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# Do technical trading profits remain in the foreign exchange market? Evidence from 14 currencies<sup>☆</sup>

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### ABSTRACT

We examine the in- and out-of-sample behavior of two popular trading systems, Alexander and Double MA filters, for 14 developed-country currencies using daily data with bid-ask spreads. We find significant in-sample returns in the early periods. But out-of-sample returns are lower and only occasionally significant. We show that a currency risk factor proposed in the literature is systematically related to these returns. We find no support for the hypotheses that falling transactions costs are responsible for declining trading profits or for the Adaptive Market hypothesis. Importantly, we show that algorithms that simulate out-of-sample returns have serious instability difficulties.

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## 1. Introduction

Examining the profitability of technical trading systems has been the subject of much research, because it can reveal market inefficiencies and possible disequilibria in the FX market. These systems –

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sets of mechanical rules that generate buy, sell or hold signals based on historical data – are designed to take advantage of time-dependencies in price changes. Under the Efficient Markets Hypothesis (EMH), price changes should not be time-dependent; in particular, there should be no systematic profits, after adjusting for returns to risk-bearing and transactions costs. Under the Adaptive Market Hypothesis (AMH; see Lo, 2004), price changes may be time-dependent, and the resulting profits are expected to dissipate only slowly.

The results in the literature to-date as to whether trading profits exist are inconclusive. The following four items summarize the findings in the literature on trading systems:

- (1) Almost all the studies find statistically and economically significant trading (system) profits when profits are computed in-sample, that is, when all the sample data are used to identify winning strategies.
- (2) Out-of-sample evidence is more mixed, particularly in the most recent papers we review below. Some studies find smaller, declining, and often insignificant out-of-sample returns from trading systems. “Out-of-sample” evaluations simulate trading using historical data but they use information available only at each decision date in the selection of strategies.
- (3) A “filter” is the minimum change required in the benchmark variable for the trading system to trigger action; the filter can be set to a variety of values. The general conclusion is that, ignoring transactions costs, small filters – triggered by small changes in the benchmark variable – produce higher returns than large filters. But because small filters imply very frequent trading, unaccounted-for transactions costs are high and trader profits are dissipated.
- (4) At least the in-sample profits documented for trading systems are often judged to be too large to represent likely returns to risk-bearing.<sup>1</sup>

The existence of trading system profits, if reliable, raises troubling questions about the efficiency of the FX markets. In this paper we investigate the main issue in FX market efficiency: do excess trading profits still exist?

We address this question by re-examining the profitability of two popular trading systems, a variant of the Alexander filter, and the Double Moving Average (Double MA) filter, from January 1986 to August 2009. We use daily data for 14 developed-country currencies, for which bid-ask spreads are available for both FX rates and Eurocurrency deposit and loan rates. The bid-ask spreads allow us to take into account explicitly the direct transactions costs of trading, rather than ignoring, estimating, or assuming them, as in the literature to-date.

We find that, consistent with the literature, these two trading systems often generate significant and positive returns (profits) when applied in-sample. When we take into account the bid-ask spreads, profits and their statistical significance is lower; however, with a few exceptions they retain significance at a lower confidence level. We confirm that in-sample trading profits are considerably lower in the second half of the sample; their statistical significance is much reduced or is nonexistent.

Also consistent with the literature, we find that trading system profits are economically smaller and generally statistically insignificant when the systems are simulated out-of-sample, and losses are much more frequent. We do find some evidence of significant out-of-sample excess returns in the beginning of our sample period (1989–1991). However, the level and significance of trading returns in the subsequent periods is very uncertain, and there are only a few instances in later subperiods where we find significant returns.

We use regression analysis to more formally test several hypotheses: (i) the risk premium hypothesis, which suggests that the exposure of the trading returns to market-wide risk factors is responsible for any measured profits, (ii) the hypothesis that lower transactions costs reduce profits by making it more attractive for less efficient traders to trade, and (iii) the AMH.

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<sup>1</sup> There are parallel “technical trading literatures” for the stock market and for commodity markets. In contrast to the FX markets literature, the general conclusion for the stock market is that apparently profitable trading systems exist for small filters, but that these excess profits would be swamped by the transactions costs incurred in following the system; see Allen and Karjalainen (1999) for further references. Also, significant profits are reported in commodity markets; see Lukac et al. (1988).

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