THE ROLE OF ELECTRONIC COMMUNICATIONS SYSTEMS IN STABILIZING MARKETS

James E. Epperson

This paper addresses the potential of electronic communications systems to advance the goal of stabilizing commodity markets. Developments in electronic communications are based on the desire for information to conduct economic enterprise and improve the quality of life. However, the technology for low-cost distribution of market information on a large scale is of recent vintage.

Telecommunication and computer technology expedites the accumulation, processing, storage, and dissemination of information. Moreover, this technology continues to improve and decline in cost at a rapid pace.

All segments of the economy are affected by the increasing influx of low-cost information -- including the agricultural sector. Both production and marketing efforts are benefiting from the improvements in information systems. Agricultural producers and agribusiness can receive information via telephone or satellite from any number of large computerized data bases to assist in production and marketing decisions. The information may already be processed for decision making or raw data for evaluation on personal computers.

The same innovations in low-cost telecommunication and computer technology have allowed the rapid development of electronic marketing which goes beyond fast accumulation and distribution of information. Electronic marketing actually generates quality market information through the price discovery process for agricultural commodities facilitated by telecommunications and more recently computer hardware and software applications.

Most writers on the subject of electronic marketing point to the early 1960s as the time of its inception with the initiation of a teletype network in Canada for selling slaughter hogs. As Henderson points out, however, the first evidence of an electronic market, called Selevision, for Florida citrus fruit in the 1940s was recorded by Cassiday. Immediately after the teletype marketing system began operating in Canada, telephone auctions (teleauctions) for livestock began to spring up in the U.S. In 1975 the first computerized marketing system, called TELCOT, for trading cotton began and continues to operate successfully.

Because of the numerous market benefits ascribed to electronic marketing, the U.S. Department of Agriculture initiated and supported several pilot computerized marketing projects in 1978. ECI which manually matched bids and offers via telephone for eggs was computerized through the USDA program. NEMA was formed as a computerized market for lambs from a teleauction in Virginia. Computerized marketing systems for slaughter hogs, called HAMS, and feeder cattle, CATTLEX, were created. And, a computer assisted trading system (CATS) for meat was also initiated.

The alleged benefits from electronic marketing may be obvious from the way it is characterized -- organized trading by description, a centralized market, yet remote access through telecommunications. Trading follows a set format with rules and regulations to accommodate many buyers and sellers trading, as a whole, substantial volumes of agricultural commodities through a centralized system which embodies a price discovery operation such as some type of auction or a bid-offer process. Assembly of commodities or traders at a central location is not necessary. Direct shipment occurs at a specified time from the seller to the buyer subsequent to the sale. Thus, trading by description, sight unseen, is essential. Further, it is paramount that the description of grades be sufficiently detailed to capture the quality attributes which are important to traders. A computerized marketing system is quite useful in this regard; for example, the TELCOT system delineates over 3,000 different grades in cotton trading.

Marketing Problems

To the extent that perfect competition is a reliable benchmark for economic efficiency, there is reason for concern if a market is characterized by few buyers and sellers, a heterogeneous product, or a product whose quality attributes cannot be easily discerned by market participants, resource immobility, and limited market information. All of these factors are interrelated; however, the focus of this paper is on market information.

Agricultural markets have become increasingly decentralized through direct sales, private treaties, formula-priced contracts, and vertical integration. Cost advantages and risk reduction are apparently behind the move towards decentralization. Direct shipment from seller to buyer is less costly than shipping to a central market assembly point for shipment subsequent to sale to a buyer. Direct coordination between a buyer and a seller can be less risky than trading via the old central terminal markets for the buyer and seller. Direct coordination

allows the buyer to specify in advance quantity, quality, and time of delivery. The seller benefits from advanced knowledge of the required specifications and the knowledge that the transaction agreement is virtually certain.

The motivation for private treaties between buyers and sellers is economically sound. Under such circumstances, however, price discovery becomes suspect. How can a competitive equilibrium price be negotiated without a central market which generates and disseminates the same accurate market information to many buyers and sellers? Thus, a new element of uncertainty is introduced with the advent of widespread decentralized agricultural markets -- the uncertainty of a fair price.

National agricultural commodity markets in reality are spatially dispersed (geographically disparate) submarkets. Typically, competitive sellers face oligopsonistic buyers. Nationally, market structure may appear competitive as there are several buyers per commodity market in the United States. However, this is misleading as the number of buyers per submarket becomes few because of spatial dispersion. Few buyers and many sellers in a market results in asymmetry of market information and power. Without a centralized market, the search for additional market information and buyers is time consuming and costly. If the expected added costs of acquiring additional information exceeds the expected increased revenue such new information would provide, the information search is curtailed, reinforcing submarkets.

