Social Comparison, the "N-effect", and Experimental Asset Bubbles

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Abstract: We provide evidence showing how the mere act of allowing traders to compare their performance against others creates tournament-like conditions that can trigger harmful asset bubbles in financial markets, an idea first tested by Schoenberg and Haruvy (2012). We qualify this result with a novel finding that shows how the distortion grows in proportion to the number of competitors (pool size), or what we term the "N-effect".

We organise a laboratory experiment in which participants are randomly assigned into markets with small, medium, and large pool sizes, and allow them to trade shares using Smith et al's (1988) double auction design. They are then shown, also through random assignment, the account balance of either the best performing or worst performing trader of the period. We then elicit from each trader Likert-scale self-reports on their satisfaction.

These data allow us to observe and empirically test a novel explanation for asset bubbles: that they arise from behaviour triggered by tournament-like conditions unwittingly generated by social comparisons – even in the absence of actual financial incentives to compare oneself against or compete with fellow traders.

Key Words: asset bubbles; social comparison; experimental finance

1. INTRODUCTION

For markets to allocate resources efficiently, they must be capable of "self-correction": traders who buy stock in anticipation of higher prices ought to cease purchasing at some point when prices actually do rise, while sellers ought to stop selling when market forces drive prices below what the shares were originally purchased for. Put another way, as long as any "positive feedback" that pushes prices up is eventually offset by "negative feedback" pushing prices back down, markets will retain their essential flexibility and usefulness, correctly signalling scarcity and value.

On the other hand, "bubbles" occur when assets are persistently traded at prices way above their intrinsic value. To economists, this is enough to indicate an inefficient allocation of resources, as buyers end up paying more than what an asset is actually worth. But to most people, the harm becomes apparent only when the bubble "bursts": that is, when the price of the asset drops suddenly and precipitously, often wiping out large sums of

value from the market and from an individual's portfolio.

There is an enormous literature devoted to explaining the causes behind asset bubbles. In this paper, we further explore a proposition first tested by Schoenberg and Haruvy (2012). Their argument is thus: asset bubbles may form as a result of "tournament-like" conditions created when traders are allowed to compare their performance against others. This intrinsic need to be better than others – or at least to avoid being the worst in a group – is so powerful that it can override a trader's better judgment. A trader may already be earning profits, but if she is concerned about her rank relative to colleagues, she may opt to take larger risks and (say) hold on to shares for longer than one normally would, in the hope that prices will rise and earn her larger profits than her peers. This "performance pressure" from social comparison can distort the normal countervailing positive and negative feedback in a market, retard the process of settling into equilibrium, and in the meantime sustain the overvaluation of assets. Interestingly, these psychological pressures that create tournament-like conditions may work even in the absence of real financial incentives to compete against each other. If true, then measures such as the 1970 US Investment Advisers Act, meant to minimise tournament-like incentives from financial markets, may prove less effective than hoped.

To test these claims, we need to be able to (a) induce asset bubbles (not an easy matter since an asset's intrinsic value is often unobservable and the existence of bubbles is usually confirmed only after they burst), (b) induce social comparison among traders, and (c) measure its psychological impact and effect on trading behaviour.

For these, we run a version of Schoenberg and Haruvy's controlled laboratory experiment, described in the next section. But as we do, we are able to extend it to test an additional hypothesis: that the pressure from social comparison is proportionate to group size. That is, traders feel worse coming last in a large group than in a small group, just as they feel better topping a large tournament than a small one. This in turn predicts larger bubbles among larger trading groups than smaller ones.

2. METHODOLOGY

Sample. We recruited 55 students (females=33, males=22) through an online sign-up link and a digital poster shared on social media. All had a background in basic micro and macroeconomics, came from DLSU's School of Economics, College of Business, and College of Liberal Arts, and ranged from first-years to seniors.

Task. Each participant was to trade shares by making offers and counter-offers until a price was agreed ("double auction"). The transaction was then recorded and the participants required to desist trading for that round. When all trades were concluded, everyone was informed of their respective account values.

Design. Trading was done inside a laboratory, at computer terminals using Z-Tree, a software for running experiments and recording data. At the beginning of each session, traders were endowed with different combinations of cash and shares, although the sum of their values was equal for all. With these endowments, traders were free to choose whether to buy or sell their shares. Shares were designed to yield dividends with an expected value of 24 experimental currency units (ECU) per round (that is, each share yielded four possible and equally likely outcomes of 0, 8, 28, or 60 ECUs per round, defining the benefits and opportunity costs of holding shares). Over the course of the experiment, the expected value of holding a share was designed to decline, so that by the end, the stock would become worthless. Traders were of course free to neither buy nor sell, in effect choosing to hold on to the risk-free cash asset. If they chose to buy, they would enter a bid into the terminal; if they chose to sell, they would instead offer a price. Once another participant accepted their bid or price, the transaction would be finalised, recorded, and both parties would be done for the round. There would be 15 such trading period, each lasting three minutes.

