

# Multi-Market Equilibrium, Trade, and the Law of One Price

Susan K. Laury and Charles A. Holt\*

April 1998

**Abstract:** This paper describes the setup of two classroom markets, one with a thin supply side and relatively higher prices. A comparison of the equilibrium price tendencies in the two markets helps students discover how to apply supply and demand analysis in this context. The introduction of speculators, who buy in one market and sell in the other, reduces or eliminates the price disparity. Class discussion can be focused on how "non-productive" speculation can increase surplus measures of efficiency when price is permitted to convey the right information about opportunity cost.

*Use:* This experiment can be used in Principles of Economics, Intermediate Economics, or International Trade to illustrate supply and demand analysis and the effects of inter-market trade. In upper-level classes, optimal bidding may also be addressed.

*Time:* Reading instructions and completing 5 trading rounds takes 30 - 40 minutes. Discussion lasts an additional 15 minutes.

*Materials:* 1 deck of cards for up to 36 students; 1 copy of the instructions and 8 small blank slips of paper for each student.

Keywords: speculation, arbitrage, experimental economics, classroom experiments.

## 1. Introduction

Although the centerpiece of any introductory economics course is the supply and demand model of perfect competition, students are frequently unable to use the cost and value numbers from a simple laboratory experiment to explain price averages. Indeed, when a group of incoming first-year doctoral students participated in this exercise it took considerable prompting before they came up with a theoretical explanation of price tendencies. Instead of looking at the outcome of trading in a single market and asking why prices converged to, say, \$6, it is instructive to set up two markets and let students try to explain why prices in the two markets differ. This two-market approach also illustrates how gains from trade arise when cross-market

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\* Laury: Department of Economics, The Darla Moore School of Business, University of South Carolina, Columbia, SC 29201, USA; Email [slaury@darla.badm.sc.edu](mailto:slaury@darla.badm.sc.edu). Holt: Department of Economics, Rouss Hall, University of Virginia, Charlottesville, VA 22903, USA; Email [holt@virginia.edu](mailto:holt@virginia.edu). This research was funded in part by the National Science Foundation (SBR-9617784 and SBR-9753125).

trading is introduced. Speculators essentially unify the markets and equalize prices as arbitrage opportunities are exploited. Multi-market experiments help bridge the gap in students' knowledge that results when the leap is made from one to many markets, as is done in most microeconomics textbooks.

We use playing cards to distribute cost and value information in classroom trading. The dual market setup can be adapted for microeconomics classes at any level, ranging in size from 10 to about 40. The exercise takes about an hour, including discussion. The next section outlines the procedures, and the third section describes how to structure the class discussion to enhance student learning. The final section surveys results from (non-classroom) research experiments in which trading occurs in interrelated markets.

## **2. Procedures**

The basic setup involves two isolated markets, with identical demand conditions but with different supply conditions. Allowing trade only within each separate market will generate higher prices in the market with tight supply, setting the stage for the subsequent introduction of "traders" who can buy in one market and sell in the other. We have used two different trading institutions, depending on the class size. With classes of about 25-35 students, it is easy to set up two "pit markets" in which buyers and sellers come together in separate trading areas to call out bids and asks and negotiate trades in a relatively unstructured situation. Discussion sections for large lecture courses, however, often have fewer students who are present on a given day. In classes with fewer than 25 students, we have found that it is better eliminate the seller side by conducting auctions in which a fixed number of commodity "units" is sold to student buyers in each market. Instructors who have not previously conducted a single pit market in class (see Holt, 1996, for instructions) may also prefer to begin with the auction approach, which is easier to conduct. The following subsections explain the procedures for an auction with fixed supply, and then for a pit market with both buyers and sellers.

