Economics Letters 154 (2017) 101–104

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Overpricing and stake size: On the robustness of results from experimental asset markets

Martin G. Kocher [a,b,c], Peter Martinsson [c,d], David Schindler [b,*]

[a] Institute for Advanced Studies, Vienna, Austria
[b] Department of Economics, LMU Munich, Geschwister-Scholl-Platz 1, D-80539 Munich, Germany
[c] Department of Economics, University of Gothenburg, Box 640, 405 30 Gothenburg, Sweden
[d] Linköping University, Linköping, Sweden

HIGHLIGHTS

- We assess the effects of a stake size variation on experimental asset markets.
- Our results show that a fivefold increase in stake size leads to higher trading frequencies.
- Mispricing and overpricing, however, are not fundamentally different for different stake sizes.

ARTICLE INFO

Article history:
Received 16 November 2016
Received in revised form
13 February 2017
Accepted 24 February 2017
Available online 27 February 2017

JEL classification:
C90
D53
G02

Keywords:
Experimental finance
Incentives
Traders
Bubbles

ABSTRACT

We assess the effects of a stake size variation on experimental asset markets. Our results show that a fivefold increase in stake size leads to higher trading frequencies. Mispricing and overpricing, however, are not fundamentally different for different stake sizes.

1. Introduction

Incentivizing choices has been a methodological cornerstone of experimental economics (e.g., Smith, 1976; Camerer and Hogarth, 1999). Compared to incentives outside the laboratory, laboratory incentives are often rather small, mostly because generating a sufficient number of observations may become very costly when using high stakes. If experimental participants receive a low monetary compensation in relation to the required effort or time, or both, non-monetary determinants might (also) influence decisions (see Smith, 1976).[1]

Given the widespread application of experimental finance for assessing policy interventions (e.g., Hanke et al., 2010) and the use of asset market experiments to understand market phenomena outside the laboratory, it is important to better understand whether and, if so, to what extent the stake size affects trading behavior in such experiments and whether an increase in the monetary stakes changes well-established regularities from experimental asset markets such as overpricing compared to the

* Corresponding author.
E-mail addresses: martin.kocher@lrz.uni-muenchen.de (M.G. Kocher), peter.martinsson@economics.gu.se (P. Martinsson), david.schindler@econ.lmu.de (D. Schindler).

http://dx.doi.org/10.1016/j.econlet.2017.02.035
0165-1765/

[1] There is a growing literature investigating the effects of systematic variations in stake size in economic experiments (e.g., Andersen et al., 2011; Gneezy and Rustichini, 2000; Johansson-Stenman et al., 2005; Kocher et al., 2008; Smith and Walker, 1993).

fundamental value (e.g., Kirchler et al., 2012; Palan, 2013; Smith et al., 1988). Interestingly, to the best of our knowledge, there is no paper that looks at a variation in stake sizes within the same experiment, holding subject pool and other determinants constant.

The objective of this paper is to investigate if and, potentially, how trading behavior is affected by an increase in the stake size. We implement the most prominent experimental asset market (a double auction market with a decreasing fundamental value of the asset). Since Smith et al. (1988), there has been lots of experimental evidence on this type of market (in slightly different versions), and its main determinants are well-understood. Our experiment features a condition with normal stakes and a condition with high stakes (five times the monetary incentives from the normal stakes), with random assignment to the two conditions.

There are several straightforward arguments why stake size could matter for asset market experiments in which trading occurs theoretically only due to different risk attitudes if one assumes perfectly rational behavior among traders. First, comparatively small monetary incentives (as often used in experiments) could be dominated by the fun of trading and speculating. Second, small monetary incentives could not be sufficient to induce traders to think hard enough about the consequences of the declining fundamental value of the assets for their long-run values. Third, small monetary stakes could affect the revealed risk attitudes and could make traders comparatively less risk averse or even risk seeking in their behaviors. The arguments would – with the exception of the last one whose impact is ambiguous in this respect – imply a greater tendency of overpricing and of creating price bubbles with small stakes in asset market experiments. Similarly, the number of trades could increase under small stakes because of the first two arguments.