At the end of each period, all traders were shown the following: their account balance (cash holdings, dividend earnings, total shares), and a share's current market value. Critically, they were also shown "relative account status". We did this by randomly assigning traders to learn about either the highest account total for that round, or the lowest account total. The trader could then use this information to benchmark her performance against a known reference. They were then asked to report via

seven-point Likert scale from "very negatively" to very positively" how satisfied they were about their own accounts.

Incentives. All participants received two types: an across-the-board show up fee of PhP20, to account for the opportunity cost of their time and a sum corresponding to their market values/performance during the experiment.

3. RESULTS

Did traders respond to psychological pressures from social comparison as much as would to economic incentives? Fig. 1 plots the mean satisfaction of traders, depending on whether they turned out to be leaders, laggards, non-leaders, or non-laggards – as well as whether they were informed of their group's best performer or worst performer.
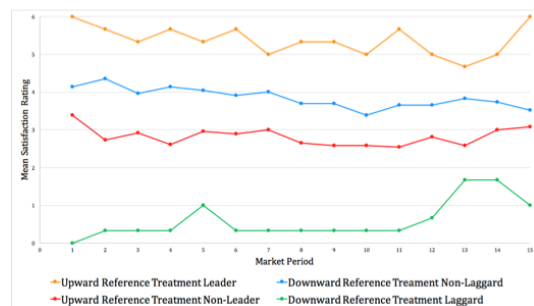

Fig. 1 Mean satisfaction per market period

We found from running paired t-tests that when information about leaders is provided ("upward reference"), satisfaction ratings are significantly higher for leaders than non-leaders (t=5.26, p=0.02). When information about laggards is provided ("downward reference"), laggards report significantly lower satisfaction than non-laggards (t=10.29, p=0.00). We also found significant results from two-sample t-tests that non-laggards given downward reference information are more satisfied with their performance than non-leaders who were given upward reference information. In other words, for traders in this experiment, it felt better not to be a laggard than it did to not be a leader.

We then ran a regression to predict satisfaction ratings based on a trader's own performance (Account Total) and her relative performance (Relative Account – the difference between one's personal account and the leader/laggard's account).

Table 1. Period 10-15 satisfactions ratings (n=330) regressed against indicators of personal and relative performance

Factors	Model 1	Model 2
Intercept	2.50251***	2.14182***
Account Total (E$)	0.00056***	0.00030**
Leader (Dummy)	0.04358	1.64677**
Laggard (Dummy)	-1.67336**	-1.25914**
Relative Account (E$)	0.00013**	
Relative Account x Non-Leader (Dummy)		-0.00004
Relative Account x Non-Laggard (Dummy)		0.00069***
R^2	0.28	0.32

From Model 1, we find evidence that satisfaction ratings decline by 1.67 Likert-scale units as one learns one is the laggard in a group. The relative account is also a significant predictor, but with a negligible near-zero impact. From Model 2 we find that awareness one is the group leader increases satisfaction by 1.65 scale units while awareness of being the laggard decreases satisfaction by 1.26 units. One of the interaction terms is significant, but the actual coefficient values are negligible.

Did performance pressures from social comparison trigger market bubbles? Fig. 2 shows two graphs in which the median trading prices for both treatment groups (upward reference and downward reference) are plotted against declining intrinsic values (recall that declining intrinsic values are built into the market from the beginning).

In both treatments, one can easily see the divergence of median prices from fundamental values (the bubbles) in the Large pool (red), as well as the price crashes at the end. In the Medium and Small pools, the bubbles were less evident. These were verified by two-sample t-tests with unequal variances.
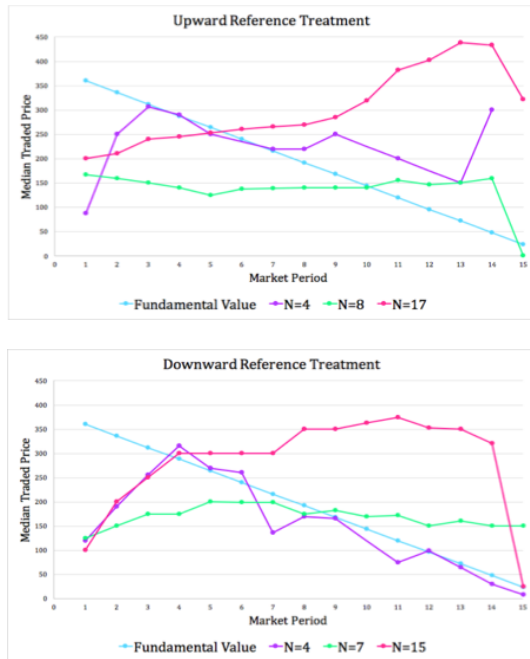
Fig. 2 Median traded prices versus fundamental asset values over time

