Information, Speculation, And Bubble Formation In Experimental Crypto-Currency Markets

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Introduction

Various studies have aimed to investigate the causes and market conditions that lead to bubbles and crashes (Abreu et al.; 2003, Lux; 1995, Vogel et al; 2018). However, a big drawback of studying real markets is the level of difficulty in employing controls, therefore raising questions about the ability to determine causality between bubbles and treatment variables in real market studies. To solve this problem economists have attempted to create laboratory experiments that yield reliable empirical data. One of the first major studies in this field was designed by Vernon Smith and his team (Bubbles, Crashes, and Endogenous Expectations in Experimental Spot Asset Markets). In this experiment Smith tested whether the rational expectation model that suggests, a stock's current value converges to the present value of a rationally expected dividend stream, would still be relevant in the context of an experimental spot asset market.

Smith et al's experimental design gained a lot of attention from economists and has ever since been used as a foundation for several future studies that aimed to investigate the existence of bubbles in an experimental market. Dufwenberg et al's Bubbles and Experience an Experiment is one big example of a study that employed Smith et al's experimental design. Dufwenberg aimed to investigate the role of experience amongst traders in the formation of bubbles in experimental asset markets. This was a pivotal laboratory experiment because it gave insights into the association between increased experience levels amongst traders and the decline in the likeliness of bubble formation.

A lot has changed since Smith and Dufwenberg's initial study of the market, one of the biggest being the introduction of a blockchain-based cryptocurrency market. The introduction of a class of an unconventional tradeable asset market raises the question of whether bubbles will persist even in experimental crypto markets. The volatile crypto market has, time and again, demonstrated patterns of a bubble, the biggest example being the bitcoin bubble created by information based on tweets. The increasing volatility and lack of information and experience surrounding trading crypto assets lead to the formation of completely new market conditions. Given the increased accessibility and trade volumes of cryptocurrencies, it becomes imperative to study this market in order to understand why cryptocurrencies frequently see price bubbles and crashes. I see great potential in creating and investigating experimental crypto markets by slightly tweaking Smith and Dufwenberg's designs.

In this paper, I will initially explore the design of Smith et al and Dufwenberg's study while surveying a few other studies that have made use of Smith's experimental design. I will then propose the application of a treatment variable (speculative information) that I wish to apply to this experimental design and will briefly describe how I will be replicating, with changes, Smith et al. and Dufwenberg et al’s initial experiment to investigate the impact of information and speculation on bubbles in experimental crypto markets.

Experimental Design Discussion

Trading Setup Overview

The success and value to academia from Smith's study mainly come from the way that the experimenters set up market conditions in order to replicate spot asset markets. In this section, we discuss how Smith et al. set up effective market parameters to replicate a typical spot asset market in a laboratory setting.

Smith et al employed an enhanced version of the PLATO computerized double auction (Williams and Smith 1984). The double auction condition was created by giving participants the option to switch between buying and selling, replicating a typical stock market trading condition. This structure of the experiment allowed players on both sides (buyers and sellers) to submit asset price quotes simultaneously.

At the beginning of the experiment, traders are given an asset endowment and a cash endowment. To submit bids, each of the participants had a computer screen that displayed 5 units, their selling price, purchasing price, dividend earnings, and total earnings. The restriction to the 5 units allowed experimenters to collect data that was reasonably easy to control and analyze, however, that lack of variety in assets could be considered a limitation due to the fact that the real spot asset market has a wide range of available options. Experimenters standardized the amount of information that each participant received by making sure traders always have knowledge of a few major metrics: their initial cash endowment, their current cash holdings (which are subject to change due to positive dividend yields, and capital gains or losses while trading), and probabilities of the dividend yield structures. This allowed them to control for the amount of influence the information had on trading behavior and patterns, therefore, increasing the internal reliability of their results.

The trading system, fundamentally, was that traders enter an amount (bid) and can enter bids and accept bids. The trading sessions lasted over a period of 15 or 30 market periods each lasting about 240 seconds. When a trader bought an asset, the price and the period purchased were recorded in the trader's inventory table and available for the traders to see. The biggest condition for trading was that the participants were allowed to buy as long as their working capital covered the purchase price. It is important to note that in the context of a real market, the condition above would translate to an assumption that traders could trade only with their fixed initial investment.