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# Assessing the profitability of intraday opening range breakout strategies

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ABSTRACT

Is it possible to beat the market by mechanical trading rules based on historical and publicly known information? Such rules have long been used by investors and in this paper, we test the success rate of trades and profitability of the Open Range Breakout (ORB) strategy. An investor that trades on the ORB strategy seeks to identify large intraday price movements and trades only when the price moves beyond some predetermined threshold. We present an ORB strategy based on normally distributed returns to identify such days and find that our ORB trading strategy result in significantly higher returns than zero as well as an increased success rate in relation to a fair game. The characteristics of such an approach over conventional statistical tests is that it involves the joint distribution of low, high, open and close over a given time horizon.



## 1. Introduction

The Efficient Market Hypothesis (EMH) of Fama (1965, 1970) asserts that current asset prices fully reflect available information (see also Fama, 1991) implying that asset prices evolve as random walks in time. Consequently, tests of the EMH have traditionally been designed to catch deviations from random walk prices and in the massive literature on the subject one is bound to find support for both acceptances and rejections of the hypothesis (e.g., Malkiel, 1996; Lo, 2001). In particular, an assertion of the EMH is that it should not be possible to base a trading strategy on historical prices (so-called

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filter rules or technical trading) and earn positive expected returns. However, the fact remains that the use of filter rules is a widespread phenomenon. Barclay Hedge estimates that filter based Hedge Funds within the Managed Futures category manage over 300 Billion USD in 2011 and is today the largest hedge fund category with respect to assets under management. Indeed, some filter rule traders appear to consistently outperform the market (see Schwager (1989), for a classic reference) and the subject has been given due attention in the literature (e.g. Brock et al., 1992; Gençay, 1996, 1998). Testing of the profitability of trading rules has traditionally been carried out based on a (at least) daily investment horizon. However, as discussed in Taylor and Allen (1992) the use of filter rules among practitioners appears to increase with the frequency of trading (see also Schulmeister, 2006, 2009). In particular, many strategies are typically employed intraday and to assess their potential profitability one would typically require intraday data. The relative unavailability of intraday data may thus be a possible explanation for the apparent lagging behind of the research community.

In this paper we remove this obstacle and propose a quite novel approach on how to assess the profitability when only records of daily high, low, opening and close are available. Obviously, there is a plethora of filter rules out there and the one we have in mind in the present paper is the so-called Opening Range Breakout (ORB), which is typically adopted intraday. This rule is based on the premise that if the market moves a certain percentage from the opening price level, the odds favor a continuation of that move. An ORB filter suggests that, long (short) positions are established at some predetermined price threshold a certain percentage above (below) the opening price.

To evoke the testing strategy and gain intuition on the way we first note that the rationale behind using an ORB filter is the believe in so-called momentum in prices (e.g. Jegadeesh and Titman, 1993). That is, the tendency for rising asset prices to rise further and falling prices to keep falling. In the behavioral finance literature the appearance of momentum is often attributed to cognitive biases from irrational investors such as investor herding, investor over- and under-reaction, and confirmation bias (see Barberis et al., 1998; Daniel et al., 1998). However, as discussed in Crombez (2001) momentum can also be observed with perfectly rational traders. In pioneering the ORB strategy Crabel (1990) presented the so-called Contraction–Expansion (C–E) principle. The principle asserts that markets alternates between regimes of contraction and expansion, or, periods of modest and large price movements, respectively. An ORB strategy may be viewed as a strategy of identifying and profiting from days of expansion. In passing we note the resemblance with the stylized fact of volatility clustering in financial return series (e.g. Engle, 1982).

Now, a seemingly quite reasonable assumption is that markets for the most part are relatively efficient with prices evolving as random walks in time, or equivalently, returns are martingales. Thus, a heuristic use of the law of large number implies normally distributed returns. According to the (C–E) principle these calm days could be considered as periods of contraction during which the returns are normally distributed. Now, during periods of expansions traders activates ORB strategies and the profitability of them implies that the martingale property breaks down with non-normality as a consequence. Building on this reasoning our testing strategy is simply based on identifying days of large intraday movements and evaluating the expected return on these days. In particular, if on a given day the price threshold implied by the rule is above (below) the high (low) price we deduce that a long (short) position was established at some point during this day. To assess statistical significance we build on Brock et al. (1992) and use a bootstrap approach adapted to the present case.

The remainder of the paper is organized as follows: In Section 2 we briefly review the underlying theory and give an account of the ORB strategy. In this section we also outline our proposed test for profitability. Section 3 gives results for the empirical application and the fourth section concludes.

## 2. Martingale prices and momentum based trading strategies

We denote by $P_t^o, P_t^h, P_t^l$ and $P_t^c$ the opening, high, low and, closing price on day $t$, respectively. A point in time on day $t$ is given by $t+\delta$, $0 \leqslant \delta \leqslant 1$. Note that $P_t^o = P_t$ and $P_t^c = P_{t+1}$. The set $\Psi_{t+\delta}$ contains the information available at time $t+\delta$. Furthermore, let $\psi^u(\psi^l)$ denote a certain threshold price level that is such that if the price crosses it from below (above) a momentum investor acts, i.e. takes a long (short) position. For ORB investors, these threshold price are often set in terms of some predetermined