How to Enhance Market Liquidity

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EC-94-03

January 1994

In *Global Equity Markets*,
R. Schwartz (ed.), Irwin Professional.
New York: 1995.

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October 21-22, 1993

Conference on Global Equity Markets:

Technological, Competitive, and Regulatory Challenges

* I thank Kalman Cohen, Bob Wood, Bob Schwartz, and other participants of the Global Equity Markets conference for their comments and suggestions.

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How to Enhance Market Liquidity

Exchange in financial markets may be diversified in a variety of dimensions. They may differ in the attributes of the traded assets, in the location of the exchange, in the time of the transaction, and in the manner that the transaction takes place. Further, markets differ in the degree of participation of intermediaries and in the role they play in the market.

Certain aspects of diversification are inherently desirable to market participants. Some types of financial exchange diversification are necessary for the particular way that the market works, including the way in which price is discovered in the market. Still other types of diversification arise naturally out of competition among exchanges. The variety of possible organizations of financial markets allows for comparisons among them. First we need to define the criteria of evaluation.[1]

A financial exchange should be structured so as to maximize the satisfaction of participants and potential participants. This is accomplished by minimizing transaction costs, establishing market prices that accurately reflect the underlying equilibrium prices, and by reducing the uncertainty that traders face in market interactions. In a related paper, Economides and Schwartz (1993) discuss in detail how the introduction of electronic calls in the presence of a continuous market may have very significant benefits. They discuss the benefits of the call in enhancing liquidity, order handling, information revelation, market transparency, market anonymity, and avoidance of free riding. The aspect we focus in this short paper is liquidity. We will argue that call markets provide coordination of trades in the time dimension, and thus

[1] See Economides (1993a) for a discussion of a financial market as a ***network***.

increase expected profits for traders. We further discuss how to best coordinate traders in their order placement in a call market, so as to achieve the highest possible market-wide profits.[2]

Liquidity plays a crucial role in financial exchange markets. Without the availability of counter-offers, markets cease to exist and they are replaced by individualized bilateral contracts. Thus, some liquidity is necessary even for the ***existence*** of a financial exchange market. Further, high liquidity expands the set of potential counter-offers and enhances the probability of a favorable match. Thus, higher liquidity increases the expected level of satisfaction (utility) of market participants.[3] This is true irrespective of the particulars of the organization of the market. However, the realization of the enhancing role of market liquidity has very important implications on the relative benefits and drawbacks of different market organizations. Clearly, ***spatial consolidation*** of markets tends to increase liquidity. To increase liquidity further, we consider next the effects of ***time consolidation*** of markets in the form of an electronic call market.

Continuous markets tend to exhibit little inherent liquidity. In these markets, liquidity is provided to a large extent by special intermediaries, market-makers, and specialists. However, the artificial creation of liquidity increases transaction costs in such markets. In contrast, electronic call markets inherently exhibit high liquidity because they implement the bunching of orders over time and their simultaneous execution. Thus, potentially call markets can offer lower transaction costs than continuous markets.

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[2] For many non-economists, coordination to an equilibrium that is better for all traders seems utopian, if not quite impossible. However, it is truly possible to create trading environments and mechanisms that do better than other environments for all traders, i.e., are ***Pareto superior*** to other environments. Disbelief of this fact is similar to the widespread disbelief among non-economists of the fact that bilateral trade can be beneficial to all parties involved.

[3] See Economides and Siow (1985, 1988), Economides (1992).

An electronic call market may be organized as a price scan double-sided auction.[4] The call, or market clearing, happens at a pre-specified time T. Market participants are connected to the auctioneer at the exchange through a network of electronic terminals. Orders are taken by the exchange from time $t_0 < T$ up to time T. Orders without contingencies (or with contingencies that have been met) are displayed in aggregate form to all market participants.[5] Thus, in the time interval $[t_0, T]$ preceding the call, every trader is able to see the evolving aggregate demand and supply in the upcoming call market.

We model call markets in the presence of a continuous market that is functioning in parallel during the period in which orders are submitted to the call market. In deciding to participate in the electronic call, many traders accept to delay their market participation. That is, many traders have decided well before the call to trade, but wait for the call instead of sending their orders to the continuous market that is still be in operation in the interval $[t_0, T]$. In making such a choice, a trader evaluates the lower transaction fees and reduced market uncertainty in the call market in comparison with the risk of price changes during the waiting period between the decision to trade and the call. Economides and Heisler (1993b) discuss the choices of traders under these circumstances.

