Price Bubbles in Large Financial Asset Markets

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Forthcoming in Handbook of Experimental Economics Results, C. Plott & V. Smith (eds.)

The propensity for long-lived financial asset markets to exhibit price bubbles relative to the per-share expected dividend stream was first documented in experimental double auctions reported by Smith, Suchanek, and Williams (1988). Subsequent research by King, Smith, Williams and Van Boening (1993) explored the robustness of this phenomenon to short selling opportunities, margin buying opportunities, limit price-change rules, informed insider trading, and increasing levels of subject experience with the double auction asset trading environment. It was found that the only reliable way to generate prices that approximately reflect the intrinsic dividend value of an asset share is to bring the same group of traders back for a series of three 15-round markets. In the first two markets, prices tended to bubble above intrinsic value and then crash back to intrinsic value prior to the final trading round. Prices in the third market tended to track the intrinsic dividend value much more accurately, reflecting the fact that traders learn through market experience to have common price expectations that are rooted in the expected dividend earnings associated with an asset share. This leads to an approximation of a risk-neutral rational expectations market equilibrium. Van Boening, Williams, and LaMaster (1993) document that the price bubble-crash phenomenon observed in double auctions is also found with regularity in 15-round closed-book call markets. All of the experiments referred to above utilized a cash reward structure and were relatively small markets with fifteen or fewer traders who were seated in the same computing lab together during the entire duration of the market.

This paper documents some open-book call asset markets that have a very large number of traders relative to traditional laboratory markets. The markets were conducted as out-of-class fully computerized extra-credit exercises in microeconomic theory classes at Indiana University. (This is

one of three such exercises described by Williams and Walker, 1993.) Trading occurred over fifteen rounds lasting a total of approximately eight weeks. Round 1, which includes completing the computer-based instructions, was typically 7-10 days long, but rounds 2 through 15 were all 3.5 days long. Students could access the market software at a time of their own choosing and as often as they wanted during each trading round in order to view the market bid and ask arrays, the tentative market price and volume, and edit their personal bid or ask. All traders in a particular market received the same initial endowment of asset shares and cash. A common dividend was declared at the end of each round and all traders in the market had the same rectangular dividend distribution.

Performance-based extra-credit points were awarded using a rank-order tournament focusing on the traders' final cash holdings. Participation-based extra-credit points were also awarded in keeping with the educational goals of the exercise. Students participating in the market were encouraged to discuss the market with one another and to ask the instructor any questions they might have about the trading procedures, dividend earnings, or the extra-credit reward structure. However, the instructor refused to reveal the range of traders' share or cash holdings since this information is unlikely to be available in a naturally occurring market.

From a research perspective, these markets are important to the basic methodology of experimental economics since very few experiments have addressed the potentially critical issues of whether stylized results of typical small-group laboratory interactions are robust to: 1) substantial increases in group size, 2) the endogenous inter-trader information flows that may exist outside of the strict privacy that is possible in laboratory environments, 3) the enhanced cognition processes that may exist in decision rounds lasting several days rather than a few minutes, and 3) nonmonetary reward structures. (See Isaac, Walker and Williams, 1994, for further discussion of these methodological issues in the context of public goods experiments.)

Figures 1, 2, and 3 illustrate the market-clearing price (determined by the intersection of the submitted bids to buy and asks to sell), trading volume (as a percentage of total shares outstanding), expected dividend stream, and maximum dividend stream for markets with 304, 244, and 310 traders respectively. The outcomes depicted in these figures are characteristic of many such large call markets conducted over the past five years. The basic price bubble-crash phenomenon is by far the most typical outcome. This result is consistent with the cash-reward, small-group, strict-privacy lab experiments reported in the literature for inexperienced or once-experienced traders. One of the more astonishing aspects of the large-group results is that the price bubble dynamic appears to be unaffected by classroom discussions of the graph showing the market price relative to the expected dividend stream (very similar to those shown in the figures) for a market that is still in progress. After viewing an on-line computer projection of the market data and listening to a quick summary of the graph's content, students frequently ask questions like "Why are people buying at such high prices?" This instructor's response is basically, "I really don't know, but they must believe that they will be able to profit from this action through dividend earnings and perhaps eventually selling the share to someone else." The traders who are doing the buying rarely choose to comment publically on their market strategy.

The lack of total control over inter-trader information flows and the ongoing interaction between subject (student) and experimenter (teacher) embodied in these educationally oriented large-group markets is atypical of pure-research endeavors. The results are meaningful to the research methodology of experimental markets, however, since they provide an explicit example of a very complex and somewhat counter-intuitive laboratory phenomenon that generalizes to a less controlled environment that captures some critical elements of market interactions in the naturally-occurring world.

