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Technical analysis: An asset allocation perspective on the use of moving averages ☆

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ABSTRACT

In this paper, we analyze the usefulness of technical analysis, specifically the widely employed moving average trading rule from an asset allocation perspective. We show that, when stock returns are predictable, technical analysis adds value to commonly used allocation rules that invest fixed proportions of wealth in stocks. When uncertainty exists about predictability, which is likely in practice, the fixed allocation rules combined with technical analysis can outperform the prior-dependent optimal learning rule when the prior is not too informative. Moreover, the technical trading rules are robust to model specification, and they tend to substantially outperform the model-based optimal trading strategies when the model governing the stock price is uncertain.

1. Introduction

Technical analysis uses past prices and perhaps other past statistics to make investment decisions. Proponents of technical analysis believe that these data contain important information about future movements of the stock market. In practice, all major brokerage firms publish technical commentary on the market and many of the advisory services are based on technical analysis. In his interviews with them, Schwager (1993, 1995) finds

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that many top traders and fund managers use it. Moreover, Covel (2005), citing examples of large and successful hedge funds, advocates the use of technical analysis exclusively without learning any fundamental information on the market.

Academics, however, have long been skeptical about the usefulness of technical analysis, despite its widespread acceptance and adoption by practitioners.[1] There are perhaps three reasons. The first reason is that no theoretical basis exists for it, which this paper attempts to provide. The second reason is that earlier theoretical studies often assume a random walk model for the stock price, which completely rules out any profitability from technical trading. The third reason is that earlier empirical findings, such as Cowles (1933) and Fama and Blume (1966), are mixed and inconclusive. Recently, however, Brock, Lakonishok, and LeBaron (1992), and especially Lo, Mamaysky, and Wang (2000), find strong evidence of profitability in technical trading based on more data and more elaborate strategies. These studies stimulated much subsequent academic research on technical analysis, but these later studies focus primarily on the statistical validity of the earlier results.

Our paper takes a new perspective. We consider the theoretical rationales for using technical analysis in a standard asset allocation problem. An investor chooses how to allocate his wealth optimally between a riskless asset and a risky one, which we call stock. For tractability, we focus on the profitability of the simplest and seemingly the most popular technical trading rule (the moving average, MA), which suggests that investors buy the stock when its current price is above its average price over a given period L.[2] The immediate question is what proportion of wealth the investor should allocate into the stock when the MA signals so. Previous studies use an all-or-nothing approach: the investor invests 100% of his wealth into the stock when the MA says buy and nothing otherwise. This common and naive use of the MA is not optimal from an asset allocation perspective because the optimal amount should be a function of the investor's risk aversion as well as the degree of predictability of the stock return. Intuitively, if the investor invests an optimal fixed proportion of his money into the stock market, say 80%, when there is no MA signal, he should invest more than 80% when the MA signals a buy and less otherwise. The 100% allocation is clearly unlikely to be optimal. We solve, for a log-utility investor, the problem of allocating the optimal amount of stock explicitly, which provides a clear picture of how the degree of predictability affects the allocation decision given the log-utility risk tolerance. We also solve the optimal investment problem both approximate analytically and via simulations in the more general power-utility case. The results show that the use of the MA can help increase the investor's utility substantially.

Moreover, given an investment strategy that allocates a fixed proportion of wealth to the stock, we show that the MA rule can be used in conjunction with the fixed rule to yield higher expected utility. In particular, it can improve the expected utility substantially for the popular fixed strategy that follows the Markowitz (1952) modern portfolio theory and the Tobin (1958) two-fund separation theorem. Because indexing, a strategy of investing in a well-diversified portfolio of stocks, makes up roughly one-third of the US stock market, and its trend is on the rise worldwide (see, e.g., Bhattacharya and Galpin, 2006), and because popular portfolio optimization strategies (see, e.g., Litterman, 2003; Meucci, 2005) are also fixed strategies, any improvement over fixed strategies is of practical importance, which might be one of the reasons that technical analysis is widely used.[3]

However, because the MA, as a simple filter of the available information on the stock price, disregards any information on predictive variables, trading strategies related to the MA must be in general dominated by the optimal dynamic strategy, which optimally uses all available information on both the stock price and predictive variables. An argument in favor of the MA could be that the optimal dynamic strategy is difficult for investors at large to implement due to the difficulty of model identification as well as the cost of collecting and processing information. It is not easy to find reliable predictive variables, and their observations at desired time frequencies are not readily available in real time. This gives rise to the problem of predictability uncertainty in practice. In the presence of such uncertainty, Gennotte (1986), Barberis (2000), and Xia (2001), among others, show that the optimal dynamic strategy depends on optimal learning about the unknown parameters of the model and that, in turn, depends on the investor's prior on the parameters. In the context of the Xia (2001) model, we find that, with the use of the MA rule, one can outperform the optimal dynamic trading strategy when the priors are reasonable and yet not too informative. This seems due to the fact that the MA rule is less model dependent, and so it is more robust to the choice of underlying predictive variables.

Furthermore, the usefulness of the MA rule is more apparent when uncertainty exists about which model truly governs the stock price. In the real world, the true model is unknown to all investors. But for a wide class of plausible candidates of the true model, the optimal MA can be estimated easily, while the optimal trading strategy relies on a complete specification of the true model. When the wrong model is used to derive the optimal trading strategy, we show that the estimated optimal MA outperforms it substantially.

In typical applications, one usually chooses some ex ante value as the lag length of the MA. The question of using the optimal lag has been done only by trial and error, and only for the pure MA strategy that takes an

[1] Some academics take a strong view against technical analysis. For example, in his influential book, Malkiel (1981, p. 139) says that, "technical analysis is anathema to the academic world."

[2] As time passes, the average price is always computed based on its current price and on those in the most recent L periods. Hence, the average is called the MA.

[3] Behaviorial reasons, such as limited attention and optimal learning with limited resources, could explain the use of simple technical rules in practice, in addition to the rational reasons explored in this paper.