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[4] For a description of the specifics of the market clearing mechanism see Economides (1993b).

[5] The call market can accommodate ***stock-specific*** contingencies and ***market-wide*** contingencies. For example, a ***stock-specific*** contingency may require that the orders of an individual trader do not exceed a certain percentage of the orders on the other side of the market. A ***market-wide*** contingency may require that the after-the-call exposure of a trader in the whole market (or for a specific collection of stocks) is limited to a certain value.

It is generally assumed that market participants demand immediacy, i.e., immediate execution of their transactions. This is disputed by Economides and Schwartz (1993a) who see the present demand for immediacy less as an inherent demand but rather as an effect of the present market organization. Economides and Schwartz (1993b) develop a questionnaire (distributed through *Trader Forum* of the *Institutional Investor* in winter 1994) that attempts to evaluate the demand for immediacy by assessing how much delay traders are willing to accept in return for a reduction in transaction fees.

The extent of liquidity at the call is crucial. The more liquid the call, the more attractive it is to traders. This mechanism is self-reinforcing: the more traders participate, the more liquid the call becomes. This self-reinforcing mechanism could exist in expectations of trader participation that get realized (fulfilled) at the time of the call. That is, a large number of traders anticipate (expect) that a large number of other traders will participate in the call; therefore they themselves participate in the call, and the expectation of large participation is fulfilled. This is certainly an equilibrium, but it is hardly the only one. In fact, it is not difficult to show that ***any size of participation is an equilibrium, including zero participation***. If everyone expected no-one else to participate in the call, he wouldn't participate himself, and the market would not exist. Given the wide multiplicity of expectations equilibria, it is clear that ***there is a need to create a specific mechanism that can support a single equilibrium of large participation***.[6]

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[6] In this analysis, we use knowledge on ***network externalities*** developed in the New Theory of Industrial Organization. A ***network externality*** is a production or consumption positive size externality. In a typical network, the addition of a new customer (or network node) increases the willingness to pay for network services by all participants. In a financial exchange network, high liquidity in a particular market is a network externality, since it increases the willingness of all traders to participate in that market, and traders receive this effect for free.

The mechanism we propose utilizes two elements: ***commitments to trade*** and ***discounts in fees and/or commissions***. Large participation can be supported as an equilibrium if it is the result of a series of sequential commitments by traders over time (in the interval $[t_0, T]$). Each commitment to participate induces further commitments by others. The level of participation at the call (and other features of the outcome) is an easy projection of the accumulated committed orders in the final moments before the call. Thus, given the sequence of commitments, the role of expectations in determining the equilibrium outcome is significantly diminished.[7]

What form does the commitment of the traders take? In placing an order at time t, a trader commits not to withdraw the order until the call. If he withdraws the order, he is charged a fee equal to the fee that he would have been charged if his order had stayed in and had been executed at the call.[8] Therefore, everything else being equal, a trader may want to delay his commitment until the last second before the call. Such behavior would completely defeat the mechanism. To avoid such behavior, ***the exchange induces traders to commit early by rewarding early commitment***. Thus, the exchange offers lower fees to traders who commit at an earlier time to participate in the upcoming call.[9] Traders self-select the time at which they enter their order. Less risk averse, more patient traders, with low demand for immediacy will

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[7] Thus, the proposed mechanism transforms orders into durable goods of varying durations. Since orders are durable, they can be counted cumulatively, and the level of participation at time T follows easily. See Economides and Himmelberg (1993) for a study of networks of durable and non-durable goods.

[8] Of course, no fees will be paid for an order that does not execute in the call because no suitable match was found.

[9] In practice, the electronic market of AZX utilizes differential fees to induce early commitments to trade in the call.

commit earliest. More risk averse traders will commit later.[10] The optimal fee structure of a monopolist-auctioneer of a call market is established in Economides and Heisler (1993a).[11]

The lower fee for early entrants rewards the extra liquidity that an early entrant brings to the call in inducing others to participate in the market in the remaining time up to the call. These early entrants allow the call to be a focal point in the competition with a continuous market.

The fee structure that gives the highest benefit to the call market auctioneer makes the last participant of the call (who signs up just before T) indifferent between participating at the call and participating at the continuous market. All participants who committed earlier pay strictly lower fees and are strictly better off by participating in the call market rather than at a continuous market. Some very early traders may even be subsidized (i.e., charged a fee below cost) to be compensated for the very large positive externality that they create in the market. Economides and Heisler (1993a) also show that, once entry has started, there are no gaps in trader arrival. That is, if the first trader enters at t_1, $t_0 < t_1 < T$, there is always some trader who enters at every instant between t_1 and T.

