

HandDA program instructions

All materials referenced in these instructions can be downloaded from:
<http://www.umass.edu/resec/faculty/murphy/handda/handda.html>

Background

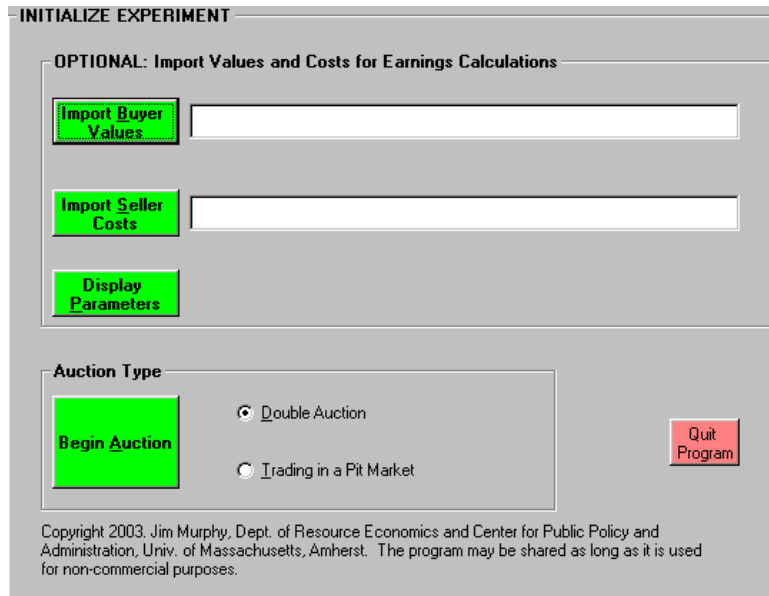
The HandDA program is another way to manage a typical hand-run double auction in the classroom. It is not a network program that lets buyers and sellers trade with each other via computers. Rather, it is a convenient tool for recording the trades in a hand-run double auction. In addition to recording trades, the program also has an optional feature that will record individual earnings. The advantages of this program over using overheads or the blackboard are: (1) the data are automatically saved for later use, (2) the trades can be displayed neatly using a laptop projector,¹ and (3) recording trades is faster.

These instructions provide a summary of how to use the program. I am assuming that you have some basic familiarity with how to run a hand-run double auction. The program can manage two different types of double auction institutions: (1) the instructor acting as the auctioneer (see Davis and Holt, 1993, for detailed instructions) or (2) trading in a pit market similar to that described by Holt (1996).²

Starting the HandDA program

These instructions assume you have already downloaded and installed the program.

To run the program, double-click on the file HandDA.exe. You should get the following program initialization screen:



¹ The program assumes your projector can display at a resolution of 1024x768.

² Davis, D. and Holt, C. (1993). *Experimental Economics*. Princeton, NJ: Princeton University Press.

Holt, C.A. (1996). "Classroom Games: Trading in a Pit Market." *The Journal of Economic Perspectives*, 10(1):193-203.

OPTIONAL: Importing buyer values and seller costs for earnings calculations

The program has an optional feature that will record the earnings of each buyer and seller, and provide some summary statistics such as average price, total quantity, producer and consumer surplus. If you want to use this feature, you will need to create text files with the buyer values and seller costs. These files are then imported into HandDA. Appendix A provides details on how to create these parameter files.

If you choose not to import these parameter files, HandDA will still record the trade data (price, buyer, seller). This data can be used to plot trades. You could also use this data to calculate individual earnings on your own.

To import buyer values, click on the green Import Buyer Values button. This will open a dialog box. Select the appropriate parameter file, and click ok. The file name should appear in the white box next to the Import Buyer Values button. Repeat the process to Import Seller Costs.

After you have imported both the buyer values and seller costs, you should inspect the parameters to ensure that they were imported properly. Clicking the Display Parameters button will open a window similar to that shown below.