### *Auction Market Procedures*

First, consider an auction setup with fixed supply and 8 buyers assigned to be in each market. (The numbers of buyers can be increased or decreased as explained below.) There are

six units available for sale in the first market, and only two units available in the second.<sup>1</sup> Buyers submit sealed bids for a single unit in their own market, with the purchase price determined by the highest *rejected* bid. Thus if the three highest bids were \$9.50, \$8.00, and \$7.00 in the thin (low-supply) market, the buyers with bids of \$9.50 and \$8.00 would each receive a single unit, but they would pay only \$7.00 for these units. If there is a tie for the lowest accepted bid (e.g. if the bids submitted were \$9.50, \$8.00, and \$8.00), one of the tied bids is randomly chosen, and all units are sold at the tie price (\$8). Buyers are given a motive to bid by providing them with "resale values," which can be conveniently assigned with playing cards. We use numbered red playing cards (hearts or diamonds) to determine resale values. The cards are shuffled and each buyer is given a card, which determines the buyer's resale value in dollars, e.g. a 6 of hearts indicates a resale value of \$6.00. A buyer who makes a purchase at a price below the resale value earns a profit that is the difference between the resale value and the purchase price. Bids above resale value are not permitted. Thus, the buyer's value corresponds to a limit price.

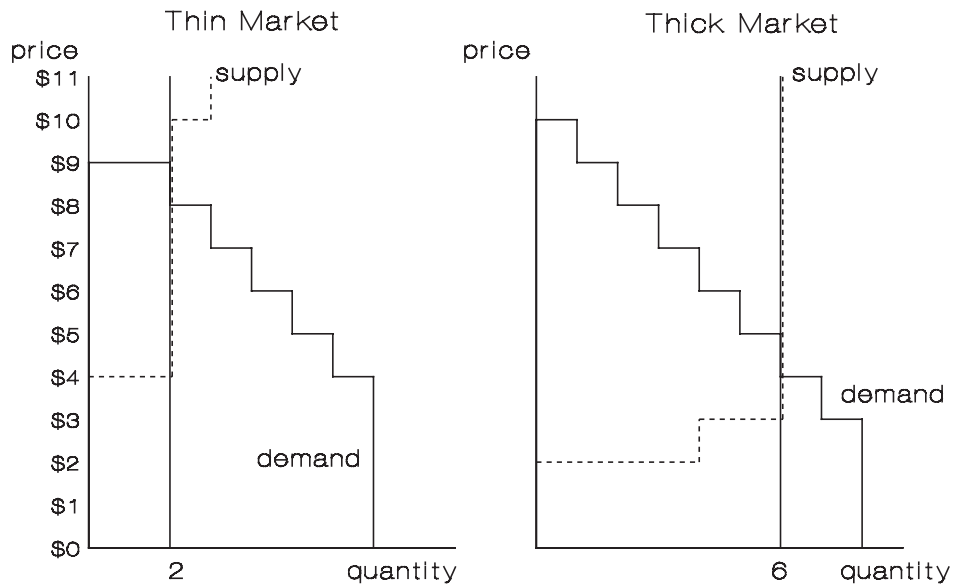
The seven cards used in each market are: 10, 9, 8, 7, 6, 5, 4, and 3; these values can be arrayed to form a demand function, as shown on the right side of Figure 1. The solid (vertical) lines show the supply function in each market (please ignore the dashed lines for now). The demand function is not shown to students prior to trading, but the equilibrium price will be between \$8 and \$9 in the thin (low-supply) market, and between \$4 and \$5 in the thick (high-supply) market.<sup>2</sup> After buyers' resale values and the trading rules are explained by reading the instructions contained in the appendix, the cards are dealt and each buyer submits a bid for a single unit by writing a bid price (identified by name) on a piece of paper. These bids are collected and ordered from high to low in each market, and the market clearing price is announced. This price is the third highest bid in the thin market, and the seventh highest bid in the thick market. Buyers then calculate their earnings (equal to zero for those who made no

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<sup>1</sup> In the instructions, the high-supply market is referred to as the Blue Market and the low-supply market is referred to as the Green Market.

<sup>2</sup> If buyers bid optimally, a price of \$8 will be observed in the thin market, and a price of \$4 in the thick market. This is discussed further in Section 3, below.

purchase).



**Figure 1.** Supply and Demand Designs

It may enhance student interest if you collect the cards between rounds, shuffle them (keeping the cards from the two markets separate), and then pass them out again to buyers before bids are made in the next period. Prices should converge to near-competitive levels after several periods, at which time trading between markets can be introduced.

