
Algorithmic Trading of Futures via Machine Learning

David Montague, davmont@stanford.edu

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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Carl Cramer Maier



Algorithmic Trading Of Futures Via Machine Learning:

High-performance Algorithmic Trading using Machine Learning Franck Bardol, 2025-06-30 DESCRIPTION Machine learning is not just an advantage it is becoming standard practice among top performing trading firms As traditional strategies struggle to navigate noise complexity and speed ML powered systems extract alpha by identifying transient patterns beyond human reach This shift is transforming how hedge funds quant teams and algorithmic platforms operate and now these same capabilities are available to advanced practitioners This book is a practitioner s blueprint for building production grade ML trading systems from scratch It goes far beyond basic return sign classification tasks which often fail in live markets and delivers field tested techniques used inside elite quant desks It covers everything from the fundamentals of systematic trading and ML s role in detecting patterns to data preparation backtesting and model lifecycle management using Python libraries You will learn to implement supervised learning for advanced feature engineering and sophisticated ML models You will also learn to use unsupervised learning for pattern detection apply ultra fast pattern matching to chartist strategies and extract crucial trading signals from unstructured news and financial reports Finally you will be able to implement anomaly detection and association rules for comprehensive insights By the end of this book you will be ready to design test and deploy intelligent trading strategies to institutional standards WHAT YOU WILL LEARN Build end to end machine learning pipelines for trading systems Apply unsupervised learning to detect anomalies and regime shifts Extract alpha signals from financial text using modern NLP Use AutoML to optimize features models and parameters Design fast pattern detectors from signal processing techniques Backtest event driven strategies using professional grade tools Interpret ML results with clear visualizations and plots WHO THIS BOOK IS FOR This book is for robo traders algorithmic traders hedge fund managers portfolio managers Python developers engineers and analysts who want to understand master and integrate machine learning into trading strategies Readers should understand basic automated trading concepts and have some beginner experience writing Python code TABLE OF CONTENTS 1 Algorithmic Trading and Machine Learning in a Nutshell 2 Data Feed Backtests and Forward Testing 3 Optimizing Trading Systems Metrics and Automated Reporting 4 Implement Trading Strategies 5 Supervised Learning for Trading Systems 6 Improving Model Capability with Features 7 Advanced Machine Learning Models for Trading 8 AutoML and Low Code for Trading Strategies 9 Unsupervised Learning Methods for Trading 10 Unsupervised Learning with Pattern Matching 11 Trading Signals from Reports and News 12 Advanced Unsupervised Learning Anomaly Detection and Association Rules Appendix APIs and Libraries for each chapter

Machine Learning and Modeling Techniques in Financial Data Science Chen, Haojun, 2025-01-22 The integration of machine learning and modeling in finance is transforming how data is analyzed enabling more accurate predictions risk assessments and strategic planning These advanced techniques empower financial professionals to uncover hidden patterns automate complex processes and enhance decision making in volatile markets As industries increasingly rely on data driven

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universal model for a large number of stocks developing predictive models based on the average price of the crowd forecasting the stock price using the attention mechanism in a neural network clustering multivariate time series into different market states proposing a multivariate distance nonlinear causality test and filtering out false investment strategies with an unsupervised learning algorithm Machine Learning and AI in Finance explores the most recent advances in the application of innovative machine learning and artificial intelligence models to predict financial time series to simulate the structure of the financial markets to explore nonlinear causality models to test investment strategies and to price financial options The chapters in this book were originally published as a special issue of the Quantitative Finance journal Machine Learning and Data Sciences for Financial Markets Agostino Capponi, Charles-Albert Lehalle, 2023-06 Learn how cutting edge AI and data science techniques are integrated in financial markets from leading experts in the industry *Florida Law Review*, 2015 **Using Statistically Implemented Neural Networks to Forecast S & P 500 Futures Contract Prices** Carl Cramer Maier, 1996 **Advanced Trading Rules** Stephen Satchell, Emmanuel Acar, 1998 An overview of financial markets trading rules It shows the financial market professional and student how to apply econometrics computer modelling technical and quantitative analysis to financial markets trading Also explained in this text are technical indicators neural networks genetic algorithms quantitative techniques and charts *Bitcoin Pricing. An Empirical Analysis* Andreas Bialek, 2019-04-01 Master s Thesis from the year 2018 in the subject Business economics Miscellaneous grade 1 3 University of Hamburg language English abstract In this paper I analyze the relation between daily bitcoin returns and sentiment using a dataset reaching from 2013 to 2018 I find that daily bitcoin returns are not only affected contemporaneous by the bitcoin sentiment measures but also in the next three days while established stock market sentiment measures provide no explanatory power Additionally the negative emotions show return reversal patterns as often observed in sentiment induced mispricing literature resulting in higher returns the next two days after affecting returns negatively today I further find that trading volume affects re turns positively today in the next four days and that it is connected with stock market measures For what I wisdom this is also the first academic research that uses the recently introduced Thomson Reuters MarketPsych Indices on cryptocurrencies *Quantitative Asset Management: Factor Investing and Machine Learning for Institutional Investing* Michael Robbins, 2023-06-24 Augment your asset allocation strategy with machine learning and factor investing for unprecedented returns and growth Whether you re managing institutional portfolios or private wealth Quantitative Asset Management will open your eyes to a new more successful way of investing one that harnesses the power of big data and artificial intelligence This innovative guide walks you through everything you need to know to fully leverage these revolutionary tools Written from the perspective of a seasoned financial investor making use of technology it details proven investing methods striking a rare balance between providing important technical information without burdening you with overly complex investing theory Quantitative Asset Management is organized into four thematic sections Part I reveals

