

Learning Market Skills Through Simulation

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Recently there has been a growing interest in business games, experiments, and simulations. Some research papers have been published in an attempt to provide an introduction to experimental methods, an assessment of available methods and the usefulness of these methods to economic education (Chamberlin, 1948; Smith 1981). The emphasis has been on using the gaming technique as a teaching device and in make the play of the game interesting for the participants. The focus has been also on using game situations as a research tool for studying the behavior of human behavior in conflict situations (Andlinger, 1958; Belman, 1957; Chamberlin, 1948; Smith, 1962). In particular, the field of experimental economics has experienced substantial development during the last two decades. Economic experiments can enable not only the testing of theories, but they also can create Artificial market situations that can be used in the classroom to examine alternative economic structures (Hoggat, 1959; Smith, 1991; Johnson and Johnson, 1989; Walker, 1987).

Myron and Saunders (1970) were among the first to publish an account of how to use experiments to teach basic economics concepts. Lewis and Wentworth (1971) published *Guide to Games and Simulations for Teaching Economics* with a reference to about ninety different activities and publications. Hemenway, Moore, and Whitney (1987) describe games that can be played in one class period. *Games, Strategies, and Managers* by John McMillan (1992) is an excellent tool to learn more about auctions and bargaining.

The simulation presented in this paper is an attempt to model a portion of reality at the level understandable to undergraduate students. It is designed to help students understand concepts such as

barter, shortages and surpluses, and the role of supply and demand forces in determining the equilibrium in a given market. It also provides a basis for analyzing the differences under competitive versus non-competitive conditions, studying monopoly and monopsony situations, and determining the value of the information and accounting in a variety of business operations. In its basic structure as a barter market, the simulation illustrates the difference between wealth and money and shows students the importance of money in developed markets.

Another benefit of this simulation is that it allows student to discover and practice personal skills and test these skills in a market context. Some of these skills are directly applicable to the entrepreneur, such as initiative, problem solving, and self-confidence. Many students who lack practice in thinking, reasoning, and problem solving can develop those skills during this simulation. The students' experience with the simulation can help develop an appreciation of entrepreneurship.

A simple barter simulation

This simulation is unique since it is the first simulation presented in the available economic literature that is based on a simple barter economy. Individual traders are asked to obtain a set of goods by trading within a larger set of goods. Each participant may be an individual or a group. The total of all goods available from all participants and all goods demanded by the participants reflects the supply/demand characteristics in a barter economy. It is not necessary that every item exists equal to its demand. Items in the market, therefore, can be in surplus or shortage, and participants may even have monopoly and monopsony positions, just as in the real world. These characteristics of the simulation compel participants to seek out relevant information and act upon it even when it is incomplete. Students discover that more trading creates better information flow among traders so that prices converge to equilibrium levels.

Prices in a barter economy are expressed in terms of an amount of Commodity X exchanged for an amount of Commodity Y. Students learn the importance of establishing prices and working with those discovered multiple prices. The use of a barter market allows students to recognize that wealth and money are indeed two different concepts. Even without the presence of money, it is possible to establish prices as the ratios of the commodities being traded. For example, in a market with six commodities, there are at least 15 different prices, as shown in the diagram below.

Each commodity, C1 to C6, has a price relative to each other commodity. This exchange ratio allows trade to occur, and wealth can be transferred between the players without the use of money. This differentiation between wealth and money illustrates to the students that the creation of wealth is not a monetary phenomenon. Wealth is generated through the creation of goods and services demanded by others. This is an important lesson for any business person, but especially for the entrepreneur.

Students learn that there are costs associated with using barter rather than using money, particularly the costs in time spent searching out advantageous trades. Barter requires a matching of people and needs, which can be very difficult to achieve. There can be a serious coordination problem for the organization of production and consumption when barter is the main form of exchange. This requires students to solve the problem of making the market more user friendly.