After reading the traders' instructions (also contained in the appendix), ask for one volunteer from each market to act as a trader. The lowest-numbered card in each market should be removed before passing out the remaining cards. Because these cards represent extra-marginal units, this does not change the equilibrium price in either market. Each trader is given a capital endowment of \$20, and is restricted to purchasing a single unit in the thick (low-price) market. Because of the price disparity between markets, this unit can be resold for a profit in the thin (high-price) market. Trading in the thick market now precedes that in the thin market.

With the introduction of traders, the supply in the thin market is increased by the number of units that the traders bring, and the market clearing price is again determined by the highest rejected bid. The predicted outcome is for two units to be purchased by traders in the thick market and resold in the thin market. The addition of these two units shifts supply out to four in the thin market and lowers the market clearing price to the \$6-\$7 range. Similarly, the

additional two units of demand should, in theory, raise the price to the \$6-\$7 range in the thick market as the traders leave only four units for buyers in the thick market.

To accommodate additional students (i.e., for classes with more than 16 students), you can assign the extra buyers low-valued (\$2 - \$4) units. Because these units do not trade at the competitive equilibrium, the market predictions do not change. Alternatively, you can add higher-valued buyers to each market (distributing the values among the range of demand possibilities). In this case, the number of units offered for sale (and possibly the number of traders) must be modified so that prices are equated between markets when each trader purchases a unit in the thick market and sells it in the thin-market. For smaller classes, the lowest-valued units (\$3) may be removed, or buyers may be allowed to purchase more than one unit by giving each student an additional playing card. The instructions in the appendix show how to implement this change.

### *Pit Market Procedures*

With larger classes, it is possible to use students as buyers and sellers who negotiate prices in a trading pit. Detailed instructions for conducting a classroom pit market are contained in Holt (1996). The demand functions are the same as those described above, but supply is determined by sellers' costs, specified using playing cards. We use numbered black cards (clubs or spades) to indicate costs, e.g. a 3 of clubs represents a cost of \$3 for producing a single unit. Production costs are not incurred unless a unit is actually sold, in which case the seller earns the difference between the sales price and the unit cost. The classroom experiment to be described used nine sellers with costs of 4, 4, and 10 in the thin market and 2, 2, 2, 2, 3, and 3 in the thick market. These costs, arranged from low to high, determine the supply functions indicated by the dashed lines in Figure 1, with market clearing prices that match those of the auction markets described above: \$4-\$5 in the thick market and \$8-\$9 in the thin market.

The trading is initiated by asking students to keep their cards private and come to two corners of the room, one for each market. Before traders are introduced, the two markets can open at the same time, which saves time. There is a separate reporting table for each market, with the instructor or an assistant at each table to report and announce transaction prices as they occur. Once in the trading pit, buyers can call out bids to purchase a single unit, and sellers can

call out asking prices to sell a single unit. In this way, students negotiate freely standing around in a group. When a buyer and a seller have agreed on a price, they come to the table designated for their market to report the price, waiting in line in pairs if there is a queue. The instructor or an assistant should check to be sure that the price is no greater than the number on the buyer's card and no lower than the number on the seller's card (otherwise, the buyer and seller are sent back to the trading pit). Once a trade is verified, it is announced loudly and written on the blackboard next to the name of the market (blue or green). Then the person at the reporting table takes the cards and sends the buyer and seller back to their seats to record their earnings. This recording is facilitated by the record sheet contained in Holt (1996). These instructions and record sheets can also be downloaded from the web, at <http://theweb.badm.sc.edu/laury>.

Speculation across the pit markets can be allowed by letting two observers come in as traders, or by assigning the low-valued buyer in each market to be traders. As before, traders are given a capital endowment of \$20 and instructed to purchase no more than a single unit. Instructions for these traders are provided at the end of the appendix. A trader may fail to sell a unit purchased in the previous phase of the market. In this case, the unit may not be carried over into the next period, and the trader incurs a loss equal to the purchase price of the unit. When inter-market trade is allowed, each of the two traders should purchase one unit in the thick market, which opens first, and sell it in the thin market. This speculation shifts out demand in the thick market and supply in the thin market, equating the competitive prices in the \$6-\$7 range.