Buyer Values								Seller Costs							
BUYER	UNIT	PER_1	PER_2	PER_3	PER_4	PER_5	PER_6	SELLER	UNIT	PER_1	PER_2	PER_3	PER_4	PER_5	PER_6
1	1	9.85	8.60	12.50	11.25	9.85	8.60	1	1	2.10	3.35	4.75	6.00	2.10	3.35
1	2	5.10	6.35	7.75	9.00	5.10	6.35	1	2	6.85	5.60	9.50	8.25	6.85	5.60
1	3	2.60	3.85	5.25	6.50	2.60	3.85	1	3	9.85	8.10	12.50	10.75	9.85	8.10
2	1	9.60	8.35	12.25	11.00	9.60	8.35	2	1	2.35	3.60	5.00	6.25	2.35	3.60
2	2	5.35	6.60	8.00	9.25	5.35	6.60	2	2	6.60	5.35	9.25	8.00	6.60	5.35
2	3	2.85	4.10	5.50	6.75	2.85	4.10	2	3	9.10	7.85	11.75	10.50	9.10	7.85
3	1	9.35	8.10	12.00	10.75	9.35	8.10	3	1	2.60	3.85	5.25	6.50	2.60	3.85
3	2	5.60	6.85	8.25	9.50	5.60	6.85	3	2	6.35	5.10	9.00	7.75	6.35	5.10
3	3	3.10	4.35	5.75	7.00	3.10	4.35	3	3	8.85	7.60	11.50	10.25	8.85	7.60
4	1	9.10	7.85	11.75	10.50	9.10	7.85	4	1	2.85	4.10	5.50	6.75	2.85	4.10
4	2	5.85	7.10	8.50	9.75	5.85	7.10	4	2	6.10	4.85	8.75	7.50	6.10	4.85
4	3	3.35	4.60	6.00	7.25	3.35	4.60	4	3	8.60	7.35	11.25	10.00	8.60	7.35
5	1	8.85	7.60	11.50	10.25	8.85	7.60	5	1	3.10	4.35	5.75	7.00	3.10	4.35
5	2	6.10	7.35	8.75	10.00	6.10	7.35	5	2	5.85	4.60	8.50	7.25	5.85	4.60
5	3	3.60	4.85	6.25	7.50	3.60	4.85	5	3	8.35	7.10	11.00	9.75	8.35	7.10
6	1	8.60	9.85	11.25	12.50	8.60	9.85	6	1	3.35	2.10	6.00	4.75	3.35	2.10
6	2	6.35	5.10	9.00	7.75	6.35	5.10	6	2	5.60	6.85	8.25	9.50	5.60	6.85
6	3	3.85	2.60	6.50	5.25	3.85	2.60	6	3	8.10	9.85	10.75	12.50	8.10	9.85
7	1	8.35	9.60	11.00	12.25	8.35	9.60	7	1	3.60	2.35	6.25	5.00	3.60	2.35
7	2	6.60	5.35	9.25	8.00	6.60	5.35	7	2	5.35	6.60	8.00	9.25	5.35	6.60
7	3	4.10	2.85	6.75	5.50	4.10	2.85	7	3	7.85	9.10	10.50	11.75	7.85	9.10
8	1	8.10	9.35	10.75	12.00	8.10	9.35	8	1	3.85	2.60	6.50	5.25	3.85	2.60
8	2	6.85	5.60	9.50	8.25	6.85	5.60	8	2	5.10	6.35	7.75	9.00	5.10	6.35
8	3	4.35	3.10	7.00	5.75	4.35	3.10	8	3	7.60	8.85	10.25	11.50	7.60	8.85
9	1	7.85	9.10	10.50	11.75	7.85	9.10	9	1	4.10	2.85	6.75	5.50	4.10	2.85
9	2	7.10	5.85	9.75	8.50	7.10	5.85	9	2	4.85	6.10	7.50	8.75	4.85	6.10
9	3	4.60	3.35	7.25	6.00	4.60	3.35	9	3	7.35	8.60	10.00	11.25	7.35	8.60
10	1	7.60	8.85	10.25	11.50	7.60	8.85	10	1	4.35	3.10	7.00	5.75	4.35	3.10
10	2	7.35	6.10	10.00	8.75	7.35	6.10	10	2	4.60	5.85	7.25	8.50	4.60	5.85
10	3	4.85	3.60	7.50	6.25	4.85	3.60	10	3	7.10	8.35	9.75	11.00	7.10	8.35