The simple barter simulation allows students to experience different market conditions for the various goods being traded. Students discover that with the shortages it is difficult to receive all of the desired quantities of items. Since prices are relative to the other items in the market, students are forced to recognize price as something more than just a monetary value. The prices paid for items where a shortage exists rise during the course of the simulation. Similarly, surpluses lower the price level. It is possible to structure simulations in such a way that all traders will have both monopoly and monopsony positions. Being a monopoly or monopsony position

allows traders to discover the importance of identifying market positions early in the simulation.

A constrained market with money simulation

It is possible to introduce money into the simulation so that

students learn that money creates a basis for pricing commodities that was not present under barter conditions. The diagram below illustrates how the existence of the additional commodity called money simplifies market pricing. In a six item barter market, the minimum number of prices possible is fifteen. In a six item market with money, the minimum number of prices is six.

Students discover that money is useful so that more exact, market-clearing pricing is possible. When money is used in a simulation, it is much easier to determine a fair price for each good. Money also helps to improve the flow of trade. Money allows a buyer to acquire the goods he wants without having to find someone who wants to trade with him for the goods he had. Students learn that money is a unit of account. It serves as the way in which we keep account of who has a claim on what resources.

Students recognize that money as a unit of account provides for a common denominator for using prices to establish wealth. Traders in the simulation, like households, make independent decisions about how much money to hold along with a variety of other commodities that they purchased during market simulation. By working through the simulation and more complex renderings of the market, students learn about the functioning of the market and develop skills that will make them more successful in market situations.

This simulation shows the value of money to a trading economy, but it must be recognized that the market as specified does not yet mirror actual markets. In the real world, traders are allowed to substitute goods. If one commodity is not available, another can be used in its stead. This type of dynamic substitution market would require a set of goods that were close substitutes, and students would have to be given substitution ratios or develop them on their own.

For pedagogical purposes, a dynamic substitution market would require students who are already sophisticated in identifying market information as an aid to market behavior. It would also be necessary to create markets with more than a few substitutable items and provide longer periods for learning in the market. The simulation

described here was designed to introduce students to basic market concepts and illustrate their operation. A market with dynamic substitution is thus a logical extension of these simulations, although time and space constraints prevent that in this note.

Structure of the simulation

The class is divided into six families (participants). Each student is randomly assigned to a family, which in larger classes may result in three to five students per family. The use of six different trading families with different goods and needs creates enough possible combinations of buyers and sellers to force students to actively seek market information. In very large classes, it is possible to form twelve families by doubling the number of trading lists. The doubling will be unnoticed in the activity of the market.

The use of three to five students within a family requires that the family achieve some level of competency with its internal communications. First-time players often find that their failure to develop effective information gathering and internal communications techniques limits their ability to be successful. This is another of the lessons that is valuable to anyone in the business of business.

At the beginning of the simulation, each family is presented with supply/demand sheets. An example of the six individual trading lists used in a simple barter simulation is presented in Table 1, and the master matrix showing the overall structure of the simulation is presented in Table 2.

It is explained to the students that the goal of the simulation is for each family to maximize its individual wealth. Since the goal is wealth maximization in a barter market, each family is to try to get as many *Athings* as possible. All items brought into the market should be traded away for other *Athings*. The students are not informed of the underlying surplus or shortage of goods since any such information could influence the actions and trading behavior of the participants. The absence of money does not make *Awealth*

maximization@ impossible, it merely redefines wealth away from the concept of money.

