduces delay in information propagation from a trader to an order book and vice versa (so a trader has outdated information about market and orders are sent to the market with a certain delay)
- Assures correct order of messages: older messages always come earlier than newer ones

Basic orders

Orders supported internally by an order book:

- `Market(side, volume)`
- `Limit(side, price, volume)`
- `Cancel(limitOrder)`

Limit and market orders notifies their listeners about all trades they take part in. Factory functions are usually used in order to create orders.

Meta orders

Follow order interface from trader's perspective (so they can be used instead of basic orders) but behave like a sequence of base orders from an order book point of view.

- `Iceberg(volumeLimit, orderToSplit)` splits `orderToSplit` to pieces with volume less than `volumeLimit` and sends them one by one to an order book ensuring that only one order at time is processed there
- `AlwaysBest(volume, limitOrderFactory)` creates a limit-like order with given volume and the most attractive price, sends it to an order book and if the order book best price changes, cancels it and resends with a better price
- `WithExpiry(lifetime, limitOrderFactory)` sends a limit-like order and after `lifetime` cancels it
- `LimitMarket(limitOrderFactory)` is like `WithExpiry` but with `lifetime` equal to 0

Traders

Single asset traders

- send orders to order books
- bookkeep their position and balance
- run a number of trading strategies
- notify listeners about trades done and orders sent

Single asset traders operate on a single or multiple markets. If a trader holds a portfolio composed of multiple assets it should aggregate an array of single asset traders.

Generic strategy

```
class Generic(Strategy):
  def __init__(self, eventGen, sideFunc, ...):
    # ... storing constructor arguments
    event.subscribe(self.eventGen, self.wakeUp)

  def wakeUp(self):
    if not self.suspended:
      # determine side and parameters of an order to create
      side = self.sideFunc()
      if side <> None:
        volume = int(self.volumeFunc())
        if volume > 0:
          # create order given side and parameters
          order = self.orderFactory(side)(volume)
          # send order to the order book
          self.trader.send(order)
```

Bullet Points

- Lorem ipsum dolor sit amet, consectetur adipiscing elit
- Aliquam blandit faucibus nisi, sit amet dapibus enim tempus eu
- Nulla commodo, erat quis gravida posuere, elit lacus lobortis est, quis porttitor odio mauris at libero
- Nam cursus est eget velit posuere pellentesque
- Vestibulum faucibus velit a augue condimentum quis convallis nulla gravida

Blocks of Highlighted Text

Block 1

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Block 2

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Block 3

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Multiple Columns

Heading

1. Statement
2. Explanation
3. Example

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Table

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table : Table caption

Theorem

Theorem (Mass–energy equivalence)

$E = mc^2$

Verbatim

Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

Figure

Uncomment the code on this slide to include your own image from the same directory as the template .TeX file.

Citation

An example of the `\cite` command to cite within the presentation:

This statement requires citation [Smith, 2012].

References

John Smith (2012)

Title of the publication

Journal Name 12(3), 45 – 678.

The End