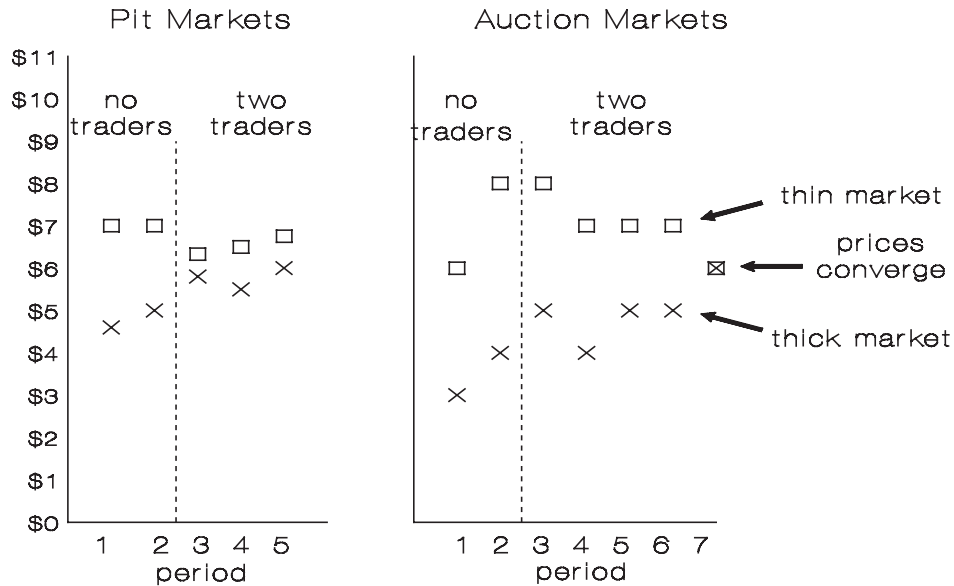
For smaller classes, we suggest that you use the fixed-supply setup described in the previous section. For larger classes, buyers and sellers can be assigned additional extra-marginal units (low values and high costs) without changing the competitive outcomes. As in the fixed-supply design, if additional intra-marginal (low-cost and high-value) units are assigned, care should be taken that the number of traders is sufficient to equate prices between markets when trade is allowed.

In both the auction and pit-market designs, prices should reach the competitive levels in two or three periods. After introducing traders, several more trading periods should be conducted in sequence (first trading in the thick market, then in the thin market). If time is running short, you may need to end trading before prices converge. Be sure to leave at least 15 minutes for

discussion.

### 3. Discussion

It is useful to discuss prices in the two separate markets before considering the effects of speculative trading across markets. We will summarize a typical adjustment pattern, and then consider how the subsequent questions and class discussion might be structured. Figure 2 shows



**Figure 2.** Average Prices for the Thin Markets (□) and for the Thick Markets (×)

the average prices for seven auction periods for one class (on the right), and for five periods of pit market trading for another (on the left).<sup>3</sup> Recall that the competitive prediction is for a price of \$8-\$9 in the thin market, and \$4-\$5 in the thick market. In each period, the average price in the thin market is shown by an open box, and the average price in the thick market is shown by an X. Notice that prices tend to separate in periods without traders and converge in the periods with traders. In particular, consider the first two periods of pit-market trading, those without speculation. The average prices in the thin market are \$7, considerably above the \$4-\$5 price

<sup>3</sup> The auction was conducted in a class of 9 undergraduate students at the University of South Carolina. Each buyer could purchase up to two units. Two low-valued (\$2) units were added to demand in the thick market. The pit-market trading involved 24 graduate students at the University of Virginia. One low-valued (\$3) unit was removed from demand in the thin market. Both changes involved extra-marginal units, so the competitive prediction was not affected.

that was typical in the thick market. It is interesting that there were many more buyers calling out bids than sellers calling out asks in the thin market; this was due to the excess demand in that market at the relatively low prices where trading started. The sellers feigned indifference and acted like there was no hurry, and one seller even turned her back on the others for several seconds. These efforts were not successful in raising prices to the competitive levels.<sup>4</sup> Sellers in the thick market tried to collude (against the instructor's admonition), but this failed.

