An Agent-based Recommending System for Stock-Trading

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Abstract

The recommending system is frequently used nowadays in Electronic Commerce. A lot of commercial transactions are made by recommends from trustable advisors, experts and partners. Many stock traders place their orders after their friends recommends them to do so. This report exams the effectiveness of recommending system in stock markets in the context of the Penn-Lehman Automated Trading (PLAT) simulator [1], which is a real-time, real-data market simulator. In this report, we analyze the performance of the trading agent using recommends from an online resources. Experimental results will also be provided.

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1 Introduction

Many major stock markets are electronic. The NASDAQ is a distributed trading system completely run through networked computers. It allows customers’ best bids and offers to be displayed and represented on the NASDAQ by their brokers or through ECNs (Electronic Communication Networks). ECNs such as Archipelago [2], Bloomberg [3] and Island [4] allow customers to display their orders and also allow customer orders to be traded with each other.

The ECNs are easy to use, and available to everyone, yet they are not platforms for customers to test their trading strategies. There are a lot of simulators developed for users to use without risking money in real markets. The Stock Market Game [5] is a simulator that enables participants to discover the risks and rewards involved in decision-making. Virtual Stock Exchange [6] is another simulator that participants can use to build and manage a virtual portfolio. The Penn-Lehman Automated Trading (PLAT) simulator uses real-world, real-time stock market data available over modern ECNs. It is the first simulator to incorporate complete order book information, thereby allowing it to “match” agent orders with real-world orders and simulate the resulting effects on the market. It also provides a lot of APIs so that the participants can program their strategies and trade with other agents and outside markets automatically.

Using these and other simulators, as well as experiments in the real world, many researchers have studied trading strategies from the perspectives of Artificial Intelligence [7, 8, 11], neural networks [9], technical analysis [10], etc., However, experimenting in the real world is expensive and most simulators differ significantly from real markets such that strategies successful in simulation may not be appropriate for real markets. PLAT is among the most realistic simulators because it both includes real-time, real-world data, and realistically models the effects of the agents’ own trades on the market. Thus, we think some interesting, potentially applicable conclusions can be reached based on agent experiments in PLAT.

In this report, we present a successful, recommending-based stock-trading strategy that we have implemented and tested in PLAT. The remainder of this report is organized as follows. In section 2, we give a brief introduction to the PLAT simulator. In section 3, we describe online real time recommendation source. The implementation details are provided in section 4. In section 5, we present detailed empirical results. Finally, we discuss the further work in section 6.

2 The PLAT Simulator

The PLAT simulator uses real-world, real-time stock market data for automated trading. It frequently queries the Island ECNs web-site to get the most recent
stock prices and buy and sell order books. The simulator then matches the buy orders and sell orders. The orders can be from Island or from trading agents. The simulator also computes the profits and losses of each connected trading agent in real time.

PLAT is equipped for testing strategies on historical data and also for running live competitions. The live competition starts and ends at the same time with normal trading sessions of the NASDAQ. The simulator supports limit orders only. A limit order is a request to buy or sell shares of a stock at a specified price. In the simulation, the best ask price is the lowest price any seller (either trading agents or outside market customers) has declared that they are willing to accept; the best bid price is the highest price any buyer has declared that they are willing to pay. If a new buy order has bid price equal to the best ask price or a new sell order has ask price equal to the best bid price, the order will be matched in the amount of the maximum available shares and the trade is executed. If a bid price is higher than the ask price, the trading price is the average of these two prices. If orders cannot be matched immediately, they are kept in the queue to wait for possible future matches.

Currently, The PLAT simulator is hardwired to Microsoft Stock (Symbol: MSFT). Trading agents in the simulation can buy or sell MSFT stocks with limit orders. There are two types of sales supported in the simulation: long and short. Long sales are what we normally think of when we think of selling, that is, sales of stocks owned by the seller. Short sales are sales of stocks borrowed by the agents from the simulator. Trading agents can also borrow money from the simulator without any interest, however, the same amount of money will be deducted from the agent’s simulated cash account. The cash in the account can be negative or positive. The value that a trading agent has in the simulation is calculated in real time by the formula: value = cash + holdings * current Price. The cash and holdings are set to 0 at the beginning of the simulation.

There are no limits on how many shares clients can buy or sell in a day, but the clients must liquidate their position by the end of the trading session each day. Otherwise, there will be a monetary penalty applied to their profit or loss each day according to how many shares they fail to liquidate by the close. There is a necessary asymmetry between buying and selling:

- Each share that clients are long at the close will be simply valued at 0. In this case, the penalties are the prices clients paid to buy these shares during the day.

- Each share that clients are short at the close will be valued at the closing price, and clients’ profit/loss will be docked accordingly. In other words, if clients are short N shares and the closing price is p, the simulator will deduct 2p * N dollars from clients’ P&L.

The PLAT simulator runs in transaction cost/rebate mode. Every time the simulator executes a trade, one side of the order must have already been sitting
in one of the order books, and the other side of the order must have been the incoming order. For each share executed by the simulator, the party whose order was already in the books shall receive a rebate of $0.002, and the party that was the incoming order shall pay a transaction fee of $0.003. This is exactly the policy used by Island [4].

We investigate our strategies in the context of PLAT simulator, and utilize an online real time recommending resource. The detail description of this recommending source is described in the next section.

3 Recommending Source

Message boards provide users a forum for discussing and sharing tips, knowledge, opinions and questions. They allow users to communicate with each other in ongoing, in-depth discussions.

However, the message posted on Yahoo Message Board may not always be trustable. The messages posted may be faked one. On March, 1st, 1999, A publicly traded Internet company ITEX sued 100 "John Does" for allegedly posting false and defamatory statements about it on the Yahoo Finance message board [12]. 100 "John Does" posted an article criticized the Portland, Oregon, Internet company with title "blind, stupid, and incompetent". ITEX, which operates

References

