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## Some issues on the stability of trading based on technical analysis<sup>☆</sup>

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### Abstract

Some stability effects of technical trading on financial/commodity markets are analyzed in this paper. Technical trading is characterized by using past price information within a time-delay horizon to forecast future price dynamics. By introducing fundamental and technical excess demand functions, the market dynamics is modeled as a time-delayed differential equation, whose (local) stability is determined by means of root-locus techniques. It is proven that the larger the time-delay horizon, the larger the stability margin. This means that short-run technical trading is more likely to induce market instabilities than large-run technical trading. It is also shown that, as expected, the larger the relative weight of technical trading with respect to fundamental trading, the smaller the stability margin of the market dynamics.

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Keywords: Technical trading; Time-delayed differential equations; Stability

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## 1. Introduction

Fundamental trading strategies consist of macro, strategic assessments of where an asset, currency or commodity should be traded based on virtually any criteria but the price action itself. These criteria often include, e.g., economic conditions of the firm or the country, monetary policy and other “fundamental” elements [1,2]. On the other hand, technical trading is probably the most common mean of making decisions and analyzing markets, including financial, forex and commodity markets. Technical trading differs from fundamental analysis in that technical analysis is applied only to the price action of the market, ignoring the fundamental factors [2]. As fundamental data can often provide only a long-term or delayed forecast of price movements, technical analysis has become the primary tool with which to successfully trade shorter-term price movements and to set stop loss and profit target. Technical analysis consists primarily of a variety of technical studies, each of which can be interpreted to generate buy and sell signals or to estimate market direction [1,3]. For instance, the head-and-shoulder pattern is a representative chartist trading rule which incorporates various technical ideas such as smoothed trends, trend reversal and resistance levels [4,5]. Foreign exchange markets are prominent examples of financial systems where technical rules have devoted a great influence [6,7].

Traditionally, academic scholars have been skeptical about the usefulness of technical trading [8], probably due to the widespread feeling that relative prices must somehow be related to fundamentals and technical trading simply ignores fundamentals. Also many scholars doubt the very existence of some stable and rigid patterns in price behaviors. However, in the practice counterpart, these techniques continue to be very popular among market participants [1,3,7,9,10]. In this way, a theoretical analysis intended to improve our understanding of market dynamics should consider the (positive and negative) effects of both fundamental and technical trading. In fact, the popularity of technical analysis, regardless of arguments in favor [2] or against [11] and its true profitability in actual markets, will have a significant impact on market stability and performance.

Departing from Day and Huang’s work [12], in the last decade a rapidly increasing interest in understanding the interaction between fundamental and technical trading can be observed. This is important since, in many markets, traders seem to use a combination of both strategies. Kirman [13], Brock and Hommes [14] and Lux and Marchesi [15] have used evolutionary games to study the effect of non-linearities by traders’ switching between technical and fundamental forecast rule. Farmer and Joshi [16] have used simple one-step ahead market models to study the interactions between technical traders and fundamentalists. Schmidt [17] has used a simple trading model to show that if technical traders are able to affect the market liquidity, their concerted actions can move the market price in the direction favorable to their strategy. As mentioned before, technical traders look for patterns in past prices, within a certain time window, and base their forecasts upon extrapolation of these patterns. In this way, technical trading can be seen as rules that feed back past (i.e., delayed) prices into the market dynamics. Although some important insights on the understanding of the market stability in the presence of technical trading have been gained with recent published

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