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Type I error of t-tests from the simple moving average technical trading rules

Numerous studies have demonstrated the inefficiency of the market via applications of t-tests on returns from Buy and Sell Days. In this study, we highlight large type I errors associated with the tests and show that it is inappropriate to use t-tests on returns from Buy and Sell Days to support market inefficiency.

Keywords: efficient market; moving average trading rules; t-tests; type I error.
JEL classification: C1; G0.

1. Introduction

Whereas fundamental analysis uses a firm's financial statements to evaluate the company's performance, technical trading rules seek to identify patterns and trend changes in market prices. As seen in studies such as (Brock et al., 1992; Chang et al., 2006; Coutts, Cheung, 2000; Kirkpatrick II, Dahlquist, 2015; Pring, 2014), researchers often focus on comparisons of mean returns from Buy and Sell Days in technical trading strategies to conclude that technical trading strategies may be profitable, thus implying market inefficiency. In this study, we present quantitative evidence that suggests that the latter conclusions are in fact spurious.

One of the most popular technical trading rules is the simple moving average technical trading rule (Pring, 2014). Under the simple moving average trading rule, a Buy (Sell) signal emits when short-term moving averages exceed (fall below) long-term moving averages.

Conditions can be added to the simple moving average trading rule by specifying different lengths of short-term and long-term averages or a band of α percentages. We will denote these conditions as $\text{MA}(S, L, a)$, where S is the length of short-term moving averages, L is the length of long-term moving averages, and a is the percentage band.

As in (Coutts, Cheung, 2000), and (Kwon, Kish, 2002), a day at time t is "classified or labeled" as a

$$\text{Buy Day if } \sum_{i=t-S}^{t} P_i \geq (1+a)\sum_{i=t-L}^{t} P_i\text{; otherwise, a Sell Day if } \sum_{i=t-S}^{t} P_i < (1+a)\sum_{i=t-L}^{t} P_i. \quad (1)$$

Following a study by Brock et al. (1992), numerous academic articles have been published using moving average trading rules and *t*-tests on Buy and Sell Day returns to test for market

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