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Do option-like incentives induce overvaluation? Evidence from experimental asset markets

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ABSTRACT

One potential reason for bubbles evolving prior to the financial crisis was excessive risk taking stemming from option-like incentive schemes in financial institutions. By running laboratory asset markets, we investigate the impact of option-like incentives on price formation and trading behavior. The main results are that (i) we observe significantly higher market prices with option-like incentives than linear incentives. (ii) We further find that option-like incentives provoke subjects to behave differently and to take more risk than subjects with linear incentives. (iii) We finally show that trading at inflated prices is rational for subjects with option-like incentives since it increases their expected payout.

1. Introduction

The role of specific compensation structures of financial market participants has become a highly discussed issue since the unfolding of the financial crisis in 2007–2008. It has been argued that bubbles in several markets were caused by excessive risk taking which stemmed from bonus payment systems and option-like compensation structures in financial institutions (Bebchuk and Spamann, 2010; Dewatripont et al., 2010; French et al., 2010; Gennaioli et al., 2012). According to Rajan (2006), one of the main origins of instability in highly developed financial markets are widely used convex incentive structures.[1] He argues that, compared to the 1970s, the reduced downside and the strongly increased upside potentials of investment managers' compensation create stronger incentives to take risks.

From the 1970s onwards, many investors started to delegate their portfolio to financial professionals. In general, this delegation of individuals' investment portfolios to financial professionals results in asymmetric information and creates a moral hazard problem (Allen, 2001). To solve the problems of moral hazard, various mechanisms are used to align the

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[1] We use "option-like" and "convex" synonymously throughout the paper.

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interests of the investment manager (agent) and the investor (principal). The most common mechanisms in the financial industry are bonus payments and option-like incentive contracts (Kritzman, 1987; Allen and Gorton, 1993; Goetzmann et al., 2003; Cuoco and Kaniel, 2011). However, Rajan (2006) argues that managerial incentives are not always aligned with the investors' interests and these misalignments may result in distortions on financial markets.

Allen and Gorton (1993) model this agency problem theoretically. In their model the investment manager does not share the losses but receives a proportion of the profits. They report "rational bubbles", as the convex incentive structure induces the investment manager to trade at prices far above fundamentals. This problem is similar to the risk-shifting problem in Jensen and Meckling (1976) where corporations' shareholders are modelled as agents and bondholders as principals. The shareholders obtain any upside potential but do not bear the full downside risk because of limited liability. Consequently, even risky negative net present value projects may be attractive for the shareholders. Likewise, Allen and Gale (2000) examine how intermediation by the banking sector leads to a similar agency problem which also results in asset bubbles.

Although these financial incentives are nowadays one of the major trading motives of financial professionals, little is known about the consequences of convex incentives on market efficiency in asset markets.[2] James and Isaac (2000) and Isaac and James (2003) investigate price formation in experimental markets under tournament incentive structures. They show that moderate overvaluation emerges under tournament incentives for all traders.

In order to analyze the effects of option-like incentives on market efficiency and investment behavior we run laboratory experiments. Inspired by Allen and Gorton (1993) and Rajan (2006), we first address the following research question:

Research Question 1: *Do option-like incentives trigger different market dynamics compared to linear incentives*?[3] To answer research question 1, we implement two different incentive structures. In two treatments (Treatment LINEAR and Treatment CONVEX) we either apply a linear or a convex incentive structure for all subjects. This enables us to investigate the pure effects of both the incentive structures on market efficiency and other market variables.

In real markets, however, investment managers with option-like incentives trade assets with investors who have linear incentives. We therefore implement a third treatment (Treatment HYBRID) in which we endow half of the subjects with convex incentives and half of the subjects with linear incentives. Thus, we formulate the second research question as follows:

Research Question 2: *How do interactions between heterogeneously incentivized subjects change market dynamics compared to a situation where all subjects have the same incentives*?

No matter whether incentives influence market dynamics or not, it is of particular interest to investigate subjects' investment behavior based on the incentives they face. Therefore, we formulate the final research question.

Research Question 3: *Do option-like incentives trigger different investment behavior compared to linear incentives*?

To answer this research question we use data of all three treatments. First, this enables us to observe behavioral differences of subjects between the base treatments LINEAR and CONVEX. Second and more importantly, this allows us to investigate how trading behavior changes when subjects with different incentives compete against each other in Treatment HYBRID.

Our main results include (i) significantly higher market prices when subjects are incentivized with option-like incentives than with linear incentives. (ii) We further show that option-like incentives induce subjects to behave differently and to take more risk than subjects with linear incentives. (iii) Finally, we report that trading at inflated prices is rational from an individual perspective since it increases the expected payout of option-like incentivized subjects. In real markets, overvalued assets would of course be harmful for the investors who delegate their portfolio to investment managers as prices no longer reflect the assets' future cash flows.

2. The experiment

In each market ten subjects trade assets of a fictive company for experimental currency (Taler) in a sequence of twelve periods of 120 s each.[4] For the sake of simplicity subjects manage a portfolio of one risky asset and risk-free cash. In particular, they are endowed with 40 assets and 2000 Taler. Valued at the expected cash-flow, i.e., expected terminal dividend (ED), of 25 Taler each subject's initial wealth is 3000 Taler in each treatment. Taler and asset holdings are carried over from one period to the next. No interest is paid on Taler holdings and there are no transaction costs.

2.1. Experimental treatments

To achieve comparability we set up the treatments in a way that expected earnings are identical across treatments. In particular, the incentive structures in all treatments are modelled such that the expected earnings of a risk-neutral hold strategy are EUR 15. Table 1 presents an overview of the treatment abbreviations and parameters.

[2] The impact of many different factors on price formation has been investigated especially in laboratory asset markets. The most prominent drivers of mispricing are lottery assets (Ackert et al., 2006), speculation (Lei et al., 2001), confusion (Kirchler et al., 2012), trend following forecasting strategies (Hommes et al., 2005; Heemeijer et al., 2012; Hommes, 2011; Bao et al., 2012), and excess cash (Caginalp et al., 1998, 2001; Haruvy and Noussair, 2006).

[3] The notion market dynamics includes overvaluation, share turnover, bid-ask spread and the volatility of price changes.

[4] To avoid end of experiment effects, subjects were told that the experiment will be terminated randomly between periods 8 and 15 with equal probability. In the first market, period 12 was chosen randomly and therefore we sticked to this ending period in all other markets.