

Developing a Trading Algorithm

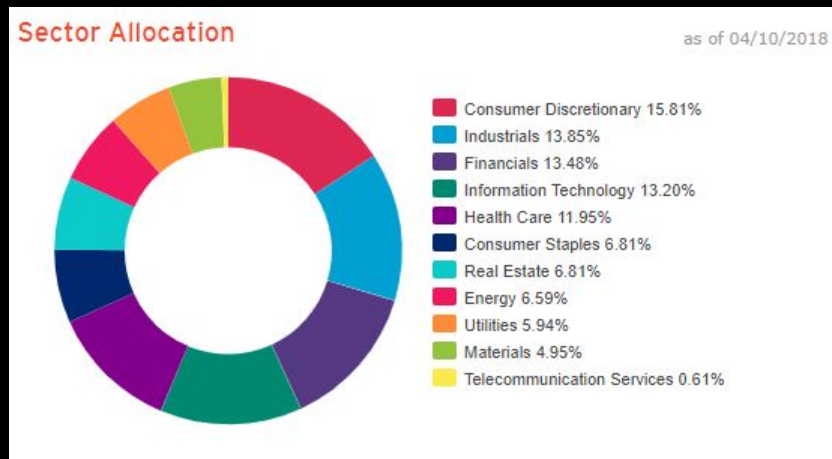
Balancing Risk and Return with SPY and TQQQ

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Flatiron School Data Science Capstone

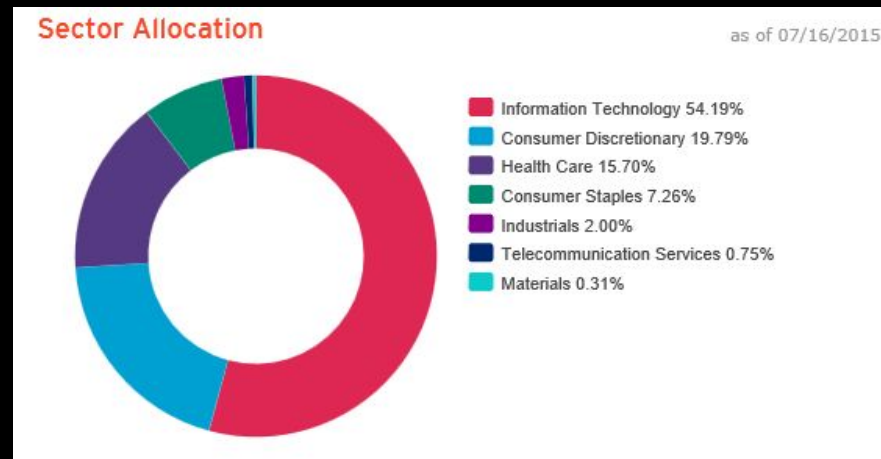
Sector Composition

S&P 500 ETF (SPY)



↑
Balanced

3X NASDAQ 100 ETF (TQQQ)



