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The "inflow-effect"—Trader inflow and price efficiency

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ABSTRACT

We investigate the impact of cash and trader inflow on price efficiency in multi-period experimental asset markets. Implementing eight treatments with 672 subjects, we find that (i) the joint inflow of cash and traders triggers strong overvaluation and massive price run-ups (inflow-effect). Remarkably, the effect occurs in almost all of the 30 markets with joint cash and trader inflow and is very robust. The effect even prevails in markets with complete and symmetric fundamental information. We further show that (ii) in treatments with the joint inflow of cash and traders, prices crash to fundamentals towards maturity of the asset. The analysis of traders' beliefs reveals that (iii) despite fundamental values staying constant, beliefs about fundamentals co-move with upwardly trending prices. Finally, we report a speculative motive only among the optimists in treatments where we observe the inflow-effect.

1. Literature and research questions

In this paper, we analyze the impact of cash and trader inflow on price efficiency with a novel multi-period experimental asset market setting. We find an "inflow-effect" as the joint inflow of cash and traders triggers strong overvaluation accompanied by significant price run-ups and crashes towards fundamentals at maturity of the asset. We elicit subjects' beliefs and observe that this effect is driven by a speculative motive among optimists and is accompanied by a strong upward adaption of beliefs about fundamentals. Given our results we believe to have developed a new experimental asset market design that reliably produces so-called "bubbles".[3]

History reports numerous cases of financial euphoria and "price bubbles". The Dutch Tulipmania in the 1630s and the South-Sea Bubble in 1720/1721 were two spectacular examples centuries ago. In more recent times financial euphoria in the second half of the 1920s, which preceded the Great Depression, the Dot-com Bubble at the end of the 1990s, and the US real estate bubble 2000–2006 are three outstanding bubble episodes among many. Besides their fascinating nature, these market failures triggered

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[3] An exact numerical definition of a "bubble" is elusive as a definition has to include (1) a reference variable (e.g., fundamental value) and (2) a threshold deviation from this reference variable to call it a bubble (see Garber (2000) and Kindleberger (2011) for definitions). We apply a more conservative approach and consciously avoid the term "bubble" for the interpretation of our results. We investigate whether overvaluation (price minus fundamental value) and price amplitude (magnitude of the price increase) differ between treatments. However, when outlining implications from existing literature we adopt the terminology and use the term "bubble" when used by the respective authors.

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severe consequences: For instance, the stock market crash of 1929 led to a global recession and political turmoil and the bursting of the US real estate bubble paved the way for the financial crises erupting in 2007. The price of bubbles has usually been bankruptcy, recession and increased unemployment after the crash. A better understanding of why, when and how bubbles emerge is crucial for efforts to abate future bubbles and to dampen their destructive impact on the entire economy.

Research on the origins of bubbles has seen great progress during the last two decades. In two surveys Brunnermeier (2008) and Brunnermeier and Oehmke (2012) give a comprehensive picture and outline various reasons for bubble formation, such as rational bubbles, limits of arbitrage and heterogeneous information. Allen and Gorton (1993) name information asymmetries between investors and portfolio managers as reasons for bubbles, while Benabou (2013) points to wishful thinking and delusion of the whole market. A seminal study that is particularly instructive to our paper is the one of Miller (1977) introducing traders with heterogeneous beliefs about the asset's fundamental value. As short selling is prohibited all units of the asset are held by the investors with the most optimistic estimates of returns of the asset. Consequently, the market price equals the beliefs of the most optimistic traders. Moreover, as soon as some traders adjust their beliefs upward – either because they become more optimistic or because they consider more optimistic traders in the future – Harrison and Kreps (1978) and Ofek and Richardson (2003) show that prices can rise above the beliefs of the most optimistic traders. The latter relate this argument to the formation of the Dot-com Bubble at the end of the 1990s.

