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Anchoring in experimental asset markets☆

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ABSTRACT

We investigate the relationship between anchoring and the emergence of bubbles in experimental asset markets. We show that setting a visual anchor at the fundamental value (FV) in the first period only is sufficient to eliminate or to significantly reduce bubbles in laboratory asset markets. If no FV-anchor is set, bubble-crash patterns emerge. Our results indicate that bubbles in laboratory environments are primarily sparked in the first period. If prices are initiated around the FV, they stay close to the FV over the entire trading horizon. Our insights can be related to initial public offerings and the interaction between prices set on pre-opening markets and subsequent intra-day price dynamics.

1. Introduction

In a seminal paper, Smith et al. (1988) (SSW) illustrate that asset prices may deviate systematically from the underlying fundamental value (FV) even in controlled laboratory environments. Moreover, SSW show that experimental asset prices follow bubble-crash dynamics: Initially, asset prices increase beyond the fundamental value until they peak and "crash" back towards the FV.[1] The observed price-dynamics proved to be highly replicable and persist under various experimental treatments (King et al., 1993; Boening et al., 1993; Porter and Smith, 1995; Caginalp et al., 1998, 2000; Smith et al., 2000; Dufwenberg et al., 2005; Noussair and Tucker, 2006; Haruvy and Noussair, 2006; Haruvy et al., 2007; Hussam et al., 2008; Williams, 2008).

We show that visual stimuli (i.e.: within-period price charts) induce anchoring behavior (Tversky and Kahneman, 1983, 1974) that can substantially mitigate experimental asset price bubbles. Most importantly, our evidence suggests that the visual stimulus needs to be provided in the first period only to affect overall price dynamics. We support our hypothesis

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[1] The resulting price paths therefore violate basic predictions associated with the homogeneous-beliefs, rational expectations equilibrium.

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with new experimental evidence from 22 laboratory sessions (216 subjects) and adapt existing theoretical frameworks to rationalize our findings (Caginalp et al., 2000; Duffy and Ünver, 2006).

Our insights suggest that trading behavior in the initial period is crucial for generating the well-established bubble-crash patterns in experimental asset markets. Our findings illustrate that actual restrictions of initial prices are not necessary to affect overall price dynamics (Caginalp et al., 2000). Instead, simply inducing a *visual* anchor at the fundamental value in the first period is sufficient to eliminate or significantly reduce bubbles in laboratory environments. If no such anchor is set, standard bubble-crash patterns emerge, even if the fundamental value is constant over time (Noussair et al., 2001).[2]

To further illustrate the importance of anchors in experimental asset markets, we present data on treatments in which first-period-anchors were set at "normatively irrelevant random numbers" (Ariely et al., 2003). Setting anchors at values which exceed the fundamental value, induces price-paths which initiate around the anchor and which slowly converge towards the FV from above. Setting anchors at values which are significantly smaller than the FV induces price paths, which tend to initiate below the FV, over-shoot the fundamental value and crash back or converge to it towards the end of the trading horizon. We use the models of Duffy and Ünver (2006) and Caginalp et al. (2000) – incorporating our anchoring insights – to explain the observed asymmetry.[3]

Our insights further improve our understanding of stock market dynamics and suggest that setting initial prices is perhaps more important than previously believed. Stock exchanges such as the New York Stock Exchange (NYSE) determine opening prices through pre-opening auctions. Between 8.00 am to 9.30 am, market makers at the NYSE collect limit orders and try to implement a market clearing price.[4] Our findings suggest that opening prices have very important implications for subsequent intra-day price dynamics. However, investigating the impact of opening prices on intra-day price dynamics in field settings is difficult due to potential endogeneity concerns. Our laboratory environment provides more control over initial prices and allows us to make causal statements regarding the relationship between initial prices and subsequent price dynamics.

The results presented in this paper also contribute to the well established literature on initial public offerings (IPO's, Ritter and Welch, 2002; Loughrand and Ritter, 2002). Interpreting the first-period price in our experimental sessions as the IPO price of a stock, our findings suggest that mis-pricing the IPO could lead to non-trivial price dynamics. Since our experimental setup gives us more control over the "IPO price" of the stock, we can make predictions about the consequences of over- and under-pricing the asset initially.[5]

Our findings are tightly related to a new emerging branch in the experimental asset market literature, which explores the relationship between visualization of trading prices and bubble formation. For instance, Cason and Samek (2014) illustrate that the provision of price-charts in standard asset market experiments mitigates bubbles. Powell (2010) presents an eye-tracking study and correlates behavior with visual attention in experimental asset markets. He observes patterns which further emphasize the importance of focus and visual attention on behavior in laboratory asset markets.

Our results also contribute to an ongoing debate on the impact of fundamental value processes on bubble formation (Kirchler et al., 2012, KHS hereafter).[6] Our insights suggest that constant fundamental values, coupled with a visual representation of trading prices, might favor anchoring towards the FV.

The paper is organized as follows. Section 2 presents our experimental design. Section 3 presents our results. Section 4 applies the model of Duffy and Ünver (2006) to our data, showing that anchoring is an important driver of our observed treatment effects. Section 5 concludes the paper.

2. Experimental design

In our laboratory environments participants traded a dividend-paying asset over a ten period trading horizon, using an experimental currency (Taler). Within each period a standard double auction trading mechanism determined bilateral trading prices. At the beginning of each experimental session half of the participants were endowed with 20 shares and 3000 Taler. The other half received an initial endowment of 60 shares and 1000 Taler.

Following the evidence of Caginalp et al. (1998, 2000), Noussair et al. (2001), Caginalp and Ilieva (2005), Haruvy and Noussair (2006) and Kirchler et al. (2012), we implemented an environment in which the fundamental value and the C/A ratio are constant over time. That is, dividends took realizations of 5 and −5 "Taler" with equal probability of 50%.

[2] In a slightly different context than ours, Caginalp et al. (2008) observe that subjects anchor their price expectations to previous prices or valuations, suggesting that anchoring may affect behavior in experimental asset markets.

[3] Caginalp et al. (2000) investigate initial price restrictions below the FV on the observed price dynamics. We extend this line of work by inducing initial prices *both* below and above the FV via visual stimuli instead of using actual restrictions and contribute by showing that the observed price-dynamics are asymmetric.

[4] Opening prices have been discussed extensively in the literature: See e.g.: Amihud and Mendelson (1987), Stoll and Whaley (1990), Biais et al. (1999) for field evidence and (e.g.) Biais et al. (2013) for experimental evidence.

[5] Our work is also connected to the literature on information revelation and asset price dynamics in experimental settings. Gillette et al. (1999) and Porter et al. (2010) find support for under-reaction to news on asset valuation.

[6] KHS argue that "confusion" about the decreasing fundamental value process, coupled with an increasing cash-to-asset value (C/A) ratio, are the most important factors generating the typical bubble-crash patterns in laboratory asset markets which use the SSW-design. Indeed, experiments intended to reduce this confusion by changing the notion of a "stock" to a "stock of a depletable gold mine," which served to instill the idea of a declining FV, mitigated bubble behavior.