If the parameters do not display correctly, there is a good chance that your parameter file was not formatted properly. See Appendix A for setting up the parameter file. After reviewing the

parameters, you can close this window by going to the menu bar and selecting WINDOW – CLOSE (CTRL + W). Note that this window only *displays* the parameters, you cannot edit the parameters in this window. You must make changes directly to the parameter file and import it.

Auction Type

The term “double auction” refers to a broad class of trading institutions in which buyers bid to purchase and sellers offer to sell a standardized commodity. In the classroom, two popular versions are the double auction in which the instructor acts as the auctioneer (Davis and Holt, 1993) and trading in a pit market (Holt, 1996). Choose which type of auction you will run; the former is the default.

The key difference between the two institutions is that in the former students call out bids and asks which are then posted. This results in a bid/ask spread. A trade occurs when a buyer accepts the current ask, or a seller accepts the current bid. Trades occur sequentially. When trading in pit market, there is no bid/ask spread. Students negotiate amongst themselves. When a buyer and a seller agree upon a price, they report the trade to the instructor who then posts the price. Trading in this auction is simultaneous.

After importing values and costs, and choosing the auction institution, you are ready to begin trading. Click the green BEGIN button.

Trading in the Double Auction

In this section, I will describe how the program works if you choose Double Auction as the Auction Type. In the next section, I will describe trading in a pit market.

Recording a bid or ask

The program assumes that all buyers have a player ID with the format “B#”, so Buyer 1 is B1, Buyer 2 is B2, etc. Likewise all sellers have an ID beginning with “S#”: S1, S2, ... (the program is not case-sensitive).

In the middle of the screen are two white boxes to enter the subject ID and the person’s bid or ask, as shown below:

Current Ask	s5	\$5.65	Undo Current Ask
Enter Bid/Ask	b3	4.25	Enter
Current Bid	b1	\$4.00	Undo Current Bid

Once you have entered the ID and price, click on the green ENTER button or press the enter key on your keyboard. The bid or ask will be posted as the new current bid or ask. There is an improvement rule: any subsequent bids must be above the current bid, and subsequent asks must be less than the current ask. This guarantees that all new bids or asks fall within the current bid/ask spread. All prices are rounded to 2 decimal places.

In the example above, a seller has one of two choices: sell to B1 at \$4.00 (in which case a trade is executed), or submit a new ask, which must be less than \$5.65. Likewise a buyer can either purchase a unit at \$5.65, or submit a new bid at a price above \$4.00. In the example above, B3 is submitting a new bid for \$4.25, which improves upon the current bid.

Executing a trade

Keep soliciting bids and asks until a trade is executed. To execute a trade, enter a new bid (or ask) exactly equal to the current ask (or bid). A trade confirmation message will appear. If, for example, Seller 4 (S4) wants to accept Buyer 3’s current bid of \$4.25, you would record this as you would any seller’s ask as shown below. Then click on ENTER .

Current Ask	s5	\$5.65	Undo Current Ask
Enter Bid/Ask	s4	4.25	Enter
Current Bid	b3	\$4.25	Undo Current Bid

The trade is immediately displayed in the Trade History for everyone to see. The bid/ask queue is cleared, and trading begins again. Continue soliciting bids and asks until no one wants to trade (or a pre-announced time limit has expired), at which time the round is over.

