



# Informational differences and learning in an asset market with boundedly rational agents

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## Abstract

In this paper we study the properties of an asset pricing model where boundedly rational agents respond to incoming news about economic fundamentals such as future dividends. Our aim is to characterize the resulting fluctuations of the market price around the time-varying underlying fundamental value. The starting point is an asset market in which agents can choose among two different degrees of information regarding future dividends. At the same time agents also try to learn the growth rate of the dividend generating process. Their interaction leads to prices that deviate perpetually from the fundamental value in the short run but stay close to it in the long run. In particular, prices exhibit time-varying nonlinear mean reversion, with parameters determined by the learning process.

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## 1. Introduction

The aim of this paper is to investigate how news about fundamentals affects price fluctuations in an asset market populated by boundedly rational agents. The model is

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set up in such a way that if all agents have full information regarding fundamentals, the price behaves according to the ‘classical’ asset pricing model described by [Gordon \(1962\)](#). To allow for possible deviations from this benchmark, we assume that agents do not fully know the parameters of the dividend process, and allow them to choose between different information sets regarding future dividends. This leads, among other results, to an explicit model for nonlinear mean reversion.

We are by no means the first to address bounded rationality in this context. Since the discovery of the so-called financial anomalies, the validity of the efficient market hypothesis has been questioned on the basis of empirical evaluation. For instance, markets exhibit excess volatility as described by [Shiller \(1981\)](#) and [LeRoy and Porter \(1981\)](#), mean reversion of asset prices, as documented by [Poterba and Summers \(1988\)](#) and [Fama and French \(1988b\)](#), and correlation between returns and lagged returns or lagged dividend yields, as shown by [Shiller \(1984\)](#) and [Fama and French \(1988a\)](#). Stimulated by these findings, part of the scientific community has investigated whether such anomalies can be explained by assuming that the agents operating in the market are boundedly rational.

One class of models in the asset market literature with boundedly rational agents takes explicitly into account the role of news on fundamentals in the price dynamics. Early examples are [Bulkley and Tonks \(1989\)](#) and [Barsky and De Long \(1993\)](#) who investigate the effect of agents trying to learn the growth rate of dividends from movements in the stock price. More recent examples are [Timmermann \(1993, 1996\)](#) and [Barucci et al. \(2004\)](#), who assume that agents estimate parameters defining the relationship between prices and dividends. In all these cases, agents use the rational expectations relationship that would hold between endogenous variables (prices) and exogenous variables (dividends) as if the underlying parameters were known. When new information about dividends becomes available, it influences returns not only directly but also indirectly as it affects the estimates of the parameters that the agents use to forecast future prices and/or dividends. Convergence of the asset price to the present value of the stream of future dividends is achieved when the agents learn the correct parameters of the dividend process.

A limitation of these models is that they assume the presence of a representative agent, so that interaction of agents with different information or expectations does not play a role. Another class of models with boundedly rational agents does concentrate on the interaction of agents choosing different expectation schemes or different investment strategies (see e.g. the survey paper of [Hommes, 2006](#)). An early example is [Chiarella \(1992\)](#) where a model of a stylized financial market with fundamentalists and chartists is shown to generate a number of dynamic regimes which are compatible with the empirical anomalies reported above. In a more recent paper, [Brock and Hommes \(1998\)](#) consider a model with agents who do not know whether it is more profitable to predict prices by relying on fundamental information, or to extrapolate trends. To choose between these two strategies, agents use a performance measure such as realized profits. This repetitive re-evaluation of the performance of the strategies leads to complex price fluctuations. These fluctuations are totally endogenous and they do not require the presence of exogenous influences such as time-varying fundamentals.

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