References

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Figure 1. Asset Market with 304 Traders:
A Rising-Price Bubble and Crash

Each trader is endowed with $150 and 12 asset shares at the beginning of round 1. At the end of each round, a per-share dividend is drawn from a uniform distribution bounded at $1.50 and $0. The expected dividend is thus $.75. In round 1, the expected dividend stream is 15 x $.75 = $11.25 per-share and falls by $.75 in each subsequent round.

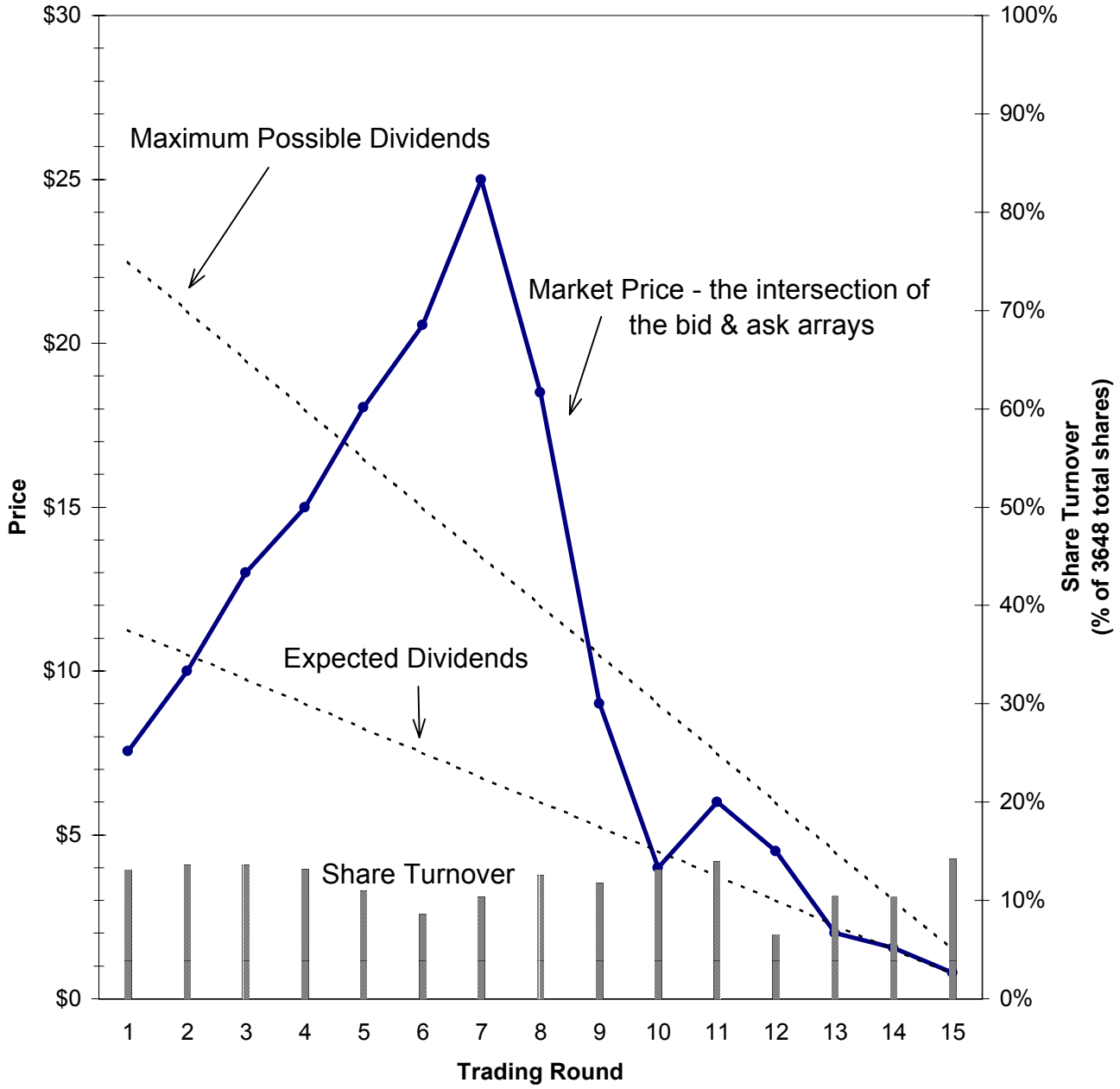

Figure 2. Asset Market with 244 Traders:
A Flat-Price Bubble and Crash

Each trader is endowed with $225 and 25 asset shares at the beginning of round 1. At the end of each round, a per-share dividend is drawn from a uniform distribution bounded at $1.50 and $.50. The expected dividend is thus $1. In round 1, the expected dividend stream is 15 x $1 = $15 per-share and falls by $1 in each subsequent round.

