
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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Algorithmic Trading Of Futures Via Machine Learning:

Hands-On Machine Learning for Algorithmic Trading Stefan Jansen, 2018-12-31 Explore effective trading strategies in real world markets using NumPy spaCy pandas scikit learn and Keras Key Features Implement machine learning algorithms to build train and validate algorithmic models Create your own algorithmic design process to apply probabilistic machine learning approaches to trading decisions Develop neural networks for algorithmic trading to perform time series forecasting and smart analytics Book Description The explosive growth of digital data has boosted the demand for expertise in trading strategies that use machine learning ML This book enables you to use a broad range of supervised and unsupervised algorithms to extract signals from a wide variety of data sources and create powerful investment strategies This book shows how to access market fundamental and alternative data via API or web scraping and offers a framework to evaluate alternative data You ll practice the ML workflow from model design loss metric definition and parameter tuning to performance evaluation in a time series context You will understand ML algorithms such as Bayesian and ensemble methods and manifold learning and will know how to train and tune these models using pandas statsmodels sklearn PyMC3 xgboost lightgbm and catboost This book also teaches you how to extract features from text data using spaCy classify news and assign sentiment scores and to use gensim to model topics and learn word embeddings from financial reports You will also build and evaluate neural networks including RNNs and CNNs using Keras and PyTorch to exploit unstructured data for sophisticated strategies Finally you will apply transfer learning to satellite images to predict economic activity and use reinforcement learning to build agents that learn to trade in the OpenAI Gym What you will learn Implement machine learning techniques to solve investment and trading problems Leverage market fundamental and alternative data to research alpha factors Design and fine tune supervised unsupervised and reinforcement learning models Optimize portfolio risk and performance using pandas NumPy and scikit learn Integrate machine learning models into a live trading strategy on Quantopian Evaluate strategies using reliable backtesting methodologies for time series Design and evaluate deep neural networks using Keras PyTorch and TensorFlow Work with reinforcement learning for trading strategies in the OpenAI Gym Who this book is for Hands On Machine Learning for Algorithmic Trading is for data analysts data scientists and Python developers as well as investment analysts and portfolio managers working within the finance and investment industry If you want to perform efficient algorithmic trading by developing smart investigating strategies using machine learning algorithms this is the book for you Some understanding of Python and machine learning techniques is mandatory *Machine Learning for Algorithmic Trading* Stefan Jansen, 2020-07-31 Leverage machine learning to design and back test automated trading strategies for real world markets using pandas TA Lib scikit learn LightGBM SpaCy Gensim TensorFlow 2 Zipline backtrader Alphalens and pyfolio Purchase of the print or Kindle book includes a free eBook in the PDF format Key Features Design train and evaluate machine learning algorithms that underpin automated trading strategies Create a research and strategy

development process to apply predictive modeling to trading decisions Leverage NLP and deep learning to extract tradeable signals from market and alternative data Book DescriptionThe explosive growth of digital data has boosted the demand for expertise in trading strategies that use machine learning ML This revised and expanded second edition enables you to build and evaluate sophisticated supervised unsupervised and reinforcement learning models This book introduces end to end machine learning for the trading workflow from the idea and feature engineering to model optimization strategy design and backtesting It illustrates this by using examples ranging from linear models and tree based ensembles to deep learning techniques from cutting edge research This edition shows how to work with market fundamental and alternative data such as tick data minute and daily bars SEC filings earnings call transcripts financial news or satellite images to generate tradeable signals It illustrates how to engineer financial features or alpha factors that enable an ML model to predict returns from price data for US and international stocks and ETFs It also shows how to assess the signal content of new features using Alphas and SHAP values and includes a new appendix with over one hundred alpha factor examples By the end you will be proficient in translating ML model predictions into a trading strategy that operates at daily or intraday horizons and in evaluating its performance What you will learn Leverage market fundamental and alternative text and image data Research and evaluate alpha factors using statistics Alphas and SHAP values Implement machine learning techniques to solve investment and trading problems Backtest and evaluate trading strategies based on machine learning using Zipline and Backtrader Optimize portfolio risk and performance analysis using pandas NumPy and pyfolio Create a pairs trading strategy based on cointegration for US equities and ETFs Train a gradient boosting model to predict intraday returns using AlgoSeek s high quality trades and quotes data Who this book is for If you are a data analyst data scientist Python developer investment analyst or portfolio manager interested in getting hands on machine learning knowledge for trading this book is for you This book is for you if you want to learn how to extract value from a diverse set of data sources using machine learning to design your own systematic trading strategies Some understanding of Python and machine learning techniques is required

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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

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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

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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 a well as featuring neural information processing approaches on financial engineering **Report of the High Powered Expert Committee on Making Mumbai an International Financial Centre** ,2007 **Information & Management** Fédération internationale pour le traitement de l'information,1997 KDD ... ,2003 *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 teh 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

Algorithmic Trading Of Futures Via Machine Learning Book Review: Unveiling the Magic of Language

In an electronic digital era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Algorithmic Trading Of Futures Via Machine Learning**," published by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we shall delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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