After the families have a chance to ask questions and make sure they understand the instructions, the simulation is started. When the market opens, everyone is free to circulate and make trades at any time consistent with each family=s supply of goods and specified needs. The role of the instructor is to facilitate the way in which individuals conduct themselves during the simulation. Throughout the

Table 1. Individual Trading Lists

To Trade	Family: Amy			Needs	To Trade	Family: Bob			Needs
Duck	200	Chicken		180	Duck	150	Chicken		180
Goose	120	Cardinal		750	Cardinal	160	Goose		60
Robin	120	Parrot		90	Parrot	300	Robin		80
Sea Gull	150	Crow		30	Sea Gull	150	Crow		30
Titmouse	240	Blue Jay		80	Titmouse	240	Blue Jay		80
Canary	90	Pigeon		180	Pigeon	300	Canary		90
To Trade	Family: Carrie			Needs	To Trade	Family: Daniel			Needs
Duck	150	Chicken		240	Chicken	120	Duck		300
Goose	80	Cardinal		750	Cardinal	160	Goose		60
Robin	120	Parrot		60	Parrot	180	Robin		60
Crow	150	Sea Gull		80	Sea Gull	100	Crow		20
Blue Jay	200	Titmouse		320	Blue Jay	200	Titmouse		480
Pigeon	180	Canary		120	Canary	120	Pigeon		180
To Trade	Family: Ellen			Needs	To Trade	Family: Fred			Needs
Chicken	90	Duck		300	Chicken	90	Duck		400
Cardinal	240	Goose		90	Cardinal	240	Goose		90
Robin	160	Parrot		150	Parrot	120	Robin		60
Crow	150	Sea Gull		120	Sea Gull	100	Crow		20
Titmouse	160	Blue Jay		120	Titmouse	160	Blue Jay		120
Canary	90	Pigeon		240	Pigeon	120	Canary		90

Table 2
Supply/Demand Master Matrix

<u>Item</u>	<u>Supplied</u>	<u>Quantity Demanded</u>	<u>Market Status</u>
Duck	500	1,000	Shortage
Chicken	300	600	Shortage
Goose	200	300	Shortage
Cardinal	800	1,500	Shortage
Parrot	600	300	Surplus
Robin	400	200	Surplus
Crow	300	100	Surplus
Sea Gull	500	200	Surplus
Blue Jay	400	400	Even
Titmouse	800	800	Even
Canary	300	300	Even
Pigeon	600	600	Even

simulation, the instructor circulates among the participants, observes trading, listens to negotiations and trade offers, offers suggestions where they seem appropriate, and provides support to the participants.

Trading continues until the close of the trades is announced by the instructor. The close of trading is determined by two factors. In many cases, the market begins to exhaust itself as trades are completed, and the instructor closes the market at that point. Even if there is active trading, however, the instructor must close the market early enough to allow sufficient time for review of the lessons learned during the simulation.

At the end of the trading session, each family reports what it has, including items successfully traded for and items not yet traded away. The success or failure of each family is determined in two ways. First, families could be identified as winners or losers by determining whether or not they were able to meet their individual needs. Families that collect all the needed items, and maybe extras, win over families who could not meet their basic needs. A second measure of individual success considers the initial wealth position of each participant. Families that start out with more wealth, in the form of shortage goods, should be expected to end with more wealth, and vice versa.

The review session is characterized by student participation. When the instructor asks the right questions, students want to tell of their experiences and observations. Students are able to identify the major characteristics of the market and the problems that exist within the market. A review of accounting and bookkeeping shows that these activities, which are usually disdained by students, have practical applications in the wider economic structures. Students discuss their strategies in the simulation and whether or not they were successful. The importance of planning for the economic structure and adapting

to its changes reveals the need for flexibility and adaptability. The students can analyze the importance of communications, the lack or presence of market power, and the availability of information. This review allows students to put concepts into their context, deepening their understanding of the ways that markets function.

Conclusions

Classroom experience suggests that the simulation provides substantial benefits for the students. This simulation gives students a real educational experience and makes economic theory more meaningful. The simulation also increases the students' motivation and learning, provides an active and enjoyable learning experience on market processes, and creates an intellectual environment that can improve attitudes towards learning. The simulation thus provides a more dynamic environment than is usually employed in the classroom. Such broad simulations develop skills that prepare students for the world beyond school.

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