Beginning a new period

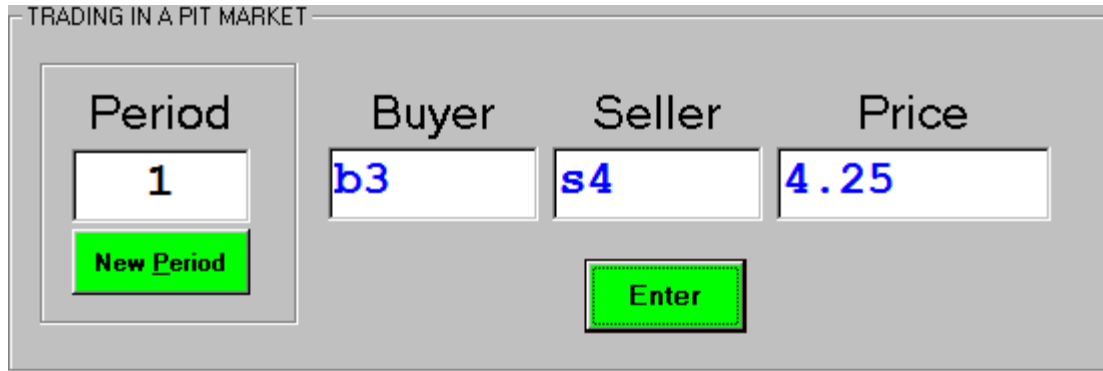
After trading for a period is over, click on the NEW PERIOD button. This clears the bid/ask queue and the trade history. The HandDA program will automatically save all the trade data at this time. You are now ready to start the next round of trading with a “clean slate.” Once you go to the next period, you cannot return to a previous period.

Trading in a Pit Market

In this section I will describe how the HandDA program works if you select Trading in a Pit Market as the auction type.

Like above, the program assumes that all buyers have a player ID with the format “B#”, so Buyer 1 is B1, Buyer 2 is B2, etc. Likewise all sellers have an ID beginning with “S#”: S1, S2, ... (the program is not case-sensitive).

When a buyer and a seller agree to trade, they report the price to the instructor. To record the trade, enter the Buyer ID, Seller ID and Price in the white boxes, then click Enter. In the example below, Buyer 3 (b3) and Seller 4 (s4) agreed to trade at \$4.25. The trade is immediately displayed in the Trade History for everyone to see. All prices are rounded to 2 decimal places.



Continue until there are no more trades for the current period (or a pre-announced time limit has expired), then click `New Period`. Trade data are automatically saved whenever you either click `New Period` or end the program by clicking the `Save Data and End Program` button.

Fixing data entry mistakes

The program allows you to undo bids, asks, or trades for the current period only. Once you go to a new period, all data are recorded and cannot be undone.

Errors entering a bid or ask (only relevant for Auction Type = Double Auction)

If a student made a mistake and wants to retract their bid/ask or if you entered the bid/ask incorrectly, you can use the `UNDO CURRENT BID` and `UNDO CURRENT ASK` buttons. Each time you click on the `UNDO CURRENT BID` (or `ASK`) button, the current bid (or ask) will be deleted and replaced with the next bid (ask) in the queue. Should you need to undo multiple bids (or asks), you can click on these buttons multiple times. Alternatively, you can click on the `CLEAR QUEUE` button. This will clear the entire bid and ask queues, and erase the current bids and asks, but will not undo the trade history.

Errors entering a trade

If a trade is erroneously recorded, click on the “`UNDO LAST TRADE`” button. This will remove the last trade from the history display on your screen. You can undo multiple trades. If Auction Type = Double Auction, then undoing a trade does not affect the current bid and ask.

Data files

After you click `Begin`, the program will automatically create up to three data files depending upon the options you chose. The three files are: `DA*TRADES.txt`, `DA*EARNINGS.txt` and `DA*QUEUE.txt`. These files are saved in the same folder as the HandDA program. The * denotes the date and time that the experiment was started; for example a program started on November 21, 2001 at 2:30:55 PM would be represented as:

- `DA-20011121-143055-TRADES.txt`
- `DA-20011121-143055-EARNINGS.txt`
- `DA-20011121-143055-QUEUE.txt`

The TRADES file contains the executed trades. Data are automatically saved to this file whenever you click on either the “NEW PERIOD” or “SAVE DATA & END PROGRAM” button. Use this file to plot the trades from a class experiment. The web site has a template for plotting data you can use. This template, `StepFunctions.xls`, is described in the next section.

