

The Graz-Innsbruck Market System

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GIMS is free, open source software for conducting asset market experiments. It builds on the trusted z-Tree 3.4.2 platform (Fischbacher, 2007) and offers extensive facilities for conducting asset market experiments:

- Continuous double auction market
 - Limit and market orders
 - Single- and multi-unit trading
 - Extensive and smart order validation features
- Sealed bid-ask call auction market
 - Limit and market orders (settlement priority can be specified)
 - Same price determination mechanism as NASDAQ
 - Submission of entire bid schedules (optional)
 - Display of indicative price (optional)
- Elicitation of subject characteristics
 - Cognitive reflection test (Frederick, 2005)
 - Holt and Laury risk-aversion measure (Holt and Laury, 2002)
 - Financial literacy score (van Rooij, Lusardi and Alessie, 2011)
 - Standardized questionnaire of demographics, additional risk items, etc.
- Other features
 - Multi-language support (currently English and German implemented)
 - Experimenter subject
 - Free specification of endowments, dividends and signals (optional)
 - Short sales and margin purchases
 - Universal timelog

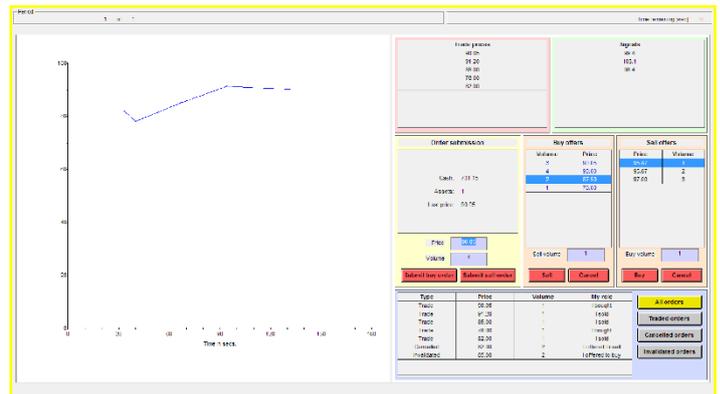


Figure 1: Screenshot of the continuous double auction trading interface.

GIMS is ready for use as-is, but can also easily be modified to accommodate new experimental designs. Many of the treatments reported in published studies on asset market experiments can be replicated in GIMS practically out of the box. Most others require little additional programming.

The software is under continuous development and improvements and bug fixes are shared between all users.

GIMS is freely available from: <http://academic.palan.biz/gims>

References

- Fischbacher, U., 2007. z-Tree: Zurich toolbox for ready-made economic experiments, *Experimental Economics* 10, 171–178.
 Frederick, S., 2005. Cognitive Reflection and Decision Making, *Journal of Economic Perspectives* 19(4), 25–42.
 Holt, C. A., and Laury, S. K., 2002. Risk Aversion and Incentive Effects, *American Economic Review* 92(5), 1644–1655.
 van Rooij, M., Lusardi, A., and Alessie, R., 2011. Financial literacy and stock market participation, *Journal of Financial Economics* 101(2), 449–472.

Details

General features

- Multi-language support. The entire treatment can be run in English or German.
- Universal timelog. The program logs every event in a single, unified timelog table, using the precise computer time instead of z-tree's imprecise experiment time.
- Experimenter subject. Experimenter z-leaf can be used to view market proceedings and to easily program experimenter interventions where desired.
- Experimenter interrupt. Experimenter can at all times move all subjects to the next stage or period or terminate the experiment.

General market features

- Complete record. No data is ever overwritten or lost.
- Choice between single unit trading or multi-unit trading.
- Free choice of number of periods. (Even random ending is trivial to implement given experimenter interrupt function.)
- Possibility to reset or carry over subject wealth from one period to the next.
- Possibility to pay subjects based on the cash balance at the end of every period or only for the cash balance at the end of the final period.
- Dividends, endowments and signals can either be randomly drawn from a freely specifiable discrete distribution, or can be imported from file (optional).
- Optimized layout. The layout of the market interface is designed to facilitate trading.
- Possibility to short assets and cash.

Continuous double auction

- Order validation. Offers can only be submitted if the submitting trader is able to fill them. Offers can only be accepted if the subject accepting them is able to pay for them (accepted ask) or deliver the assets (accepted bid). Subjects can only accept the best offer to buy/sell currently outstanding and cannot trade with themselves.
- Automatic invalidation of orders. Individually valid orders are allowed, but upon each transaction all existing outstanding orders are evaluated and (optional) their volume reduced (multi-unit setting) or the order invalidated if they are no longer feasible. In other words, a subject can have orders outstanding which he or she could not all fill, but every single outstanding order viewed in isolation is always feasible.
- Possibility to let subjects vote for an early end to trading. Only when all subjects have voted for ending the period early does it actually end.
- SpamControl feature to prevent individual subjects from filling the order book with bids or asks (optional).
- Bid-ask-improvement rule (optional).
- Display of a list and/or a chart of transaction prices (optional).
- Subject can display (i) all his/her non-open orders, (ii) only trades, (iii) only cancelled orders, or (iv) only invalidated orders.
- Order book can be emptied after every trade (optional).

Call auction

- Possibility to let subjects submit a single bid and ask pair, or entire bid and ask schedules with or without limits on the number of individual bids and asks.
- Possibility to submit limit and (optionally) market orders. Note that allowing market orders introduces the risk of subject bankruptcy.
- Price-Market order (price assumed to equal auction price)-Time priority rule or Price-Limit order-Time priority rule.
- Possibility to display indicative price, updated at freely specifiable intervals.

This mechanism replicates the price determination mechanism of NASDAQ OMX. Steps 0-1 are the same for all markets analyzed (ASX, BSE India, NASDAQ OMX, NSE India, NYSE, XETRA), and Step 2 is used by all markets except for the NYSE.

At some point, most exchanges (except for NASDAQ OMX) use a reference price (e.g. the previous closing price) in case earlier steps do not lead to a unique price. However, this is impractical in an experimental market, where there is no such price in the first period, and where – depending on the experiment – periods may be designed to be independent.