Expected Benefits from More Perfect Information

An electronic market is organized involving a central, open price discovery mechanism and decentralization of geographically dispersed market traders and commodities. As such, it possesses not only the potential advantage of a highly competitive market arena but also the cost advantage of direct sales. An electronic market is expected to be more stable, characterized by less uncertainty, than are conventional markets for agricultural commodities. In addition, forward contracting via a computerized system is expected to retain the same risk management advantage of direct coordination by one-on-one private treaty between buyers and sellers without the risk of accepting an unfair price.

Given the structure of U.S. agricultural markets as briefly described, the key to more stable, thus less uncertain, market prices is more accurate and uniformly distributed market information. The highly competitive setting of a computerized marketing system should generate accurate market information and distribute this information uniformly to all traders instantaneously. All traders are aware of many more transaction alternatives; thus, the oligopsony of submarkets is broken.

Trader behavior is influenced by the quantity and quality of available market information. Risk averse sellers will offer commodities at prices below that which would maximize expected unit profit; they may lower their higher initial offers quickly, sending signals to buyers that sellers will accept even lower bids. Risk averse buyers will tend to bid for commodities at higher prices than that which would maximize expected unit profit; they may raise their lower initial offers quickly, sending signals to sellers that buyers will accept even higher offers. Thus, if sellers are generally more risk averse than buyers, market clearing prices will tend to be below the competitive equilibrium level. Further, if there are great differences in risk averseness among buyers or among sellers, bargaining strength tends to differ substantially among transactions. As a result, short-run price variablility is greater than would otherwise be if traders were similar in risk preferences.

The impacts of risk averseness and variable risk preferences are reduced substantially with increased availability of market information. Current, accurate information, uniformly distributed, reduces perceived risk and tends to cause risk-averse, risk-seeking, and risk-neutral choices to converge. Thus, market stability and efficiency is improved.

A stable, efficient market in the short run should generate a distribution of prices with low variance which are unbiased estimates of the competitive equilibrium. Short-run prices should adjust immediately to the arrival of information instantaneously available to all traders in the market. This sensitivity of price to new information should be reflected by numerous but small changes in price evenly distributed about the mean. Further, price changes in a more sensitive market should lead price changes in a less sensitive market for the same commodity. Also, prices in a sensitive market should be less correlated with prices in previous periods than would be expected in a less sensitive market for the same commodity. These indications of stability and reduced uncertainty in a market are expected to be reflected in prices generated from electronic markets.

Empirical Evidence

Several electronic markets have been evaluated with respect to efficiency measures. Because electronic aided markets are of recent vintage, evidence for efficiency gains is scant in some respects but overwhelming in others.

Studies of ECI, NEMA, HAMS, CATTLEX, and feeder cattle teleauctions in Georgia reveal significantly higher prices on the average in these electronic markets compared to respective conventional markets. Higher prices in these electronic markets may be due to lower transaction costs, a shift in market power, a tendency toward more risk-neutral trading strategies by sellers, or a combination of these factors, all of which reflect the availability of quality information.

More recent analysis of teleauction versus auction prices for feeder cattle in Georgia showed higher probabilities of arriving at sale prices above selected reservation prices in teleauctions. Auction prices used in the comparison were for auctions nearest the location of respective teleauctions. Data were for 1977 to 1982; and all prices and costs are in 1977 dollars. The odds were 0.733 for teleauctions and 0.636 for auctions that the sale price exceeded the variable cost of production of $34.24 per cwt for 600-800 pound stockers as budgeted by McKissick and Brown. For 400-500 pound calves the variable cost of production as computed by Brown, Westberry, and Dorminey was not high enough to show probability differences. However, at higher, arbitrary reservation prices probability differences emerged. For example, at a reservation price of $41.25 per cwt the odds were 0.667 for teleauctions and 0.556 for auctions that the sale price exceeded the reservation price. The difference in odds favoring the teleauction widened as the arbitrary reservation price was increased, even to the limit of the data.

Further evaluation of ECI and HAMS showed that in the short run prices changed more often and by smaller amounts than indicated in respective conventionally reported prices. These electronic markets reflect price nervousness, ever searching for the right price.

Additional analysis of HAMS showed that price tended to be less correlated to the price on the previous day than was found in the conventional market. This indicates that HAMS was more sensitive to current events than the conventional market.

Studies concerning TELCOT and NEMA found that price changes on these electronic systems tended to lead changes in conventional price quotations. Again, the indication is that electronic markets are more sensitive to market information than conventional markets.

