

Discussion

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The authors of this article present convincing evidence that opening prices differ from closing prices. Their major empirical finding is that returns that are measured from the opening of the market to the next open have higher variance than returns measured from the close of trade to the next close. This result is also found in Amihud and Mendelson (1987), but this article improves on the Amihud-Mendelson study by using a larger sample and by conducting a number of other tests.

What is special about opening prices? The authors argue that the higher volatility of open-to-open returns is due to the strategic behavior of the specialist. The specialist sets the opening price in the call auction market that occurs at the open and is allowed to trade from his own account at this price. The authors suggest that in exploiting his monopoly position, the specialist increases the effective bid-ask spread at the open and, therefore, makes prices more volatile. While I find this a plausible interpretation of the results, I do not believe the case is quite as clear-cut as the authors suggest.

First, we should not immediately conclude that it is the opening prices that are special. Perhaps closing prices are not "typical." There seems to be evidence indicating that closing prices are more likely to be ask prices than bid prices. Brock and Kleidon (1989) observe that some traders, especially index fund managers, have a strong desire to trade at closing prices and that these traders are more often buying than selling. If closing prices are more likely to be ask prices than bid prices, then close-to-close returns will be subject to less bid-ask bounce than returns measured using prices that are equally likely to be bids or asks. However, it does appear from other studies that returns measured from other points in the trading day also show lower volatility than the open-to-open return. If the bid-ask bounce is reduced for close-to-close returns, it cannot be the entire explanation for the authors' results. It nevertheless may be a factor to consider in interpreting these results.

The benchmark model the authors apparently have in mind and

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seem to use throughout the article in assessing the performance of the opening call auction market is one where the specialist is not only competitive but also risk-neutral. For example, the authors measure the serial correlation of returns measured around the opening and find a tendency for price reversals. This is, of course, consistent with the specialist maximizing monopoly profits as depicted in their Figure 1, and this is the interpretation that the authors emphasize. Price reversals of this sort would also be found in a market setting in which there are a number of competing market-makers who are risk-averse. If market-makers are risk-averse, then prices will not follow a martingale. Consider, for example, the Grossman-Stiglitz (1980) model of a market. In this model there is a continuum of risk-averse traders who submit demand functions. These traders could be viewed as competitive market-makers who absorb the supply shock, which can be viewed as the net total of market orders. In this model the equilibrium price is affected by the supply shock because the traders are risk-averse. Increasing the variance of the supply shock increases the volatility of prices. This occurs even when there is no private information in the economy. In that case the market is truly a Walrasian auction, but, because of risk aversion, supply shocks (or order imbalances) affect prices. Models of this sort can be extended to multiperiod settings. Even if the supply shocks in each period are independent, price changes will be serially correlated. In other words, risk aversion rather than monopoly power may be the explanation for the observed results. It should also be observed that risk aversion may play a more important role at the open than at other times of the day since the degree of uncertainty at the open may be greater than at any other time.

If monopoly power is the explanation for the higher volatility at the open, we must ask what is the source of the specialist's monopoly position. This is not a silly question. Given that traders can submit limit orders, it is not clear that the specialist can manipulate the market to his advantage. If, for example, the specialist makes a profit by selling at price P_i (see Figure 1), then a trader could submit a limit order at a price slightly lower than P_i and capture this profit for himself. The key here is that this competing market-maker can only condition his limit order on the price. The specialist has private information about the market conditions at the open: He observes the order imbalance at all prices, the total number of market orders as well as the net imbalance in market orders, and so on. If the specialist has monopoly power, then it must be due to this informational advantage. For example, knowing this additional information about the orders submitted at the open might reveal to the specialist information about the future cash flows of the stock. If it

were possible for traders to submit more complicated orders, then this informational advantage might disappear. A more complicated order might be one which said "buy 2000 shares if the price is less than 30 and if the difference between sell and buy market orders exceeds 5000 shares." Clearly, it would be infeasible to have trading conducted in this manner.

The specialist's advantage is that he can submit his order after he has seen the orders all other traders have submitted. Going last is clearly desirable. There have been proposals to automate the opening auction or even to replace the continuous market with a series of auctions. Before each auction took place traders would submit their orders to a computer. As these orders were received the computer would provide some summary information about the accumulated orders. At the time of the auction the computer would find the market-clearing price and cross all the appropriate orders. In such a system there would be most likely an advantage to waiting until the last possible moment to submit one's order. One argument in favor of a continuous market in which trades are processed sequentially is that the sequence in which orders are presented is actually determined in equilibrium by the price mechanism. It is no longer the case that submitting one's order last is an advantage. This is because all orders are not processed at the same price. One may get a better price when submitting early than when submitting late. One would expect that in equilibrium traders sort themselves out in the sequence and it is the characteristics of the price process that adjust to bring about this equilibration. To my knowledge issues of this sort have not been explored in any detail, but they are clearly relevant to understanding the differences between auction markets and continuous-trading markets.

In the later sections of the article, the authors examine the relation between price volatility and volume. The results seem to support the contention that the effective bid-ask spread at the opening is higher than it is at the close and that market structure has an effect on the price process. In interpreting their results, however, the authors seem to have in mind a model in which trading causes price changes. The reverse, of course, is also possible. New information can come into a market, perhaps through public announcements, and the price can then change to reflect this new information. The price change can in turn generate trading on the part of portfolio insurers, option traders, and others following dynamic trading strategies. If the direction of causality is reversed in this manner, then some of the implications that the authors find in their results no longer apply. For example, the authors state that "influence of trading volume at the open is quite strong. This effect implies an inability or unwillingness to find off-

setting volume that would mitigate opening price volatility." Imagine, however, that the price change that occurs at the open is due to information that has been publicly released overnight. The trading volume that occurs at the open is simply a reaction to this information and the price change it causes. One would expect that a larger price change would lead to a larger trading reaction and hence to larger volume. This is exactly the relation found by the authors. However, there is no action that can be taken by the specialists to offset the price volatility, at least no action that does not lead to a loss for the specialist. The price change is due to the information that has come into the market and not to the order imbalance.

The authors' investigation of the behavior of the market at open is the most ambitious to date. While the authors' results strongly support the proposition that returns measured from open to open significantly differ from those measured close to close, the causes and implications of these differences are not completely obvious. Indeed, the interpretation of many of the results depends on the specific assumptions made about the specialist (e.g., risk-neutral or risk-averse), the factors generating trade, and the nature of information flows, public and private, in the market. This article should stimulate additional research addressing these issues.

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