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# Algorithmic Trading of Futures via Machine Learning

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Algorithmic trading of securities has become a staple of modern approaches to financial investment. In this project, I attempt to obtain an effective strategy for trading a collection of 27 financial futures based solely on their past trading data. All of the strategies that I consider are based on predictions of the future price and volatility of the various securities under consideration, and so the majority of the effort in this project has been directed toward using machine learning techniques to obtain predictions for future price and volatility. This project was inspired by the Quantiacs futures competition, to which I submitted a number of the trading strategies I obtained during my work on this project.

## Introduction

### The Contest

The goal of this project was to obtain a high-performing trading strategy for the Quantiacs futures contest [\[1\]](#). Quantiacs is a quantitative trading platform that invests in crowdsourced trading systems, and connects users trading systems with institutional investors, [sharing] a performance fee with the developer. The Quantiacs futures contest was a competition to obtain a trading strategy which invests in a collection of futures securities and attempts to maximize the Sharpe ratio (a measure of risk-adjusted return) over both a training period (Jan. 1, 2001–Nov. 30, 2014) and a live trading period (Dec. 1, 2014–Jan. 31, 2015). Trading systems are ranked using the minimum of the performance over these two intervals, and the top three performing strategies (determined January 31, 2015) will receive guaranteed minimum

investments (\$250,000 for third place, \$500,000 for second, and \$1,000,000 for first).

### The Trading Model

The trading model employed by Quantiacs is somewhat simplified relative to a real-world trading scenario. In particular, the daily closing price is what is used to determine the buying/selling price when orders are placed on a given day, and orders may only be placed once per day. However, the model does include small fees meant to simulate the effects of slippage and trading commissions, and so may offer a relatively realistic trading simulation for relatively long term investment strategies (where trades are being performed on a daily basis, as opposed to high frequency approaches with many trades being performed each second).

### The Data

The backtesting data for the contest consisted of approximately 3800 days of trading price and volume data (from Jan. 1, 2001 to the present day) provided by Quantiacs for 27 different futures contracts (including various currencies, precious metals, agricultural products, etc.). More specifically, the data contained the daily high, low, opening, and closing prices, and daily trading volumes over this time period. In addition, the rules of the competition specified that on any given day, the only legal input into the trading strategy was the previous 504 trading days worth of this data for each of the 27 securities under consideration.

### The Objective

As mentioned above, the goal in the Quantiacs futures competition is to obtain a trading strategy with opti-

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**Chao Zhang**



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