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Can we still beat "buy-and-hold" for individual stocks?

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HIGHLIGHTS

- We tests our 2 strategies on HSI and HSP indices and 12 constituent stocks of HSI.
- Our strategies are less effective on individual stocks than on stock indices.
- Our strategies are more effective on property stocks than on non-property stocks.
- Our strategies work better on stocks whose Shiryaev–Zhou indices fluctuate less.
- Our strategies work better during "bad times" than during "good times".

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ABSTRACT

Many investors seek for a trading strategy to beat the "buy-and-hold" strategy. In light of this, Hui and Yam (2014) and Hui et al. (2014) derived a trading strategy from the Shiryaev–Zhou index, and found that the resulting strategy outperformed the "buy-and-hold" strategy for western and Asian securitized real estate indices respectively. However, whether the trading strategy works on individual stocks or not is still unknown. This is the first study to test whether the trading strategy can beat the "buy-and-hold" strategy on individual stocks. We construct two trading strategies and compare the resulting profits with the profits arising from the "buy-and-hold" strategy on Hang Seng Index (HSI), Hang Seng Property (HSP) Index and 12 constituent stocks of HSI during the period December 29, 1995– December 31, 2013. The second strategy (Strategy 2) is a new strategy which incorporates short-selling, and has the effect of multiplying the profit. The results show that our trading strategies are less effective on individual stocks than on stock indices, and are more effective on property stocks than on non-property stocks. Moreover, our strategies outperform "buy-and-hold" by a larger extent on stocks of which the Shiryaev–Zhou indices fluctuate less frequently. Furthermore, by tracking the resulting profits of the three strategies at different times along the whole period of observation, our strategies work better during "bad times" than during "good times". This reflects that our trading strategies are especially useful in protecting investors from substantial loss during market downturns.

1. Introduction

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Investors always seek for a strategy to maximize their profits. One well known trading strategy is the "buy-and-hold" strategy based on the efficient market hypothesis (EMH). According to the EMH, at any time, security prices fully reflect all

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available information [1]. The EMH was supported by a number of studies like Malkiel and Fama [1] and Malkiel [2,3]. Barber and Odean [4] showed that households trading stocks more frequently were beaten by the market by a larger extent. This result also supports the "buy-and-hold" strategy and hence the EMH. However, some other studies gave evidence contrary to the EMH. For example, Joel-Carbonell and Rottke [5] found REIT market irregularities during the period 1991–2008, which was contrary to underlying rational human behaviour. Hence someone tries to explore a strategy to outperform the "buy-and-hold" strategy. This lays out the background of our study.

The above said problem motivates scholars to study portfolio profit optimization. The first to work on this topic was Markowitz [6], who introduced the mean–variance modern portfolio theory (MPT). The MPT was incorporated with fuzzy set theory by Hui et al. [7] to study portfolio optimization in direct real estate investment. Many dynamic models, e.g. the Merton portfolio [8], [9] and the continuous-time Markowitz model [10], lead to continuously rebalancing optimal portfolios. They do not result in the pure "buy-and-hold" strategy. Other recent works on optimal trading strategies are described as follows. Liehr and Pawelzik [11] derived an optimal trading strategy with variable investment for minimizing the risk to profit ratio. They tested their trading strategy on DAX and S&P indices using different types of prediction models in comparison. Krystalogianni and Tsolacos [12] developed a Markov switching strategy to investigate the structure of yields between broad asset classes. Their resulting Markov switching model was superior to simple buy-and-hold strategies. Applying cointegration methods, Gallo et al. [13] constructed globally diversified real estate portfolios which beat the mean–variance optimized portfolio by almost 600 basis points each year.