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[10] Also, traders with large orders may be at greater risk of moving the market price in small liquidity markets, and therefore may prefer the call more than the continuous market.

[11] This mechanism is reminiscent of pricing by a price discriminating monopolist in Mussa and Rosen (1978). The good "participating in the call market" is differentiated in quality (vertically differentiated) so that all traders would prefer to enter later, everything else being equal. The auctioneer of the call market sells the higher quality goods (entry near T) at a higher price. However, he cannot fully implement an optimal price discrimination scheme that would require selling at different prices (fees) to different traders who arrive at the same time, as well as prohibiting arbitrage among entry times.

The profit-maximizing call market auctioneer internalizes some of the externality of liquidity provision by early entrants, but does not fully internalize the externality. Maximization of the total benefit to society from the call market requires even lower fees to be charged to early participants. A perfectly price discriminating monopolist call market auctioneer can decentralize the total social benefit maximizing solution. However, the auctioneer in a typical call market is unable to implement price discrimination, and therefore he cannot achieve social benefit maximization.

The self-reinforcing nature of liquidity, as of any other network externality, creates the possibility that often small size financial exchange networks will not be observed. That is, there exists some positive size of a network, named ***critical mass*** n^{CM}, below which no network is observed. Thus, either no market of this type is observed, or a market of size at least n^{CM} is observed. It follows that one should not be surprised by very sudden growth of certain financial networks, including call markets, as conditions change that make a market of critical mass just sustainable.

We have shown earlier that the self-reinforcing nature of liquidity and the dependence on beliefs and expectations of the size of the market (in the absence of the explicit mechanism we propose) leads to a multiplicity of equilibria. Therefore ***history matters***, i.e., historical events may define which of the equilibrium outcomes is realized, and in particular which markets exist and which do not. In that respect, it is important to note that there may be crucial time inconsistencies. The technological conditions of yesterday may lead to the selection of environment X, but the conditions of today may make system Y the inevitable choice if we had not selected anything before. But, it is possible that, if we had selected X yesterday, today we may still want to continue with X. That is, it may take a very drastic improvement in certain dimensions to make Y the best choice given the earlier selection of X. This process is further complicated by the fact that the profits accruing to different parties will be different in different environments and systems, and therefore the incentives for change will not in general be coordinated.

Continuous markets are praised for their production of up-to-the-minute market-relevant information, most notably market clearing bid and ask prices. This creates a potentially significant criticism of traditional non-electronic call markets, which were essentially infrequent exchanges of particular stocks. However, in an electronic market structured in the way described in this paper, every participant can calculate the market clearing price during the period $[t_0, T]$. Thus, although there are no transactions until time T, at a time t in $[t_0, T]$ there is an easy-to-calculate price that reflects the equilibrium price if a clearing would have happened at that point in time. Further, this price is validated by the cumulative orders on both sides of the market up to that point t. Thus, even though this "would-be" clearing price at time t is not announced, it is validated by a larger volume of orders than any particular clearing price at any point in time in a continuous market.[12] Therefore, ***the electronic call market produces timely information of superior quality, and cannot be criticized on informational grounds***. The volume-validated "would-be" clearing price may serve as a better base for derivative calculations rather than the price in the continuous market.

Price piracy is easy and common in financial markets. For example, prices established at the NYSE are used on regional exchanges and proprietary systems in place of price discovery.

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[12] Of course, the volume of accumulated orders increases as time approaches T.

This free riding on information weakens the exchanges where price is discovered as well as the validity of the market price. The existence of piracy has created incentives for the exchanges not to reveal the equilibrium price with accuracy. Thus, ***piracy can hurt transparency in financial markets***. Price piracy can similarly affect call markets by creating fragmentation, reducing liquidity, and diminishing the validity of the discovered price. It is hard to eliminate the incentive for price piracy without administrative measures.

In summary, this short paper focused on liquidity considerations in financial markets. We demonstrated the liquidity advantages of call over continuous markets. Further, we analyzed a structure of time-differentiated fees in a call market that guarantees high liquidity. We also discuss the importance of critical mass and the creation and acquisition of price information on market equilibrium, and ultimately on the market structure of financial exchanges.

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