There are a few existing experimental papers that are related to our research. Ackert et al. (2006) show that increasing the endowments of experimental participants leads to more risk-taking. They however do not investigate trading behavior in double auction markets but look at bidding for a risky prospect in sealed-bid auctions. Most closely related to our paper is probably the paper by Bossaerts and Plott (2004). They compare stake size differences and do not observe a significant effect of the monetary stakes on market outcomes. However, they compare American students with standard incentives and Bulgarian students with high incentives, which changes two potential determinants of market outcomes (stake size and subject pool) at once. As a consequence, they cannot address stake size effects separately.

2. Experimental design

Our setup featured a continuous double auction market with open order books (e.g., Eckel and Füllbrunn, 2015; Kirchler et al., 2012; Noussair and Tucker, 2013; Palan, 2013; Smith et al., 1988). This market has been used frequently in the experimental finance literature, and it is known for its tendency to lead to overpricing. Each market consisted of ten traders who could accept open offers to buy or sell shares of a single dividend-bearing asset with decreasing fundamental value over the course of ten periods, or create offers to sell or buy shares. In the beginning of the first period, each trader received an endowment of shares and experimental points; half of the traders received 20 shares and 3000 points, while the others received 60 shares and 1000 points, with random assignment to the two initial endowments. Each period lasted exactly 120 s, and a stochastic dividend, which paid either 10 points or zero with equal probability, was added to cash holdings at the end of each period. Short-selling and borrowing money were prohibited, and cash and asset holdings were transferred from period to period. Assets did not carry any value apart from the stochastic dividend, and the dividend process was carefully explained to experimental participants.[2]

The experiment was conducted at the experimental laboratory of the University of Economics Ho Chi Minh City, Vietnam. We implemented two conditions that differ from each other only in the conversion rate between experimental points (i.e., cash in the experiment) and money (Vietnamese Đồng (VDN)). Average earnings in STANDARDSTAKES were calibrated to be similar to average earnings during normal experiments conducted at this particular laboratory. We set them to around VDN 200.000, which corresponds to a purchasing power of US-$23.36 using the most recent PPP conversion data from the World Bank, and a show-up fee of VDN 40.000, corresponding to US-$4.67.[3] These incentives are (from a purchasing power standpoint) not only equivalent to experiments usually run at this particular laboratory, but are also in line with hourly rates in European or US laboratories. Earnings in HIGHSTAKES treatment were then *quintupled* relative to STANDARDSTAKES. In the experiment, one experimental point corresponded to VDN 50 or VDN 250, depending on the treatment. Hence, the HIGHSTAKES treatment provides very strong incentives for our pool of participants.

In total, we conducted six sessions with two markets in each session. The experiment was computerized using z-Tree (Fischbacher, 2007). This leaves us with six markets for STANDARDSTAKES and HIGHSTAKES each. Thus, in total, 120 subjects took part in the experiment—all students from the University of Economics Ho Chi Minh City: They received detailed written instructions (clearly mentioning the conversion rate) that were read aloud, and several helpers answered any remaining questions in private. Subjects were given a trial asset market to become familiar with the trading mechanism and the software. After the tenth period, subjects were asked to fill in a short questionnaire asking standard demographics and were then released from the laboratory, privately receiving their earnings in cash.

3. Results

In our analysis, we employ the commonly used measures (see, e.g., Stöckl et al., 2010; Kocher et al., 2016) for *mispricing* and *overpricing*: relative absolute deviation (RAD) and relative deviation (RD). RAD measures by how many percent prices are, on average, off the fundamental value, and RD indicates by how many percent prices are, on average, above the fundamental value. Since subjects within one market interact with each other and hence data from within a market do not fulfill the independence assumption, we conduct our statistical analysis on the most conservative level, namely the average market level. This leaves us with twelve strictly independent observations.

Table 1 provides an overview of all relevant variables on the level of the individual market and Fig. 1 displays the aggregate price movement in STANDARDSTAKES and HIGHSTAKES, respectively. Additionally, the solid line represents the expected fundamental value, i.e., the risk-neutral valuation of the asset. One can easily see a general tendency of asset underpricing in the first period compared to the fundamental value and later overpricing. The levels and trends are the same for both treatments. In STANARDSTAKES, we observe an average RAD of 0.48 and an RD of 0.24. The levels are in line with mispricing and overpricing found in related

[2] We use exactly the same market setup as Kocher et al. (2016). Experimental instructions can be found in the online appendix.