Next, compare what happened in the two pit markets following the introduction of traders in period 3. Prices in the thin market declined slightly and stayed in the \$6-\$7 competitive band predicted with speculation, whereas prices in the thick market rose from an average of \$5 in period 2 to an average of \$6 in period 5. Prices took several periods to converge in the auction market because one trader was unable to purchase a unit until the final trading period.<sup>5</sup>

The costs, values, and transactions prices for both pit markets are shown in Table 1. Notice that traders purchased two units and displaced the buyers with marginal resale values (\$6 and \$5), except in period 4 where the \$6 resale value buyer made a purchase instead of the buyer with the \$7 resale value. Furthermore, all of the gains from trade were realized in period 5, as the buyers with \$6 and \$5 resale values were excluded from the thick market; these units went to the "right" buyers who had previously been excluded in the other market, i.e. those with resale values of \$8 and \$7. Because these latter two buyers were unable to make purchases prior to the introduction of cross-market trade, the gain from the addition of these buyers is  $\$7 + \$8 = \$15$ . This gain more than offsets the loss of buyer value of  $\$5 + \$6 = \$11$  in the thick market, as the price increase excluded these two marginal buyers there. There is, of course, no change in total production costs, because the same units are produced as before: all six units in the thick market

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<sup>4</sup> The failure of prices to rise to the competitive prediction of \$8-\$9 in the thin market was probably caused by the cost-structure that was used. Previous research experiments have shown that price convergence is influenced by the relative magnitudes of consumer and producer surplus at the competitive price. The two low-cost units in the thin market yielded a large producer surplus, which typically causes prices to converge from below in double-auction experiments (see the discussion and references in Davis and Holt, 1993, chapter 3). A design with seller costs of \$6, \$7, and \$10 in this market would produce symmetric consumer and producer surplus.

<sup>5</sup> This illustrates the need to set the initial capital endowment high enough so that a trader who loses money on a transaction is not excluded from the market. In the auction market reported here, traders were given an initial endowment of only \$10. When one trader lost \$4 on an initial contract, he could not bid more than \$6 (the amount of his remaining capital) in subsequent rounds. He was unable to purchase a unit with this bid, which kept prices from equalizing. This problem was noticed before period 7, and his capital endowment was increased.



and the two low-cost units in the thin market. How this gain in value is divided between buyers and sellers depends on the actual transactions prices.

The discussion should begin by asking why prices were higher in the thin market, which should bring the obvious response that there is a scarcity there (only 2 units in the auction setup; alternatively, there are fewer sellers in the pit market setup). Then announce the buyers' card numbers (and sellers' card numbers in the pit market setup). These card numbers should be read from the actual cards, *in no particular order*. Then ask why the prices converged to the levels observed. This question is more difficult for students; they will typically not recognize the application of supply and demand, especially in the pit market setup with both buyers and sellers. Here you may need to lead a little, to help them discover how to apply supply and demand in this particular case with discrete units.

In the highest-rejected-bid auction, they will have to figure out that the optimal bid is one's own resale value.<sup>6</sup> Noting that bids above value are not permitted, ask if it optimal to bid below value. Someone will say yes, and ask them for an example in which more money is earned by bidding below value. The discussion of examples will make it clear that bidding below value does not lower the price this person pays, which is the highest rejected bid. Then ask if bidding below value can ever cause regret. The answer is that this bidder might lose a purchase that would have been profitable with a bid at resale value. It helps to write the numbers being used in the discussion on a vertical price line on the blackboard, with the buyer's reservation value marked clearly. Finally, the relationship between bidding at value and the market clearing (competitive) price needs to be brought out by questions.

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<sup>6</sup> It is possible that some buyers may discover this on their own. In the auction session reported here, one buyer questioned after the first round why she would ever want to bid less than her value. It is best to defer the answer to such questions until the discussion period. You can then start the discussion of this issue with that student's observation.