↑
Tech-heavy and leveraged

Performance Comparison

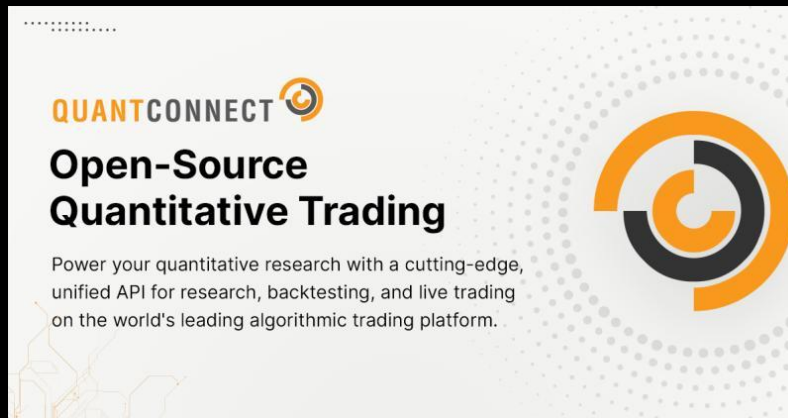


Algorithm Goals

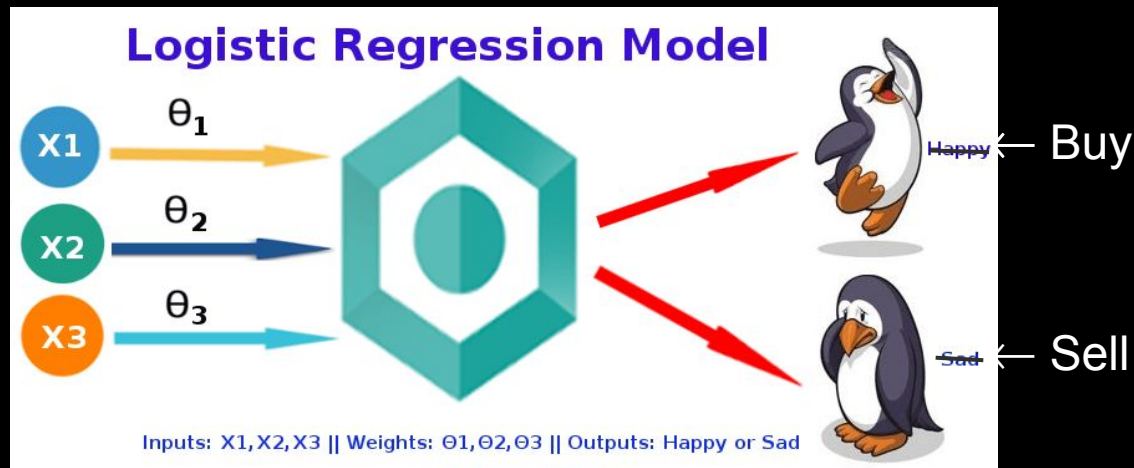
- Maximize performance in excess of SPY alone
⇒ Use a mixed SPY+TQQQ strategy
- Minimize value lost during significant drawdowns
⇒ Implement drawdown-based stop-loss logic
- Minimize number of trades to keep fees low
⇒ Tune hyperparameters accordingly

QuantConnect Platform

- Code with Python
- Free - except for tuning
- Advanced backtesting



First Approach: Machine Learning



Failed to outperform SPY

- Not enough data to train model effectively
- Slow backtests - hard to iterate
- Data did not have enough predictive power

Second Approach: Rule-Based Strategy

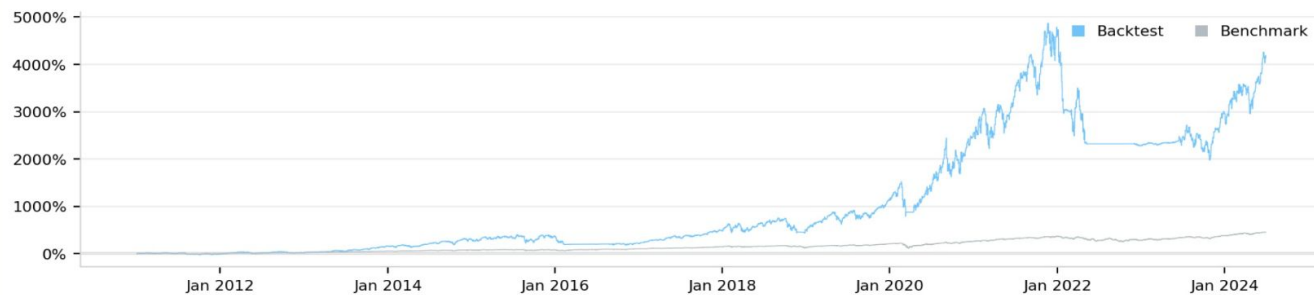


Results

Aggressive Parameters: `allocation_spy` = 30%, `tqqq_drawdown_threshold` = 45%

- **Alpha:** 0.116
- **Maximum Drawdown:** 58.2%
- **Market Entries:** The algorithm entered the market 11 times: 4 in SPY and 7 in TQQQ.
- **Total Fees:** \$3,467 in total fees.
- **Total Return:** 4,132%
- **Compound Annual Growth Rate (CAGR):** 32%
- **Net Gains:** The strategy netted \$4.23 million on a \$100,000 initial investment.
- **Timeframe:** January 1 2011 to June 30 2024.

Cumulative Returns



Results

Conservative Parameters: `allocation_spy` = 70%, `tqqq_drawdown_threshold` = 30%

- **Alpha:** 0.037
- **Maximum Drawdown:** 30.1%
- **Market Entries:** The algorithm entered the market 18 times: 4 in SPY and 14 times in TQQQ.
- **Total Fees:** \$1,998 in total fees.
- **Total Return:** 791%
- **Compound Annual Growth Rate (CAGR):** 17.6%
- **Net Gains:** The strategy netted \$891,200 on a \$100,000 initial investment.
- **Timeframe:** January 1 2011 to June 30 2024.

Cumulative Returns



Q&A

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Thanks for listening!