The EARNINGS file is created only if you imported buyer values and seller costs into HandDA so that earnings could be calculated. For each period, this file contains the following information: Period, Total Quantity Traded, Average Price, Consumer Surplus, Producer Surplus, Total Surplus, Earnings for each Buyer, Earnings for each Seller.

When you choose auction type = Double Auction, the QUEUE file logs all submitted bids and asks, plus the executed trades. It also tracks whenever you undo a transaction. Data are written to this file each time you press “ENTER” to record a bid, ask or trade. Generally, I do not expect this file to be used much. But if you wanted to analyze the bid/ask sequence leading up to a trade, or to recover from a computer crash, this file could be helpful.

Copying trades to a spreadsheet for display

The web site has a spreadsheet called `StepFunctions.xls` that can plot supply and demand functions, and plot the trades for up to three trading periods. Before class, input the supply and demand step functions. You can click on the green button labeled “CLICK HERE TO DRAW GRAPH” to view the competitive equilibrium.

After trading has ended, open the TRADES file in Excel. This text file is tab delimited. Copy the trade prices for each period from TRADES file to the appropriate column for that period in the `StepFunctions.xls` spreadsheet. Then, in the spreadsheet, click the green “CLICK HERE TO DRAW GRAPH” button to update the charts.

Appendix – Creating parameter files for buyer values and seller costs

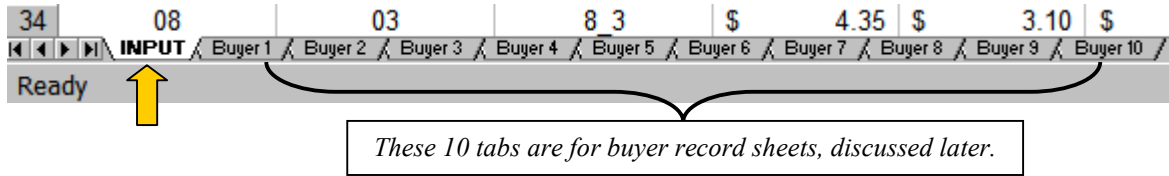
The web site has two Excel spreadsheets that contain sample buyer values (`buyers.xls`) and seller costs (`sellers.xls`). These spreadsheets serve two purposes: create student record sheets and create tab-delimited text files that can be imported for HandDA earnings calculations. I will describe `buyers.xls`, but both spreadsheets work essentially the same way. The format is relatively straightforward, just input the parameters under the appropriate column headings. The spreadsheet does not have any error checking, so below are some detailed instructions in case you have questions about how this file should look.

Parameter file summary

1. Open `buyers.xls` and select the INPUT worksheet.
2. Update Period headings in row 7
 - a. The Period headings should exactly match the number of periods. That is, do not have a Period heading if there are no data below it, and do not have a column of data without a Period heading.
3. Rows 8-10 contain number of periods, number of buyers and maximum number of units that the “largest” buyer may purchase. These are automatically calculated and do not need to be edited.
4. The buyer values begin in Row 11.
 - a. Column A: Buyer ID number.
 - b. Column B: Unit number
 - i. Both Buyer ID and unit number must be number consecutively beginning with 1. Excel should automatically format all number as 2 digits (1=01, etc).
 - c. Column C: BuyerID_UnitNumber
 - i. This column combined the first two columns into the format BuyerID_UnitNumber. There is an equation you can copy, or you could input this yourself.
 - d. Columns D and greater: Buyer values for each period.
 - i. The default is 6 periods. You can add or subtract periods, but be sure that the column headings in Row 7 are updated correctly as mentioned above.
5. Save `buyers.xls` as a regular Excel file.
6. Save `buyers.xls` as a tab-delimited text file
7. Import the text file into HandDA

Detailed Instructions

The spreadsheet buyers.xls has a total of 11 “worksheets” or tabs. The first worksheet is named INPUT, and the next 10 are Buyer 1, ..., Buyer 10 as shown below.