Table 1. Transactions Record for Two Pit Markets

Key: An asterisk (\*) denotes an inefficient buyer inclusion.

	Thick Market			Thin Market		
	cost	value	price	cost	value	price
period 1	3	9	6	4	8*	6
	2	6	5	4	10	8
	3	10	5			
	2	5	4			
	2	7	5			
	2	4*	3			
period 2	2	8	6	4	8*	7
	3	10	5	4	10	7
	3	7	5			
	2	9	5			
	2	6	5			
	2	4*	4			
period 3	3	10	6	4	8	6
	2	8	5	4	10	6
	3	9	5	trader	9	7
	2	7	5			
	2	trader	7			
	2	trader	7			
period 4	2	9	5	trader	9	7
	2	trader	5	4	10	6
	3	trader	6	4	8	6
	2	6*	5	trader	7	6
	3	10	6			
	2	8	6			
period 5	3	8	6	4	10	7
	2	9	5	4	9	7
	2	10	6	trader	8	7
	3	7	6	trader	7	6
	2	trader	7			
	2	trader	6			

In the pit market version, you can lead them toward supply and demand by considering

a specific price that came up in a student's answer and asking whether there are more interested buyers or more interested sellers at that price. Students should then consider how this imbalance is likely to affect the price level. At this point, asking where the price will end up usually generates the right answer, although teasing out the supply and demand reasoning may be slower for some classes than for others.

Having data for two different market structures can be quite helpful for the evaluation of *ad hoc* explanations of what determines price levels. These stories can generally be made to fit what happened in one market but not in both. For example, a conjecture that price should be several dollars above cost would work in the thick market but not in the thin market. You can also discuss imbalances of bids and asks that might occur if prices start too high or too low in one of the markets.

After students understand how prices are determined in the isolated markets, you can turn to the effects of trade. Follow-up questions can address the reasons for trade across markets in this context. By now, students should realize that there are profits available to traders who buy in the low-priced market and sell in the high-priced market. The subsequent discussion therefore can emphasize how trade affects prices, and the reasons for this. Try to get your students to relate their intuitive answers to shifts in demand in the low-price market and the resulting increase in supply when traders enter the high-priced market. Questions about whether profit opportunities persist should make it clear that prices will tend to equalize. Next ask what buyers in each market will think about the advent of speculation. The answer should pick up the fact that buyers benefit when prices fall and suffer when prices rise, and the reverse is true for sellers. The obvious question, then, is whether the gains of one group more than offset the losses of another. This is a much more subtle issue for students, and you will have to focus the discussion on total earnings of the group as a whole. Recall that the same units are produced as before trade, so there is no change in production costs. However, the inclusion of the high-value buyers (\$7 and \$8) in the thin market more than offsets the exclusion of the low-value buyers (\$5 and \$6) in the thick market, for a net gain of  $\$7 + \$8 - \$5 - \$6 = \$4$ . This may seem like a small amount, so express it as a percentage of the total earnings (sum of buyer and seller surplus), and discuss what this percentage might mean at the economy-wide level when trade barriers are removed, for example. Finally the gains from trade should be related to the surplus area in the

supply and demand figure.

You should point out that the increased efficiency comes at the expense of buyers in the thick market, who pay a higher price (or are shut out of the market entirely), and sellers in the thin market, who receive a lower price. This is one reason why free trade can be controversial, especially when it is difficult to see other gains from trade (reduced prices in other markets or gains due to comparative advantage, for example). Finally, note that the speculators make profits without producing any real goods, and ask how efficiency can arise as a result of such "unproductive" activity.

The tendency for prices to equalize is sometimes referred to as the Law of One Price in textbooks. While this exercise demonstrates its predictive power in a simple market, you might ask for conditions under which this Law may not hold. For example, does California wine cost the same in California and Japan? This should induce people to mention transportation costs. Understanding can be improved by considering the effect of a \$1 cost of moving a unit from the thick market to the thin market.