The method this study applies is the Shiryaev–Zhou index, which is named in honour of its two founders, A. Shiryaev and X.Y. Zhou. Hui and Yam [14] and Hui et al. [14] derived a trading strategy from the Shiryaev–Zhou index, and tested the strategy on western and Asian securitized real estate markets respectively. Both of them found that their derived trading strategy outperformed the "buy-and-hold" strategy generally. However, both studies used data of securitized real estate indices. Whether the trading strategy works on individual stocks or not is still unknown. In order to solve this myth, we use data of Hang Seng Index (HSI), Hang Seng Property (HSP) Index and 12 constituent stocks of HSI. We divide the 12 stocks into 6 property stocks and 6 non-property stocks to compare the performance of our strategies on different types of stocks. Secondly, for Hui and Yam [14] and Hui et al.'s [14] strategy, when the estimated value of Shiryaev–Zhou index is negative, the strategy is to hold entire cash. This strategy is based on the rationale that a stock/stock index is usually falling when its Shiryaev–Zhou index is negative, but with the assumption that short-selling is not allowed. However, in reality, short-selling is allowed in some markets. In this study, we will construct a new trading strategy so that we short-sell the stock/stock index when its estimated value of Shiryaev–Zhou index is negative, so that we can take advantage of the adverse movement of stocks by short-selling. Furthermore, we will track the performance of our strategy and the "buy-and-hold" strategy along the whole timeline to compare the performances of the strategies at different times during the period of observation.

This study derives two trading strategies from the Shiryaev–Zhou index, and tests the strategies on HSP Index and six of its constituent stocks over the period December 29, 1995–December 31, 2013. We compare the resulting profits with the profit derived from the "buy-and-hold" strategy, and consider three scenarios: (i) no transaction costs, (ii) 0.1% transaction costs, and (iii) 0.2% transaction costs. The paper proceeds as follows: Section 2 reviews previous studies related to the Shiryaev–Zhou index. Section 3 lays out the formula of the Shiryaev–Zhou index and its statistical estimation. Section 4 describes the trading strategy derived by Hui and Yam [14] and Hui et al. [24], and constructs a new trading strategy which incorporates short-selling. Section 5 explains the data source. Section 6 analyses the trends of the Shiryaev–Zhou indices of HSP Index and the 12 constituent stocks chosen. Section 7 tests our two trading strategies and the "buy-and-hold" strategy on HSP Index and the 12 constituent stocks, and compares the resulting profits. Finally, we draw a conclusion in Section 8.

2. Literature review

The Shiryaev–Zhou index is derived from the problem of finding the optimal selling time to minimize the expected relative error between the selling price of a stock and its maximum price. The first attempt to solve this problem was done by Graversen et al. [15], who solved the problem of stopping a Brownian motion in order to minimize the square error deviation from the maximum. Shiryaev et al. [16] developed a "goodness index" γ of a stock to determine the optimal selling time of the stock. Adopting the probabilistic approach, they showed that the optimal selling time t was determined by $t = T$ (T is the end of the period $[0, T]$) if $\gamma \geq \frac{1}{2}$, and $t = 0$ if $\gamma \leq 0$. For the case $0 < \gamma < \frac{1}{2}$, Shiryaev et al. [16] claimed that the result is same as the case $\gamma \leq 0$, and referred to Dai et al.'s [17] PDE approach for this result. Du Toit and Peskir [18] provided another probabilistic proof of Shiryaev et al.'s [16] result. Applying the techniques in solving the secretary problem, Yam et al. [19–21] resolved the same problem in the binomial tree setting, deriving and generalizing the Shiryaev–Zhou index over the corresponding framework. Note that Shiryaev et al.'s [16] "goodness index" is larger than Yam et al.'s [19–21] Shiryaev–Zhou index by a magnitude of 1/2.

The optimal trading strategies derived from Shiryaev et al. [16], Du Toit and Peskir [18] and Yam et al. [19–21] are called "bang–bang" strategies, of which the practicality was empirically investigated by Wong et al. [22], and hence a dynamic bang–bang strategy allowing for parameters of the return distribution to vary over time was derived. Provided that λ was estimated using recent returns, Wong et al.'s [22] dynamic bang–bang strategy beat the "buy-and-hold" strategy on the CRSP, FTSE 100 and Hang Seng indices. The sign of λ is the same as the sign of the Shiryaev–Zhou index [22] and determines when one should buy or sell an asset. Therefore, we can combine Wong et al.'s [22] dynamic bang–bang strategy with the Shiryaev–Zhou index, building up the theoretical and conceptual framework of our study.

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