invaluable lessons for planning and governance of investment decision making Part 2 discusses quantitative financial modeling covering important topics like overfitting mitigating unrealistic assumptions managing substitutions enhancing minority classes and missing data imputation Part 3 shows how to develop a strategy into an investment product including the alpha models risk models implementation backtesting and cost optimization Part 4 explains how to measure performance learn from mistakes manage risk and survive financial tragedies With Quantitative Asset Management you have everything you need to build your awareness of other markets ask the right questions and answer them effectively and drive steady profits even through times of great uncertainty

Computational Finance and Its Applications Wessex Institute of Technology, 2004 Intelligent computational systems have become increasingly important in many financial applications such as portfolio selection proprietary trading and risk management At the same time traditional techniques are constantly being improved and developed as a result of the increased power of modern computer systems

Information & Management Fédération internationale pour le traitement de l'information, 1997 *Michigan Law Review*, 2017-12 Report of the High Powered Expert Committee on Making Mumbai an International Financial Centre, 2007

Progress in Neural Information Processing Shunichi Amari, 1996 These two volumes are the papers presented at the International Conference on Neural Information Processing ICONIP 96 held in Hong Kong 24-27 September 1996 Over three hundred selected papers make up two volumes of 700 pages each Featured topics of Volume 1 are Learning Theories and Algorithms Speech and Signal Processing Pattern Recognition and Image Processing Recurrent Networks Automata and Dynamics Volume 2 focusses on Financial Engineering and Time Series Forecasting Evolutionary Computing Neurosciences and Biophysics Neural Control and Robotics Hardware Implementations Hybrid Systems and Applications plus a number of Special Sessions Other topics covered include image processing computer vision fuzzy logic pattern recognition algorithms and architectures and financial engineering These two volumes combine to cover the major topics in neural information processing and reflect the latest progress with a good balance between scientific studies and industrial applications as well as featuring neural information processing approaches on financial engineering

KDD ..., 2003 *Learn Algorithmic Trading* Sebastien Donadio, Sourav Ghosh, 2019-11-07 Understand the fundamentals of algorithmic trading to apply algorithms to real market data and analyze the results of real world trading strategies Key Features Understand the power of algorithmic trading in financial markets with real world examples Get up and running with the algorithms used to carry out algorithmic trading Learn to build your own algorithmic trading robots which require no human intervention Book Description It's now harder than ever to get a significant edge over competitors in terms of speed and efficiency when it comes to algorithmic trading Relying on sophisticated trading signals predictive models and strategies can make all the difference This book will guide you through these aspects giving you insights into how modern electronic trading markets and participants operate You'll start with an introduction to algorithmic trading along with setting up the environment required to perform the tasks in the book

You ll explore the key components of an algorithmic trading business and aspects you ll need to take into account before starting an automated trading project Next you ll focus on designing building and operating the components required for developing a practical and profitable algorithmic trading business Later you ll learn how quantitative trading signals and strategies are developed and also implement and analyze sophisticated trading strategies such as volatility strategies economic release strategies and statistical arbitrage Finally you ll create a trading bot from scratch using the algorithms built in the previous sections By the end of this book you ll be well versed with electronic trading markets and have learned to implement evaluate and safely operate algorithmic trading strategies in live markets What you will learn Understand the components of modern algorithmic trading systems and strategies Apply machine learning in algorithmic trading signals and strategies using Python Build visualize and analyze trading strategies based on mean reversion trend economic releases and more Quantify and build a risk management system for Python trading strategies Build a backtester to run simulated trading strategies for improving the performance of your trading bot Deploy and incorporate trading strategies in the live market to maintain and improve profitability Who this book is for This book is for software engineers financial traders data analysts and entrepreneurs Anyone who wants to get started with algorithmic trading and understand how it works and learn the components of a trading system protocols and algorithms required for black box and gray box trading and techniques for building a completely automated and profitable trading business will also find this book useful

Neural Networks in Finance and Investing Robert R. Trippi, Efraim Turban, 1996 This completely updated version of the classic first edition offers a wealth of new material reflecting the latest developments in the field For investment professionals seeking to maximize this exciting new technology this handbook is the definitive information source

Enhancements to the Data Mining Process George H. John, 1997

Artificial Life, 1994 Consists of the proceedings of 1987 Interdisciplinary Workshop on the Synthesis and Simulation of Living Systems 1990 1992 Artificial Life Workshop 1994 1996 International Workshop on the Synthesis and Simulation of Living Systems 1998 International Conference on Artificial Life

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