Finally, did psychological pressures correspond to the size of the trading pool? To measure this "N-effect", we included Pool Size dummies to Models 1 and 2, using Medium as the base category. The results are found in Table 2.

Only the dummy variable for the Large pool is significant in both models, both with negative coefficients, but a larger magnitude in Model 2 (-1.35 compared to -0.14 in Model 1). Thus, whatever psychological impact of being a laggard or leader was most pronounced in the Large pool relative to the Medium pool, whereas there was no statistical difference in psychological impact between traders in the Small pools versus the baseline Medium pool.

4. DISCUSSION

Our results reveal three findings: first, even if the experiment contained no explicit financial incentives to reward being a performance leader or punish being a performance laggard, the utility of

Table 2. Period 10-15 satisfaction ratings (n=330) regressed against indicators of personal and relative performance, with additional dummy variables for pool size

Factors	Model 1 ($df = 6$)	Model 2 ($df = 7$)
Intercept	2.90783***	2.60174***
Account Total (E$)	0.00069***	0.00010***
Leader (Dummy)	-0.64537	1.18398*
Laggard (Dummy)	-1.77756***	-1.27702***
Relative Account (E$)	0.00007**	
Relative Account x Non-Leader (Dummy)		-0.00013**
Relative Account x Non-Laggard (Dummy)		0.00073***
Small Dummy	0.16074	-0.03780
Large Dummy	-0.14308***	-1.34841***
R^2	0.34	0.40

traders was nevertheless strongly predicted by their relative standing among peers. The highest level of satisfaction was still experienced by leaders, the lowest by laggards. Second, asset bubbles can indeed be created under these conditions, again despite the lack of actual tournament-inducing economic incentives. The bubbles were most evident in the Large pool of traders, and did not occur within the Small pool. Finally, we confirm that pool size is in fact a significant predictor of trader satisfaction, and thus may serve as evidence of an "N-effect" and idea that the larger the pool, the greater the psychological impact of leading or lagging relative to peers.

How reliable are these findings? In the original manuscript, we included a battery of tests (paired t) to indicate whether random assignment successfully created homogenous groups. In all cases, the null was not rejected, suggesting no statistical

difference between the groups based on various categories.

Could salience have been an issue? That is, could the pool of student traders have failed to internalise the rules of the market or could they have lacked the experience that real-world traders possess? To address this, we introduced several protocols: pilot tests in order to ensure our instructions were comprehensible, a printed instruction sheet during the experiment itself that participants could refer to, and a series of Powerpoint slides to support our verbal instructions. It was also made clear to the participants that they would be paid a flat rate just for turning up, but also a variable reward according to the value of their portfolios.

Finally, might the bubbles have resulted simply from an increase in volume trading rather than the psychological impact of social comparison? Since asset bubbles are formed as a consequence of trading, could it be that the deviation in prices is simply driven by the growing number of trades rather than any psychological pressures? To test this, we carried out a Granger test, pairing median volumes with median prices per period across all treatments. Whether forwards or backwards, the null was not rejected, indicating that neither volumes nor prices caused the other in our market experiment.

Our findings add to the growing body of research on the undesirable effects of tournament structures on some types of markets. While tournaments have been proposed as a solution to certain moral hazard problems (Tsoulouhas, 1999), experimental research has also qualified these findings. For instance, it has found that men and women respond differently to tournament-like incentives (Gneezy & Rustichini, 2004; Niederle & Versterlund, 2008), and that underperformers are more likely to cheat in competitive environments (Schwieren & Weichselbaumer, 2010).

Social comparison is persistent, and as Festinger (1954) proposes, it plays a major role in creating a person's sense of belonging. Akerlof and Kranton (2000) have since developed a utility function that allows us to analyse a person's satisfaction as it is driven by one's identity – that is, the difference between one's choices and the expectations of society. Models like these, as well as the experiments designed to test them, will go some way toward explaining persistent anomalies in finance, such as how asset bubbles can form even under seemingly benign economic conditions.

5. ACKNOWLEDGMENTS

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