[3] 200,000 VDN approximately purchase two combo meals at McDonalds, a medium-priced bottle of wine or a monthly transportation pass in Ho Chi Minh City at the time of research.

Table 1
Descriptive overview of relevant variables on the market level.

Market	High stakes	RAD	RD	Trading frequency	Assets per trade	Trades per period
1	N	.3293	−.0109	13.68	8.31	1.81
2	N	.3610	.0679	8.86	4.11	2.15
3	N	.4010	.3635	12.22	6.38	2.01
4	N	.3640	.2737	12.09	9.59	1.27
5	N	.4097	.0994	21.06	6.84	3.49
6	N	1.7655	1.7655	9.00	6.36	1.51
7	Y	.5884	.4542	15.04	5.15	3.28
8	Y	.3985	−.0400	20.05	8.71	2.52
9	Y	.3440	.1277	14.69	8.26	1.89
10	Y	.2720	−.1094	15.35	8.78	1.85
11	Y	1.1802	1.1760	17.67	6.70	3.04
12	Y	.4923	.4442	15.43	6.67	2.37

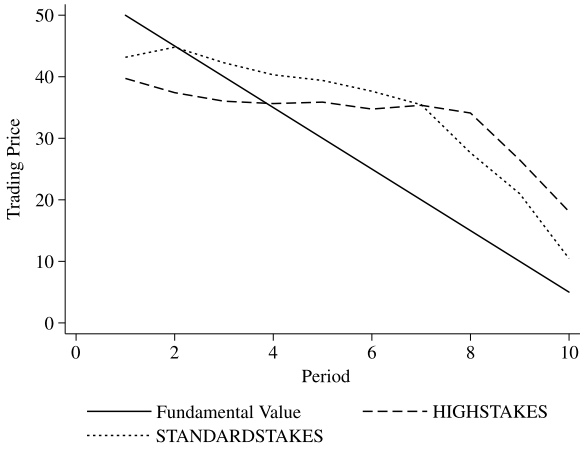

Fig. 1. Development of trading prices.

studies using standard stake sizes.[4] The relevant measures are very similar for HIGHSTAKES, where we find an RAD of 0.47 and an RD of 0.21. Statistical tests[5] indicate that neither of these measures is significantly different between the two treatments ($p = 0.42$ and $p = 0.87$, respectively). We also detect no treatment differences, when using the mean price of each trade ($p = 0.87$) or the mean price of each asset ($p = 0.87$) as our test variables.

Although the stake size variation did not affect prices, we observe that trading frequencies increase in stake size. In STANDARDSTAKES, subjects traded 12.8 shares per period, while in HIGHSTAKES, they traded 16.4 shares, on average. The difference is significant at the 1%-level.[6]

Statistical tests provide tentative evidence that the increase in the total amount of shares traded is actually not due to subjects trading more assets per trade ($p = 0.56$), but rather due to subjects engaging in more trades per period ($p = 0.09$). Hence, it is activity of traders that is elevated.

4. Conclusion

We report results from a laboratory experiment designed to test if and, potentially, how trading behavior is affected by size of monetary stakes in an asset market experiment. Several arguments can be brought forward that would indicate a reduction in overpricing, bubbles and trading frequency when stakes in the experiment become more significant. While we find mispricing and overpricing as the most important market outcome variables to be unaffected by a fivefold increase in stake size (from standard stakes to very high stakes), we observe a significantly increased trading frequency.

Our contribution is at least twofold. First, we make a methodological point that is worthwhile emphasizing: The usual stake sizes used in asset market experiments do not lead to artefactual results, in particular they do not seem to amplify overpricing and the emergence of bubbles. With the necessary qualifications, we can conclude that we have re-assuring news for the (external) validity of standard experimental asset markets with respect to stake size. Given the obvious effect of our treatment variation on incentives without any differences in prices, one can cautiously assume that even more pronounced increases in stake size should not have strong effects on the development of average market prices.

