

Viewing the Simulation Live on Your Own Computer

Software Name: Simul2.exe

Reference: Antoni Bosch-Domènech and Shyam Sunder, "Tracking the Invisible Hand: Convergence of Double Auctions to Competitive Equilibrium," Computational Economics, 2000.

You can get a better sense of the dynamics of the markets reported in this article, by looking at the actual simulations on your own computer by following the instructions given in this appendix. We also describe what you will see on your computer screen.

Hardware Requirements:

IBM/clone with VGA or Enhanced VGA monitor.

How to Get the Software:

Download a copy of file simul2.exe from <http://www.som.yale.edu/faculty/sunder/zisoft.html> and store it on your hard drive or a floppy.

How to Run the Simulation:

1. Enter the directory in which file simul2.exe is stored, type simul2, and press the enter key.
2. The computer prompts you for two integers, lag% and nolag%. You should enter the two numbers separated by a comma, and press the enter key. The parameters you choose will have the following effects. Make your choice accordingly:

If you respond with 0,1 the program will run automatically without a break. If you respond with 1,0 it will run automatically but with one second pause after each step so you can see most steps of the process. If you respond with 0,0 the program will run in small steps, and you have to hit the space bar after each step. Try them in this order. If the program does not seem to be doing anything for a while, it is probably waiting for you to hit the space bar. All other parameters are picked by the computer as preset values or random draws. Sit back and enjoy the show.

3. The program will show you a 5-market economy with strict budget constraint ($L = 0$). As described in the paper, there are four sets of arbitrageurs. There are eight exogenous buyers, eight exogenous sellers, and eight arbitrageurs in each set.

What You See on the Screen:

The first row of boxes: The five boxes from the left show the five markets, beginning with market 1 on the left. Market 1 has exogenous buyers and their demand function is shown in empty red circles. The second from right is the last market with exogenous sellers and their supply function is shown in filled purple circles. Horizontal dotted line is the equilibrium price range.

When the market runs, you will see moving black circles in each market to indicate current asks, and moving red circles to indicate current bids in each market.

If you run the program with 1,0 or 0,0 in response to the first query, you will also see the following (it is lost in speed of the computer if you run this with 0,1). When a bid and an ask cross in a market, a green line connecting that bid and ask appears in the box for the appropriate market. The computer chalks out in blue the transfer path of one unit from the appropriate seller on the right (whose circle becomes hollow) to the appropriate buyer on the left (whose circle becomes filled) after the transaction is completed in each market in sequence.

Please note that the bids of eight buyers in each market are arranged from left to right beginning from the left-hand side-wall of the box corresponding to that market. Asks of the eight sellers in each market are also arranged from left to right, ending at the left-hand side of the wall of the box corresponding to that market.

Second Row of Boxes: As each transaction is completed in each market, the transaction price path in each market is plotted in red circles in the second row of boxes. Again, the dotted line is the equilibrium price range.

Third Row of Boxes: As each trader earns profit, its amount is plotted in the third row of boxes. The exogenous buyers are arranged to the right of the left wall of the first box. All other groups of traders are arranged to the left of the right wall of the appropriate boxes.

Fourth Row of Boxes: The first box in the fourth row plots the efficiency (the cumulative percent of the maximum possible surplus extracted) with each transaction. If the last bar does not reach the top of the box, the market is less than 100 percent efficient.

Second box in the fourth row is the counter. Each horizontal bar represents a round. The proportion of the bar completed shows the proportion of total iterations for the round completed. The program is set to run 10 times, and each run completes a horizontal strip in this box.

Last Column of Boxes: The last column to the right gives summary data accumulated over multiple runs of this market. The graphs in the right column are updated refreshed after every round.

In the first row, you can see the percent of runs in which each of the exogenous buyers (from left to right in red) and each of the exogenous sellers (from left to right in purple) trades its unit. This gives you an idea of the relative frequency with which the intra and extra-marginal traders get to trade.

In the second row, you see the average of the transaction price paths in each of the five markets, averaged over the rounds run so far. The blue bars under the average price path are the number of transactions from which the average was computed. This explains why the last one or two points on the price path can have a large deviation from the equilibrium price level (because they are computed from fewer observations.)

In the third row, you see six vertical bars. The left bar shows the percent of maximum possible total profit earned by the exogenous buyers. The rightmost bar is for the exogenous sellers, and the other bars are for the various groups of arbitrageurs. The total height of these bars adds up to average efficiency of all rounds so far plotted in the right side of the rightmost box in the fourth row.

In the fourth row, you will see a round-by-round graph of efficiency of these markets. The right most thick line is the average value of this graph.

Have fun. Let us know if there are any problems at shyam.sunder@yale.edu.