#### **4. Further Reading**

Miller, Plott, and Smith (1977) conducted the first laboratory experiment in which traders or speculators were allowed to buy in one market and sell in a subsequent market. Unlike the exercise described here, the supply curve was stationary, and the demand shifted in and out in alternating "seasons." In each session, some subset of participants were given the right to purchase in the initial low-demand (low-price) season and sell in the high-demand season. With double-auction trading similar to the pit market setup in this paper, speculation causes seasonal price differences to diminish rapidly over time, with a consequent increase in market efficiency. Similar results are reported by Williams (1979), and for markets with different locations, by Plott and Uhl (1981). Convergence to an intertemporal competitive equilibrium was less dramatic when both supply and demand shifted between seasons (Williams and Smith, 1984). Some of this literature is surveyed in Plott (1989) and Holt (1995).

## Appendix: Instructions

*Auction Instructions.* Changes for the two-unit version are bracketed and italicized in the instructions that follow.

Today we will have a market in which the people on my right are buyers in the Blue Region and the people on my left are buyers in the Green Region. Notice: all of you today are buyers. I will now give each of you a numbered playing card. Please hold your card so that others do not see the number. Each card represents the value to you of one unit of an unspecified commodity that may be bought in today's market.

You can each buy one unit [*up to two units*] of the commodity during a trading period [*(one unit for each card you hold)*]. The number on your card is the dollar value that you receive if you make a purchase. You will be required to buy at a price that is no higher than the value number on the card. Your earnings on the purchase are calculated as the difference between the value number on the card and the purchase price that you negotiate. For example, if you have a 10 and you purchase 1 unit at a price of \$6, your earnings are  $(10 - 6) = \$4$ . [*If you buy only one unit of the commodity, you receive the highest of the two values on your playing cards. For example, if you have a 10 and an 8 and you purchase 1 unit at a price of \$6 your earnings are \$4.*] If you do not make a purchase, you do not earn anything in the period. Think of it this way: it's as if you knew someone who would later buy the unit from you at a price that equals your value number, so you can keep the difference if you are able to buy the unit at a price that is below the resale value.

TRADING RULES. In the Blue Market there are six units available for sale, and in the Green Market there are 2 units available for sale. In order to purchase units, you will make written bids to purchase units of the good. The bid you submit should represent the maximum price you are willing to pay for a given unit. [*You can submit different bids for each unit of the good (for example, \$10 for the first unit and \$9 for the second unit -- remember the first unit you purchase is worth more to you, so the bid for the second unit should never be higher than for the first). Or, you can submit the same bid for both units of the good (for example, \$10 for two units of the good).*]

After everyone has submitted their bids, I will place all Blue Market bids in order from highest to lowest. The highest six bids will each obtain a unit of the good. The price of the good will be equal to the seventh highest bid. Thus, no one will pay a price any higher than the amount submitted in their bid (and the actual purchase price may be lower). In case of a tie, winners will be randomly drawn from all tied bids. The price will be equal to this (lowest) tied bid.

For example, if the bids were: \$10, \$10, \$10, \$9, \$9, \$8, \$8, \$7, the highest six bids correspond to \$10 through \$8. However, only one of the \$8 bids will receive the good (because there are seven bids at this level). The price of the good would be \$8. On the other hand, if the bids were: \$10, \$10, \$10, \$9, \$9, \$8, \$7, \$7 all of those who bid \$10 through \$8 (the highest

six bids) would receive units of the good at a price of \$7 (the seventh highest bid).

In the Green Market, bids will also be ordered, however only the highest 2 bidders will receive units of the good. The price of the good will be equal to the third highest bid. Thus, no one will pay a price any higher than the amount submitted in their bid (and the actual purchase price may be lower). Ties will be handled as in the Blue Market.

Some buyers with low values may not be able to purchase a unit, but do not be discouraged. New cards will be passed out at the beginning of the next period. Remember that earnings are zero for any unit not bought (buyers receive no value).

**Note:** You will not be earning any money in this experiment!

### Buyer Record Sheet

period 1		-	
	(value)		(price)
		=	(earnings)
period 2			
	(value)		(price)
		=	(earnings)
	total earnings all periods:		

### *Trader Instructions (Auction Market)*

For the next several periods, one buyer from each market (Blue and Green) will act as a trader. These traders are able to both buy and sell units, as described below.