For the purposes of importing buyer values into HandDA, only the INPUT worksheet is relevant. I will discuss the student record sheets later. Below is a screen print from the INPUT worksheet.

	A	B	C	D	E	F	G	H	I	J
1	To make data entry easier I set up this spreadsheet so that all the values can be entered here.									
2	The values on each subject's sheet are automatically updated (up to 6 trading periods. For more than 6 periods you will have to update worksheets)									
3	To use this INPUT worksheet to create a parameter file used for profit calculations in OralDA, save this sheet as a text file. Then import into OralDA.									
4	To print all worksheets at once, go to FILE -- PRINT as usual. Select "entire workbook" (lower left corner)									
5										
6	Sort data by buyer number then by unit number. For the OralDA program parameter file you can add additional columns for more periods.									
7	Buyer Number	Unit Number	Buyer Unit	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	
8	NP	06	<< Number of periods. Calculated automatically, do not delete formula							
9	NT	10	<< Number of Buyers. Calculated automatically, do not delete formula							
10	UN	03	<< Maximum number of units that any one person can buy. Calculated automatically, do not delete formula							
11	01	01	1_1	\$ 9.85	\$ 8.60	\$ 12.50	\$ 11.25	\$ 9.85	\$ 8.60	
12	01	02	1_2	\$ 5.10	\$ 6.35	\$ 7.75	\$ 9.00	\$ 5.10	\$ 6.35	
13	01	03	1_3	\$ 2.60	\$ 3.85	\$ 5.25	\$ 6.50	\$ 2.60	\$ 3.85	
14	02	01	2_1	\$ 9.60	\$ 8.35	\$ 12.25	\$ 11.00	\$ 9.60	\$ 8.35	

The INPUT worksheet is initially set up for 10 buyers, 6 periods, and each person has 3 units to buy. For the HandDA parameter file, you can have up to 99 buyers, 99 periods, and 99 units (no, I have not tested these limits).

The blue text in the first 6 rows contains some instructions, but is not used.

Row 7 has the column headings. The important thing to know is that HandDA counts the number of cells in this row that have text and uses this to determine how many periods there will be. So, do not add headings for Periods that do not have data, and make sure that every period does have a column heading. Below are two examples of unacceptable formats:

Missing Heading for Period 6

H	I
(save to update worksheets)	
Then import into OralDA.	
Add columns for more periods.	
Period 5	
Formula	
\$ 9.85	\$ 8.60
\$ 5.10	\$ 6.35
\$ 2.60	\$ 3.85

Has Period 7 heading, but no Period 7 data

H	I	J
(save to update worksheets)		
Then import into OralDA.		
Add columns for more periods.		
Period 5	Period 6	Period 7
Formula		
\$ 9.85	\$ 8.60	
\$ 5.10	\$ 6.35	
\$ 2.60	\$ 3.85	

If you add or delete periods, **you MUST update the Period Number headings**. The spreadsheet figures out how many periods there are based on the column headings. The file is initially set up for 6 periods. If you want to add a seventh period, make sure that cell J7 says Period 7. If you only want to use 5 periods, be sure to delete the Period 6 from cell I7.

The program does not like any missing values, so if you delete a Period, be sure that you delete all the data in that column. If a value is zero, be sure to enter zero. **Do not leave a cell blank.**

You should not need to edit rows 8-10, they are updated automatically. These calculate the number of periods, number of buyers and maximum number of units that a subject is able to trade. (Note: each buyer can have a different number of units, this cell just figures out the number of units that the “largest” buyer can trade).

With the exception of updating the Period Number column heading in Row 7, all of the updating is done in Rows 11 and greater.