Second, the higher trading frequency is a surprising finding. If at all, we would have expected a lower one for cautious and risk averse traders. The prospect of rising prices on the market seems luring for traders, even if there is more at stakes to lose. Our experiment cannot offer a causal explanation for the underlying behavioral mechanisms. It could be that higher stake sizes create an even stronger psychological tendency to engage in trading activity, but an increasing effect on potential overconfidence is also conceivable.

Acknowledgments

We would like to thank an anonymous referee, Michael Kirchler and participants at the 2015 Experimental Finance for very helpful comments. We are very grateful to Phạm Khánh Nam for providing the laboratory resources and Matthias Kensbock as well as Julia Rose for excellent research assistance.

Appendix A. Experimental instructions

Supplementary material related to this article can be found online at http://dx.doi.org/10.1016/j.econlet.2017.02.035.

References

Ackert, L.F., Charupat, N., Church, B.K., Deaves, R., 2006. An experimental examination of the house money effect in a multi-period setting. Exp. Econ. 9, 5–16.
Andersen, S., Ertaç, S., Gneezy, U., Hoffman, M., List, J.A., 2011. Stakes matter in ultimatum games. Amer. Econ. Rev. 101, 3427–3439.
Bossaerts, P., Plott, C., 2004. Basic principles of asset pricing theory: Evidence from large-scale experimental financial markets. Rev. Finance 8, 135–169.
Camerer, C.F., Hogarth, R.M., 1999. The effects of financial incentives in experiments: A review and capital-labor-production framework. J. Risk Uncertain. 19, 7–42.
Eckel, C.C., Füllbrunn, S.C., 2015. Thar SHE blows? Gender, competition, and bubbles in experimental asset markets. Amer. Econ. Rev. 105, 906–920.
Fischbacher, U., 2007. z-Tree: Zurich toolbox for ready-made economic experiments. Exp. Econ. 10, 171–178.

[4] Kirchler et al. (2012) find an RAD = 0.41 and an RD = 0.30, while Kocher et al. (2016) find an RAD = 0.33 and an RD = 0.19.

[5] All tests are two-sided Mann–Whitney-U tests with $N_1 = N_2 = 6$, where subscripts indicate the two treatments.

[6] This results holds if using turnover as an alternative measure.

Gneezy, U., Rustichini, A., 2000. Pay enough or don't pay at all. Quart. J. Econ. 115, 791–810.
Hanke, M., Huber, J., Kirchler, M., Sutter, M., 2010. The economic consequences of a tobin tax – an experimental analysis. J. Econ. Behav. Organ. 74, 58–71.
Johansson-Stenman, O., Mahmud, M., Martinsson, P., 2005. Does the size of stake matter in trust games? Econom. Lett. 88, 365–369.
Kirchler, M., Huber, J., Stöckl, T., 2012. Thar she bursts: Reducing confusion reduces bubbles. Amer. Econ. Rev. 102, 865–883.
Kocher, M.G., Lucks, K.E., Schindler, D., 2016. Unleashing animal spirits – self-control and overpricing in experimental asset markets, CESinfo Working Paper Series, 5812.
Kocher, M., Martinsson, P., Visser, M., 2008. Does stake size matter for cooperation and punishment. Econom. Lett. 99, 508–511.
Noussair, C.N., Tucker, S., 2013. Experimental research on asset pricing. J. Econ. Surv. 27, 554–569.
Palan, S., 2013. A review of bubbles and crashes in experimental asset markets. J. Econ. Surv. 27, 570–588.
Smith, V.L., 1976. Experimental economics: induced value theory. Amer. Econ. Rev. 66, 274–279.
Smith, V.L., Suchanek, G.L., Williams, A.W., 1988. Bubbles, crashes, and endogenous expectations in experimental spot asset markets. Econometrica 56, 1119–1151.
Smith, V.L., Walker, J.M., 1993. Monetary rewards and decision cost in experimental economics. Econ. Inquiry 31, 245–261.
Stöckl, T., Huber, J., Kirchler, M., 2010. Bubble measures in experimental asset markets. Exp. Econ. 13, 284–298.