Blue and Green trading will now be conducted in sequence (first trading in the Blue market and then trading in the Green market). Traders will be given an initial capital endowment of \$20. They may use all or part of this money to purchase units of the good.

Traders are each allowed to purchase one unit in the Blue market. In this market, a trader may submit a bid to buy as before. However, the trader's value of the good is not yet known - it depends upon the (uncertain) price at which the good is sold in the next market. If a trader's bid is successful then the trader has one unit of the good to sell in the Green market. The trader's capital endowment will be reduced by the purchase price of this unit.

Any units purchased in the Blue market will be added to the existing supply in the Green market. If one trader purchases a unit of the good in the Blue market, there will be three units for sale in the Green market (the two units currently offered by me, and one unit from the trader). The three highest bidders will purchase units at a price equal to the fourth highest bid. If both traders purchase one unit in the Blue market, there will be two additional units available for sale in the Green market. Thus the four highest bidders will purchase units at a price equal

to the fifth highest bid.

After sales have been made in this market, the trader's capital endowment is increased by the sales price of this unit. If the sales price is higher than the amount the trader paid for the unit, then the trader earns a profit on this unit. For example, if a trader buys a unit at a price of \$9 and sells it at a price of \$10, this trader's capital stock is increased by \$1. If the sales price is lower than the amount the trader paid for the unit then the trader earns a loss on this unit. For example, if a trader buys a unit at a price of \$10 and sells it at a price of \$9, this trader's capital stock is decreased by \$1. Traders earn a profit by purchasing at a low price and selling at a high price.

At no time may a trader submit a bid to buy a unit for more than the amount in the current capital stock.

### Trader Record Sheet

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period 1	_____		_____		_____		_____
	(initial capital)	-	(purchase price)	+	(sales price)	=	(final capital)
period 2	_____		_____		_____		_____
	(initial capital)	-	(purchase price)	+	(sales price)	=	(final capital)
	total earnings all periods:						

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*Pit Market Instructions.* For the pit market, use the instructions included in Holt (1996), together with the trader instructions below.

For the next several periods, one buyer from each market (Blue and Green) will act as a traders. These traders are able to both buy and sell units, as described below.

Blue and Green trading will now be conducted in sequence (first trading in the Blue market and then trading in the Green market). Traders will be given an initial capital endowment of \$20. They may use all or part of this money to purchase units of the good.

Traders are each allowed to purchase one unit in the Blue market. In this market, traders negotiate contracts as before. However, the trader's value of the good is not yet known -- it depends upon the (uncertain) price at which the good is sold in the next market. If a trader purchases a unit in the Blue market, then the trader has one unit of the good to sell in the Green market. The trader's capital endowment will be reduced by the purchase price of this unit. At no time may a trader buy a unit for a price greater than the amount in the current capital stock.

Traders who purchase units in the Blue market may then enter the Green market as sellers. They are free to negotiate a sales price with any of the Green market buyers. If a trader sells a unit in the Green market, the trader's capital endowment is increased by the sales price of this unit. If the sales price is higher than the amount the trader paid for the unit then the trader earns a profit on this unit. For example, if a trader buys a unit at a price of \$9 and sells it at a price of \$10, this trader's capital stock is increased by \$1. If the sales price is lower than the amount the trader paid for the unit then the trader earns a loss on this unit. For example, if a trader buys a unit at a price of \$10 and sells it at a price of \$9, this trader's capital stock is decreased by \$1. Traders earn a profit by purchasing at a low price and selling at a high price.

If a trader purchases a unit in the Blue market, but does not sell it in the Green market, the unit "expires" and the trader earns a loss equal to the purchase price of the unit. In other words, a unit purchased in one round cannot be sold in any other round.

### Trader Record Sheet

period 1							
	(initial capital)	-	(purchase price)	+	(sales price)	=	(final capital)
period 2							
	(initial capital)	-	(purchase price)	+	(sales price)	=	(final capital)
	total earnings all periods:						

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