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An empirical investigation of methods to reduce transaction costs

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ABSTRACT

Among 37 methods to reduce transaction costs, we recursively choose the best method for next period's investment in each of three portfolio strategies: levered-momentum, zero-cost momentum, and the equally-weighted market. We identify a few of the best methods and offer a framework by which additional methods can be considered. Within our framework, the best methods recapture a substantial amount of wealth and significantly improve risk-adjusted performance, both economically and statistically. Security migration can present a barrier to transaction cost reduction, as improvements occur for zero-cost momentum portfolios invested in all stocks but not for decile-momentum portfolios.

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1. Introduction

Trading can result in substantial wealth loss from transaction costs. Before transaction costs, a dollar invested in 1970 in a levered-momentum strategy grows to $44,563 at the end of 2012. With monthly rebalancing and 50 basis points for one-way proportional transaction costs, a dollar invested in the same strategy only grows to $60. Reducing the rate of portfolio rebalancing will reduce transaction costs, but it may also reduce profitability. Therefore, the rate at which portfolios are rebalanced must be carefully chosen.

Over time, traditional transaction costs such as brokerage commissions, bid-ask spreads, and market-impact costs have declined (see for example, Hasbrouck (2009)). Yet for some investors, reduced transaction costs may be offset by the use of high-frequency trading strategies. Also, recent proposals for legislation regarding taxes on financial transactions continue to make the frequency of portfolio rebalancing a relevant concern.[1]

There is an absence of empirical research given to finding the best method to reduce transaction costs, or to the more specific question of choosing a distance measure that defines a no-trade region for optimally adjusting the rate of portfolio rebalancing.[2] Typically, researchers apply a single method or distance measure to a portfolio strategy in order to reduce transaction costs. Examples of such approaches include Brandt et al. (2009) and Kirby and Ostdiek (2012), among others. Departing from this literature, we consider the

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[1] For one example of such proposed legislation, see http://www.govtrack.us/congress/bills/111/hr4191.

[2] In contrast to the absence of empirical research considering methods to reduce transaction costs, there is a large theoretical literature beginning with Constantinides (1986).

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method of optimal portfolio rebalancing as an additional choice parameter. Among 37 methods for adjusting the rate of portfolio rebalancing, we recursively choose the best method over the previous 5 years for the next year's investment.

Compared to using a single method, as in most prior research, we significantly increase the scope of methods considered by choosing from a set of 37 methods. Yet there are many more potential methods to reduce transaction costs, even if one only considers the possible distance measures that could be used to define a no-trade region. Of the 37 methods we consider, most of which are detailed in Cha (2007), only 17 methods are ever chosen as the best and used out-of-sample.[3] Of this subset of 17 methods, only 9 methods are chosen more than once in a time series. Therefore, we are able to identify a few of the best methods.

Perhaps more importantly, we offer a general methodology by which additional methods can be considered to further identify the subset of the best methods. The process of choosing the best method in order to adjust the rate of portfolio rebalancing enables substantial out-of-sample wealth to be recaptured. Compared to a dollar that only grows to $60 after transaction costs when invested in the levered-momentum strategy, adjusting the rate of portfolio rebalancing allows the dollar to grow to $20,281. Considering additional methods within our general methodological framework may lead to an even greater recapture of the wealth lost through transaction costs.

Reducing transaction costs is not the only benefit from less frequent rebalancing. A dollar invested in an equally-weighted market portfolio grows to $87 before transaction costs. Across objective functions, a dollar invested in the equally-weighted market portfolio grows to an average value of $152 after transaction costs, once the rate of rebalancing is adjusted. Therefore, another potential benefit of optimal portfolio rebalancing is increased portfolio efficiency.

Less attention has been given to the improvements in portfolios optimization from reduced portfolio rebalancing. In prior literature, including Constantinides (1986), Balduzzi and Lynch (1999), Leland (1999), Liu and Loewenstein (2002), Liu (2004), DeMiguel et al. (2013), and Garleanu and Pedersen (2013), the decision to choose optimal weights is bundled with the objective of reducing transaction costs. Insofar as it is possible, we try to separate any initial decision to choose optimal weights from the decision to reduce transaction costs.

In-sample, the best of the 37 methods we consider recaptures an economically significant amount of wealth. Out-of-sample, the best methods recover substantial wealth for a levered-momentum portfolio and an equally-weighted market portfolio. It is more difficult to recover wealth for a zero-cost momentum portfolio made up of stocks in extreme past-return deciles. This suggests that errors in estimating the parameters necessary for transaction cost reduction may be more severe for smaller portfolios, in which turnover comes primarily from securities entering and leaving the portfolio instead of from changing portfolio weights. Similar patterns occur in the recapture of risk-adjusted performance, as measured by certainty equivalent returns or Sharpe ratios.

To see whether the lack of performance improvement for the decile-momentum portfolio stems mainly from a migration of stocks in and out of the portfolio, we consider a zero-cost momentum portfolio that invests in all stocks. In contrast to the decile-momentum portfolio, there is considerable recapture of out-of-sample terminal wealth from making an adjustment to the rate of rebalancing. In addition, out-of-sample risk-adjusted performance measures are significantly improved both statistically and economically by adjusting the rate of rebalancing. It appears that the degree of security migration may present a barrier in attempting to reduce losses in wealth and performance from transaction costs.

2. Constructing a general framework for studying methods to reduce transaction costs

Constructing a general framework to examine various methods to reduce transaction costs is admittedly difficult. There are numerous choice variables: trading strategies/optimization techniques, methods to reduce transaction costs, objective functions, transaction cost modeling, performance measures, etc. There are often multiple alternatives for each choice variable, and the best option is not always obvious.

2.1. What to study: Portfolio optimization techniques or trading strategies

Among the many choices, perhaps the most difficult and important decision for meaningful inferences is determining which trading strategies or optimization techniques to consider. Before this can be decided, it appears necessary to make a distinction between trading strategies and optimization techniques—and to choose which is more beneficial to study. DeMiguel et al. (2009) find that an equal-weighted allocation, which is chosen heuristically rather than optimally, has better out-of-sample performance than numerous optimized allocations. In this regard, attempting to begin with the best portfolio optimization technique may limit the study to a single strategy.

The limitations of portfolio optimization are similar to the limitations of simulation environments often used to study various optimization techniques. Most simulations are limited to less than 100 assets, while real-world portfolios may hold thousands of assets.[4] "Curse of dimensionality" problems are common for many portfolio optimization techniques. Most simulations and many portfolio optimization techniques do not easily allow for the appearance of new securities and disappearance of older securities.

Portfolio techniques and the simulated data in which they are typically examined will limit inferences too much to satisfy our research objectives. Although admittedly out of reach, we wish to find the best method of reducing transaction costs for any trading strategy or portfolio with good out-of-sample properties. With this goal in mind, we choose to consider the more general category of trading strategies, applied to a real data set of individual securities.

[3] For a thorough discussion of the distance measures used in this paper, we refer the reader to the survey by Cha (2007).

[4] For examples of portfolio choice simulations, see MacKinlay and Pastor (2000), DeMiguel, Garlappi, and Uppal (2009), Kan and Zhou (2007), or Tu and Zhou (2011). The largest simulated portfolio in these papers contains 50 assets.

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