Available online at www.sciencedirect.com
ScienceDirect
ELSEVIER
Journal of Financial Markets 13 (2010) 129–156
Journal of FINANCIAL MARKETS
www.elsevier.com/locate/finmar

Optimal transaction filters under transitory trading opportunities: Theory and empirical illustration

Ronald Balvers[a,c,*], Yangru Wu[b,c]

[a]Division of Economics and Finance, College of Business and Economics, West Virginia University, Morgantown, WV 26506, USA
[b]Rutgers Business School-Newark and New Brunswick, Rutgers University, Newark, NJ 07102, USA
[c]Chinese Academy of Finance and Development, Central University of Finance and Economics, China

Available online 5 August 2009

Abstract

If transitory profitable trading opportunities exist, transaction filters mitigate trading costs. We use a dynamic programming framework to design an optimal filter that maximizes after-cost expected returns. The filter size depends crucially on the degree of persistence of trading opportunities, transaction cost, and standard deviation of shocks. For daily dollar–yen exchange trading, the optimal filter can be economically significantly different from a naïve filter equal to the transaction cost. The candidate trading strategies generate positive returns that disappear after transaction costs. However, when the optimal filter is used, returns after costs remain positive and higher than for naïve filters.

JEL classification: G10; G15; G11

Keywords: Transaction costs; Transaction filters; Trading strategies; Foreign exchange

1. Introduction

It is inarguable that opportunities for above-normal returns are available to market participants at some level. These opportunities may be exploitable for instance at an intra-daily frequency as a reward for information acquisition when markets are efficient, or at a

*Corresponding author at: Division of Economics and Finance, College of Business and Economics, West Virginia University, Morgantown, WV 26506, USA. Tel.: +1 304 293 7880; fax: +1 304 293 2233.
E-mail addresses: rbalvers@wvu.edu (R. Balvers), yangruwu@andromeda.rutgers.edu (Y. Wu).

1386-4181/$ - see front matter
doi:10.1016/j.finmar.2009.07.005

lower frequency to market timers when markets are inefficient. By nature these profit opportunities are predicable but transitory, and transaction costs may be a major impediment in exploiting them.[1] This paper explores the optimal trading strategy when transitory opportunities exist and transactions are costly.

The model we present is applicable to the arbitrage of microstructure inefficiencies that require frequent and timely transactions, which may be largely riskless. An example is uncovered interest speculation in currency markets where a trader takes either one side of the market or the reverse. Alternatively, a trader arbitrages differences between an asset's return and that of one of its derivatives: going long on the arbitrage position or reversing the position and going short, as is the case in covered interest arbitrage.

Alexander (1961) and Fama and Blume (1966) introduced ''filter rules'' according to which traders buy (sell) an asset only if its current price exceeds (is below) the previous local minimum (maximum) by more than X (more than Y) percent, where X and Y are parameters of the rule, commonly set equal and chosen in the range of 0.5–5% (e.g., Sweeney, 1986). The parameters X (and Y if different) determine a ''band of inactivity'' that prompts one to trade once a realization exceeds the local minimum or is below the local maximum by a certain percentage. A larger band of inactivity (larger X) filters out more trades, thus reducing transactions costs.[2] The general idea of filters, in filter rules, as well as other trading rules, is that if the trade indicator is weak the expected return from the transaction may not compensate for the transaction cost. Lehmann (1990) provides an interesting alternative filter by varying portfolio weights according to the strength of the return indicators—in trading smaller quantities of the assets with the weaker trade indicators, transaction costs are automatically reduced relative to the payoff.

Knez and Ready (1996) and Cooper (1999) explore different filters and find that the after-transaction-cost returns indeed improve compared to trading strategies with zero filter. The problem with the filter approach is that there is no way of knowing a priori which filter band is reasonable because the buy/sell signal and the transaction cost are not in the same units—the filter is the percentage by which the effective signal exceeds the signal at which a change in position first appears profitable before transaction costs, but this percentage bears no relation to the percentage return expected. This also implies that there is no discipline against data mining for researchers: many filters with different bands can be tried to fabricate positive net strategy returns. While Lehmann's (1990) approach provides more discipline as it specifies a unique strategy, the filter it implies is not generally optimal.

The purpose of this paper is to design an optimal filter that a priori maximizes the expected return net of transaction cost. To accomplish this we employ a ''parametric'' approach (e.g., Balvers et al., 2000) that allows the trading signal and the transaction cost

[1]For instance, Grundy and Martin (2001) express doubt that the anomalous momentum profits survive transaction costs, and Hanna and Ready (2005) find that the momentum profits are substantially reduced when transaction costs are accounted for. Lesmond et al. (2004) conclude more strongly that momentum profits with transaction costs are illusory. Neely and Weller (2003) reach a similar conclusion for trading profits in foreign exchange markets after transaction costs.

[2]Note the two usages of the term filter. We distinguish ''filter rules''—the specific class of technical trading rules defined above—from a more generic use of the term ''filter''—a criterion for selecting a set of trades to exclude. The latter refers typically to a ''band of inactivity''. Filter rules use different size filters but filters can be applied to a much broader class of trading rules that are not filter rules. In the following we examine different size filters for ARMA and moving average trading rules, but not for filter rules.