Column A contains the Buyer Number and Column B contains the Unit Number (i.e., first unit, second unit, etc. for that buyer). Both Buyer and Unit Number must be whole numbers, ordered consecutively, starting with 1. Excel will automatically display these as two digits (i.e., 1 = 01, 2 = 02, ...). Do not change that formatting.³

Column C, Buyer_Unit, automatically combines Columns A and B. This column is used as a lookup value for the record sheets. You should not have to make any changes in this column. Just make sure if you add more buyers that you copy the equation that generates this. You could also input manually if you prefer. The format is *BuyerNumber_UnitNumber* (e.g., Buyer 1’s second unit would be represented as 1_2).

Columns D and greater are the buyer values for each period. For example, in the screen print above, Row 11 contains the following information:

³ Should the pre-formatting somehow get deleted, this is how you can format columns A and B to always display two digits. Under the menu bar, select FORMAT—CELLS. Choose the Number tab. Under Category, select Custom. Under Type, enter 00. Click Ok.

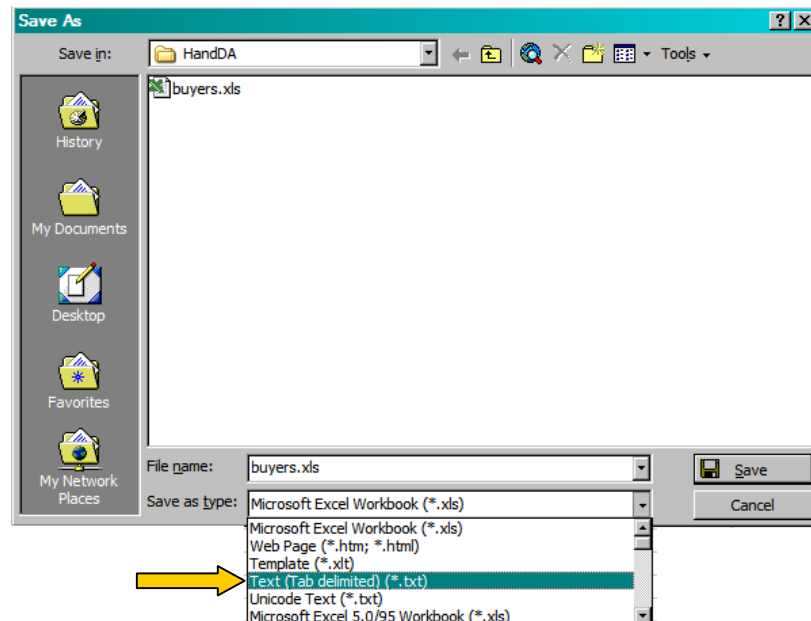
Buyer Number	Unit Number	Buyer_Unit	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
NP	07	<< Number of periods. Calculated automatically, do not delete formula						
NT	10	<< Number of Buyers. Calculated automatically, do not delete formula						
UN	03	<< Maximum number of units that any one person can buy. Calculated automatically, do not delete formula						
→ 01	01	1_1	\$ 9.85	\$ 8.60	\$ 12.50	\$ 11.25	\$ 9.85	\$ 8.60

This line says that the value of Buyer 1's first unit traded is \$9.85 in Period 1. In Period 2, his first unit for Buyer 1 is worth \$8.60, etc.

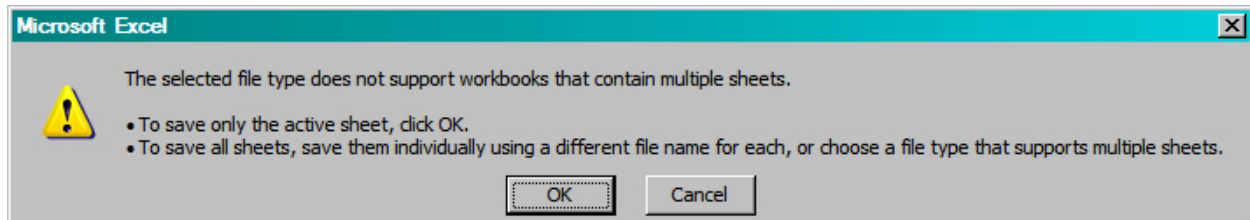
Saving the parameter file

After updating the parameter file, you should save it in two different formats. First, save the file as an Excel spreadsheet the way you normally would. This preserves all the equations and student Record Sheets should you need to edit something later.

