

THE DYNAMICS OF SPECULATIVE BEHAVIOUR

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Abstract

A number of recent empirical studies cast some doubt on the random walk theory of asset prices and suggest these display significant transitory components and complex chaotic motion. This paper analyses a model of fundamentalists and chartists which can generate a number of dynamic regimes which are compatible with the recent empirical evidence.

1. Introduction

One of the cornerstones of the modern theory of finance is the view that asset prices exhibit random walk behaviour. This view is important in empirical finance because it is the theoretical underpinning of the large number of efficient market studies which focus on the forecastability of asset returns. It is also important in theoretical finance because it is the basis of the stochastic price mechanisms assumed in many of the key theoretical models in finance, e.g. the optimal portfolio rules of Merton [24], the intertemporal capital asset pricing model of Merton [25] and models for the pricing of contingent claims, Black and Scholes [4].

The impressive statistical evidence in favour of market efficiency discussed for example by Fama [9] has been taken as support for the random walk model and until fairly recently financial economists have been contented with this view as the explanation of the time series behaviour of observed asset prices.

Recent empirical studies, however, have led to some questioning of the basic tenets of the efficient market model, or at least of the view that it suggests for asset price dynamics. For a start, there is a large number of studies reporting various anomalies relating excess returns to a variety of factors such as firm size, market sentiment, day of the week, month of the year, etc. Much of the recent anomalies literature is surveyed by Keim [18]. Lo and MacKinlay [21], employing tests based upon variance estimators find that a random walk model is generally not consistent with the stochastic behaviour of weekly stock returns and also find significant positive serial correlation for weekly and monthly holding period returns. Their results also indicate that mean reverting fads models as suggested by Shiller and Perron [33] and Summers [35] cannot account for the departures from the random

walk model. Poterba and Summers [26] find evidence that transitory components account for a large fraction of the variance in common stock returns. Fama and French [10] find evidence of large predictable variation in 3–5 year stock return variances. A number of other empirical studies provide evidence that stockmarket returns contain a sizeable predictable component, e.g. French et al. [13] and Campbell [6]. Then there is a large and growing literature on the excess volatility of asset prices, starting with Shiller [32] and recently surveyed by West [36], that puts into question the view that asset prices are determined solely from rationally expected fundamental values, which according to Samuelson [30] should follow a random walk.

The stock market crash of 1987, and more recent gyrations, have caused financial economists to ponder more deeply the applicability of the random walk/efficient markets paradigm and have thereby given impetus to the quest for a fresh look at models of how the stock market in particular, but speculative markets in general, work. Leland [20] suggests a number of competing theories for stock market behaviour, one of which is firmly rooted within the traditional efficient markets paradigm, others, however, are based either on a perceived breakdown of the market mechanism or on a consideration of different classes of investors.

Significantly, despite the dominance of the random walk/efficient markets paradigm in the academic literature, some major investment institutions continue to devote a considerable amount of valuable resources to technical analysis and there are even claims that it is possible to "beat the market" with such techniques, e.g. Pruitt and White [28].

The above considerations suggest that there is a need to consider some alternative models of asset price dynamics (i.e. alternative to the view that the price reflects only the rationally expected fundamental value of the asset). What would we require of an alternative model to reconcile it with the various strands of literature we have cited? Firstly, we would require that the model generate a significant transitory component around an equilibrium which reflects the rationally expected value of the asset. Secondly, the model must allow for the incorporation of chartists, a group which bases its market actions on an analysis of past price trends. Since this group seems to be an important part of real markets it is important to determine what effect its activity has on the behaviour of assets prices and whether the behaviour of a model incorporating chartists comes closer to explaining some of the empirical results cited earlier.

In this paper we analyse a model of asset price dynamics containing fundamentalists (who are forming rational expectations on the fundamental value of the asset) and chartists (who are reacting to price trends). A number of models of fundamentalists and chartists have been analysed in the literature. We cite in particular the works of Zeeman [37], Beja and Goldman [3], Frankel and Froot [12] and Bowden [5]. The model we analyse is a development of the model of Beja and Goldman. These authors posit demand for the asset as having a fundamental component and a speculative (chartist) component. The fundamental demand is the aggregate