In recent years especially experimental asset market research has made important contributions to the investigation of bubble phenomena. The major advantage of economic experiments is that factors influencing individual decision-making can be explored in detail. In the seminal design of Smith et al. (1988) – SSW henceforth – bubbles emerge because of speculation (Smith et al., 1988; Lei et al., 2001), inexperience (Dufwenberg et al., 2005), confusion and framing of the fundamental value (Huber and Kirchler, 2012; Kirchler et al., 2012) and lack of information asymmetries (Sutter et al., 2012). However, one of the most prominent reasons for strong bubbles in this setting appears to be “excess cash”, i.e., high initial cash to asset-value ratios (CA-Ratios) in the market. The CA-Ratio is defined as the total amount of cash divided by the product of outstanding shares and fundamental value of the asset. Among others, Caginalp et al. (1998, 2001) and Haruvy and Noussair (2006) report strong bubbles in markets of SSW-type with high initial CA-Ratios.[4]

Bubble phenomena have been investigated in different fields other than economics including history, psychology and sociology. Across fields it is evident that, among the above outlined reasons, one of the most important ingredients of historic bubbles is the “inflow” of new liquidity by new traders (see the narratives of Galbraith, 1994 and Kindleberger, 2011 on various historic bubble episodes). Xiong and Yu (2011) hypothesize that this effect has strongly contributed to the Chinese Warrants Bubble from 2005 to 2008. In arguably one of the clearest bubble episodes in history, Put-warrants of 18 Chinese companies have been traded at highly inflated prices although the warrants were essentially worthless. The study of Xiong and Yu (2011) is one of the rare examples in which fundamentals are empirically observable because the fundamental values, derived according to the Black–Scholes formula, were almost zero. As a theoretical explanation, Xiong and Yu (2011) put forward the resale option theory that builds on the joint effects of heterogeneous beliefs and short-selling constraints (Harrison and Kreps, 1978; Morris, 1996; Scheinkman and Xiong, 2003). A drawback is that they cannot test their hypothesis that the inflow of new traders has contributed to the Chinese Warrants Bubble.

By using laboratory experiments, we overcome shortcomings of empirical studies in measuring this inflow-conjecture. Usually, fundamental values are very difficult to measure and the extent of trader inflow is not quantifiable in empirical studies. Even if fundamental values and trader inflow could somehow be analyzed, the problem of not knowing the ceteris paribus outcome without trader inflow arises. Laboratory experiments bypass these difficulties as fundamentals and trader/cash inflow can be controlled. With a specific treatment design the “inflow-effect” can be isolated by comparing results from a treatment with cash and trader inflow to those from treatments without inflow of new traders. In two studies with settings different from ours, Hirota and Sunder (2007) and Deck et al. (2014) investigate the effects of overlapping generations in laboratory asset markets. Hirota and Sunder (2007) find strong bubbles only in markets with short-term investors, i.e., investors that do not stay in the market until maturity. Using the SSW-model, Deck et al. (2014) report bubbles when new traders enter and crashes at the time when a subset of traders exit. However, neither of these studies separates the effect of new traders entering from the effect of increasing CA-Ratios in the market.[5]

In the first part of our paper, we disentangle the effect of new trader inflow from the effect of an increasing CA-Ratio. We develop a novel market model in which information about the constant fundamental value of the asset is distributed heterogeneously, leaving each trader with incomplete information. In four basic treatments we implement a 2×2 design

[4] However, it appears that high CA-Ratios must already be present in the beginning of the market for bubbles to form. In markets with constant fundamental value and symmetric information Kirchler et al. (2012) report that increasing CA-Ratios over time when starting from a low level, do not yield bubbles. It is also shown in this framework that asset repurchases increase and share issues decrease prices (Haruvy et al., 2014).

[5] Although they tackle another research question Oechssler et al. (2011) allow for some form of endogenous inflow of traders in their markets. They operate five different markets simultaneously with subjects being free to enter and exit. A related line of literature also deals with the impact of inexperienced subjects on price efficiency. In these studies inexperienced subjects usually replace experienced subjects in the market. Dufwenberg et al. (2005) show that it is sufficient to include a small fraction of experienced traders among a majority of inexperienced ones to sustain price efficiency. Xie and Zhang (2012), however, find that bubbles are not significantly abated by the third repetition of the market with the inflow of new inexperienced traders. In another study that focusses on the inflow of new traders Akiyama et al. (2014) show that a significant inflow of inexperienced traders causes prices to deviate from fundamental values. They show that this finding is not because of the responses of experienced subjects to the strategic uncertainty generated by the new traders. This mechanism is mainly due to the behavior of the inexperienced traders making more pricing errors.