Conclusions and Implications

Economic theory, substantiated by empirical research, has shown the importance of full information as a vital ingredient to a stable, competitive, predictable market. Such a market is efficient, able to capture the underlying value of commodities traded to the collective benefit of all market participants. There are few if any barriers to entry into such markets.

Because electronic communication systems collect and disseminate information rapidly, they are seen as highly useful instruments for enhanced performance of agricultural markets. However, the most powerful instrument conceived thus far in this vein appears to be the electronic market.

An electronic market, especially a computerized system, with an open price discovery mechanism, not only collects and disseminates information, it also generates market information and distributes it uniformly and rapidly to all remotely accessed market traders wherever they may be located. An electronic market allows a blend of the best in marketing arrangements. The centralized open price discovery mechanism yields competitive yet nervous prices with low variance encompassing less uncertainty for market trades. Commodity decentralization allows the cost advantage of direct shipment from seller to buyer. In addition, forward contracting on the electronic system allows the same risk-management feature of private treaty market coordination without the loss of a competitively discovered price.

Structural benefits should also be forthcoming from electronic marketing. The demise of agricultural submarkets effectively reduces the concentration of buyers for each seller. In addition, small firms, whether buyers or sellers, are favorably affected by the reduction in costs involved in searching for market information in an electronic market, prompting further decreases in market concentration. Reduced market concentration perpetuates improved market performance encompassing price discovery which more nearly reflects low-variance, competitive equilibrium prices.

Evidence is mounting that electronic markets for agricultural commodities are more efficient than conventional markets. Thus, research results show that electronic markets tend to be more stable involving less risk in trader decisions.

REFERENCES

Brown, R. E., G. Westberry, and C. Dorminey. Beef Cow-Calf Enterprise Cost Analysis. Georgia Coop. Ext. Ser., Farm Management 8, Misc. Pub. No. 28, Apr. 1984.

Buccola, S. T. "Risk Preferences and Short-Run Pricing Efficiency." Amer. J. Agr. Econ. 65(1983): 587-591.

Cassidy, R., Jr. Auctions and Auctioneering. Berkeley and Los Angeles: University of California Press, 1967.

Epperson, J. E. and L. C. Moon. "The Potential for Improved Economic Efficiency in the Fresh Fruit and Vegetable Market Via Computer Technology." J. Food Distrib. Res. 9(2)(1978): 2-8.

Epperson, J. E., J. L. Adrian, and J. J. VanSickle. "Cost Analysis of Computerized Marketing of Fresh Fruits and Vegetables." HortScience. 19(1984): 22-25.

Ethridge, D. E. "A Computerized Remote-Access Commodity Market: TELCOT." South. J. Agr. Econ. 10(2)(1978): 177-182.

Helmreich, D. P., J. E. Epperson, and C. L. Huang. "The Value of Electronic Marketing -- Some Empirical Evidence." Paper presented at AAEA annual meeting, Champaign IL, 27-30 July 1980.

Henderson, D. R. and E. D. Baldwin. "Marketing Slaughter Hogs by Remote-Access Computerized Auction: Theory and Empirical Results." Paper presented at AAEA annual meeting, Clemson, SC, 26-29 July 1981.

Henderson, D. R. "Electronic Marketing in Principle and Practice." Paper presented at the AAEA annual meeting, Ithaca, NY, 5-8 August 1984.

McKissick, J, C. and R. E. Brown, Jr. Georgia Stocker - Finishing Alternatives (Fall/Winter 1983-84). Georgia Coop. Ext. Ser., Marketing and Farm Management Special Rep. 214, Aug. 1983.
Schrader, L. F. "Implications of Electronic Trading for Agricultural Prices." Paper presented at the AAEA annual meeting, Ithaca, NY, 5-8 August 1984.
Sporleder, T. L. "Policy Considerations of Emerging Information Technologies." Paper presented at the SAEA annual meeting, Nashville, TN, 6 February 1984.
Sporleder, T. L. "Implications of Electronic Trading for the Structure of Agricultural Markets." Paper presented at the AAEA annual meeting, Ithaca, NY, 5-8 August 1984.
Tomek, W. G. and K. L. Robinson. Agricultural Product Prices. Ithaca, NY: Cornell University Press, 1972.
Turner, S. C. and J. E. Epperson. Cost Analysis of Alternative Communication Systems for Computerized Agricultural Marketing. Georgia Agr. Exp. Sta. Res. Bull. No. 292, Apr. 1983.
Turner, S. C., J. E. Epperson, and S. M. Fletcher. "Producer Attitudes Toward Multicommodity Electronic Marketing." Amer. J. Agr. Econ. 65(1983): 818-822.

The author is Associate Professor, Department of Agricultural Economics, University of Georgia, Athens.