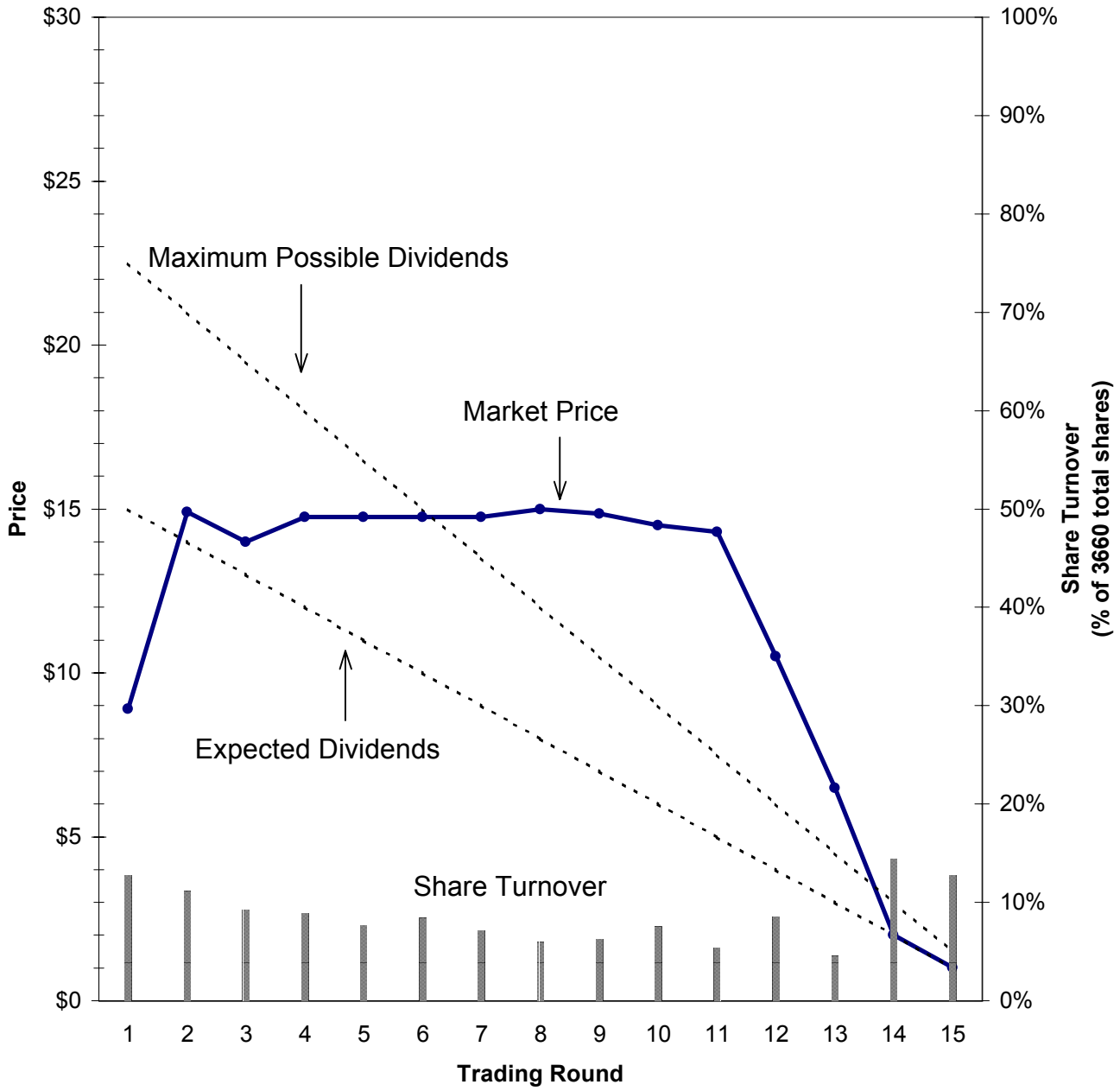

Figure 3. Asset Market with 310 Traders:
A Rare Double Bubble and Crash

As in Figure 1, each trader is endowed with $150 and 12 asset shares at the beginning of round 1. At the end of each round, a per-share dividend is drawn from a uniform distribution bounded at $1.50 and $0. The expected dividend is thus $.75. In round 1, the expected dividend stream is 15 x $.75 = $11.25 per-share and falls by $.75 in each subsequent round.