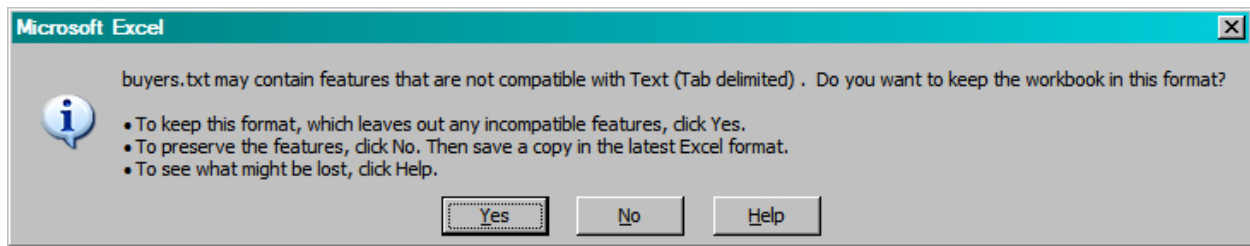
Next, save the file as a tab-delimited text file. This is the file that HandDA will use. First, **make sure that the Input worksheet is showing** (not one of the Buyer Records). On the menu bar, select File – Save As. You will get the following dialog box.



Next to “Save as type” select **Text (tab delimited)** as shown above. Then click Save. You might get a warning about not supporting multiple sheets, similar to that below. If you do, click OK.



You may get another warning about features not compatible with Text. Click Yes.



You should now have a file named `buyers.txt` saved on your computer. If you open the file in a text editor such as Notepad, it should look similar to the example at the end of these instructions.

If you need to make any changes later, I would recommend that you begin with the Excel file `buyers.xls` and then repeat the steps to save as text. This will reduce the likelihood of an error.

A comment on anticipating the number of students in the class

It is often the case that you do not know how many students will actually show for class on a given day. In preparing the parameter file for HandDA, you can construct one set of files (buyers and sellers) with the *maximum* number of students you expect to show up. If fewer actually attend class, you can still use these files. For example, say you have 20 students in class and parameterize the experiment for 10 buyer and 10 sellers. If only 15 show up, you might have Buyers 1-8 and Sellers 1-7. The parameter file you import to HandDA will think there are 10 of each, but it does not matter because HandDA does not calculate the competitive equilibrium—it only tracks trades and earnings. In your EARNINGS file, Buyers 9-10 and Sellers 8-10 will have zero earnings because they did not trade. I find this much easier than constructing multiple parameter files for the different possible number of students in class.

Although calculating individual earnings is not contingent upon the number of traders, clearly the competitive equilibrium does depend upon the number of traders. For the parameter file with 10 buyers and 10 sellers, before class I construct a table with the equilibrium price, quantity, etc. Once I know how many students will participate, I look up the equilibrium in the table, jot the information on a piece of paper, and hand it to a student to hold for the end of class.

Student Record Sheets

The spreadsheet `buyers.xls` also has 10 tabs labeled Buyer 1, Buyer 2, etc. These contain some preformatted student record sheets. These sheets are not relevant for the HandDA program, I provide them because you might find it useful to have these record sheets already made. As long as you do not change the number of buyers (10), the number of periods (6), or maximum number of units (3) in the INPUT sheet, the buyer values you enter into the INPUT sheet should automatically update the student record sheets with the new values. If you want to add periods, buyers or number of units, you can certainly update the INPUT sheet as described earlier and can import that into HandDA. However, it is possible that the Student Record Sheets will not update properly and you will have to enter the Buyer Values into the Record Sheets manually.