Developing a Trading Algorithm

Balancing Risk and Return with SPY and TQQQ

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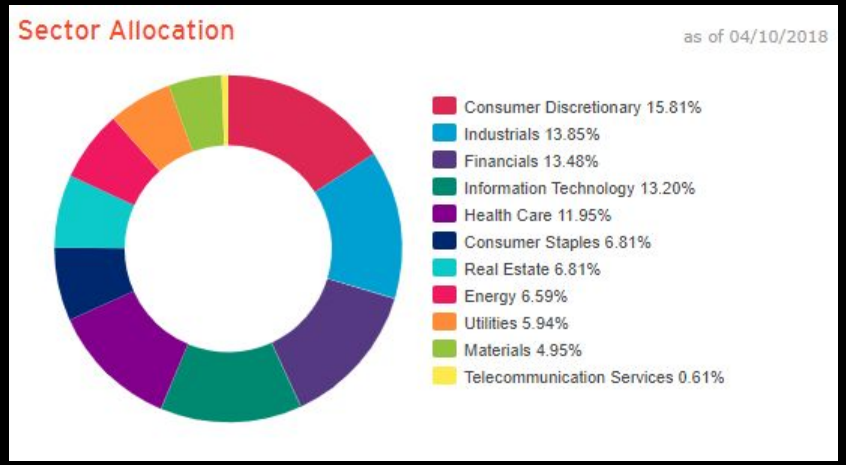
Flatiron School Data Science Capstone

Sector Composition

S&P 500 ETF (SPY)



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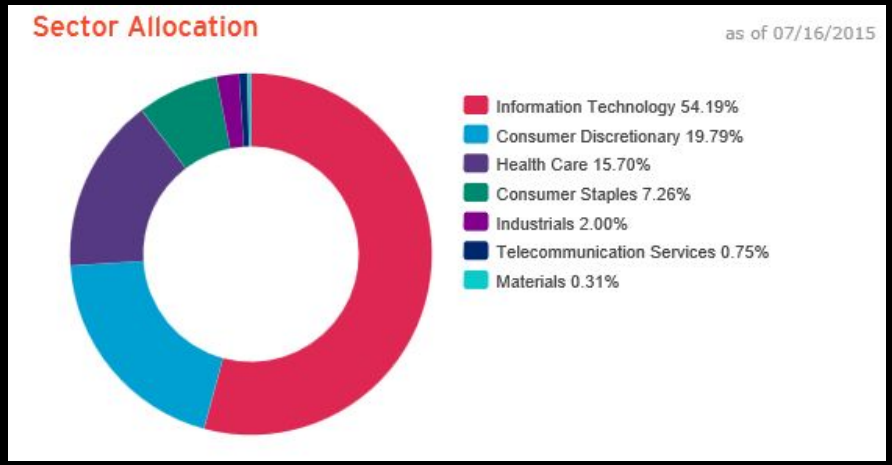
Balanced

3X NASDAQ 100 ETF (TQQQ)



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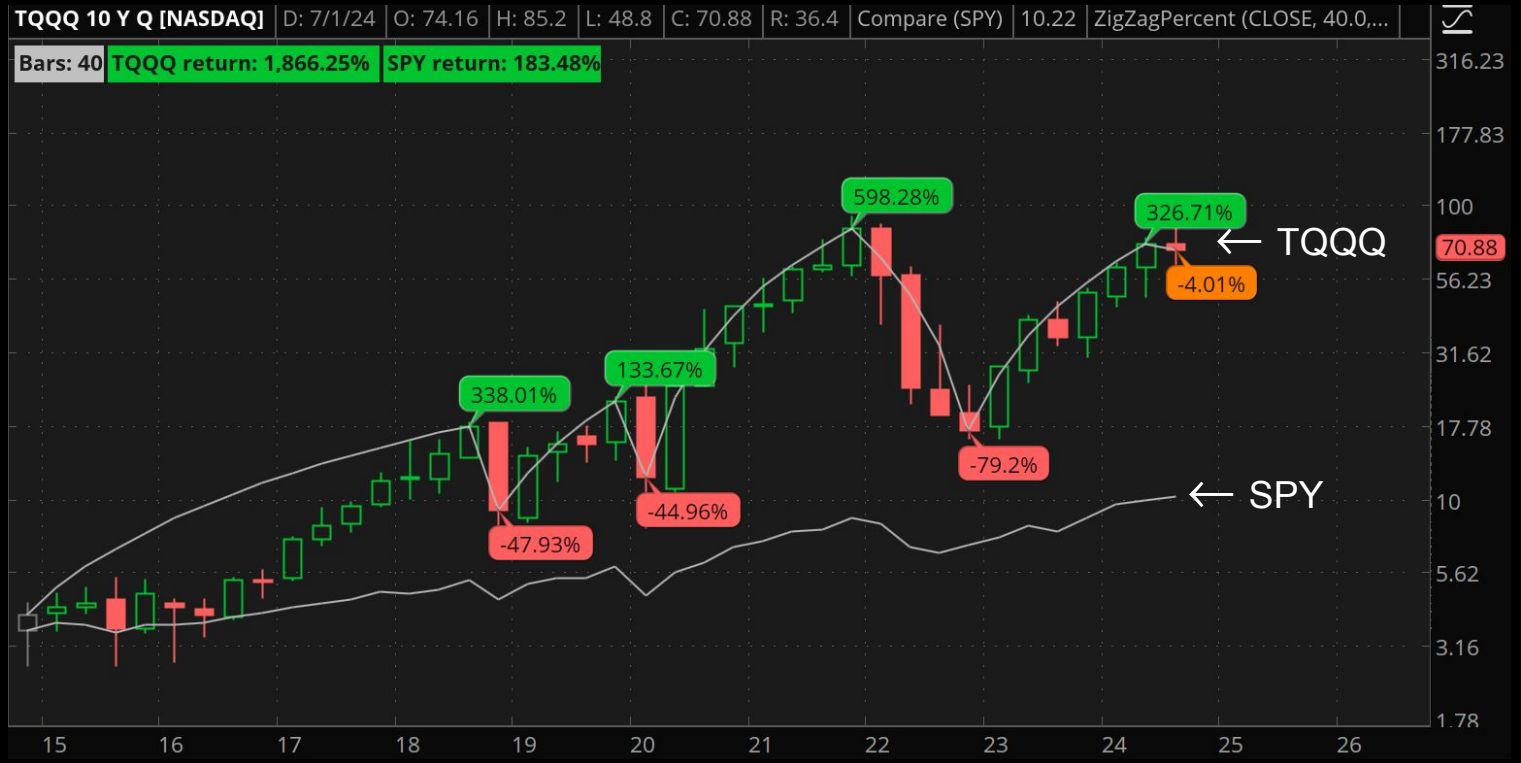
Tech-heavy and leveraged

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

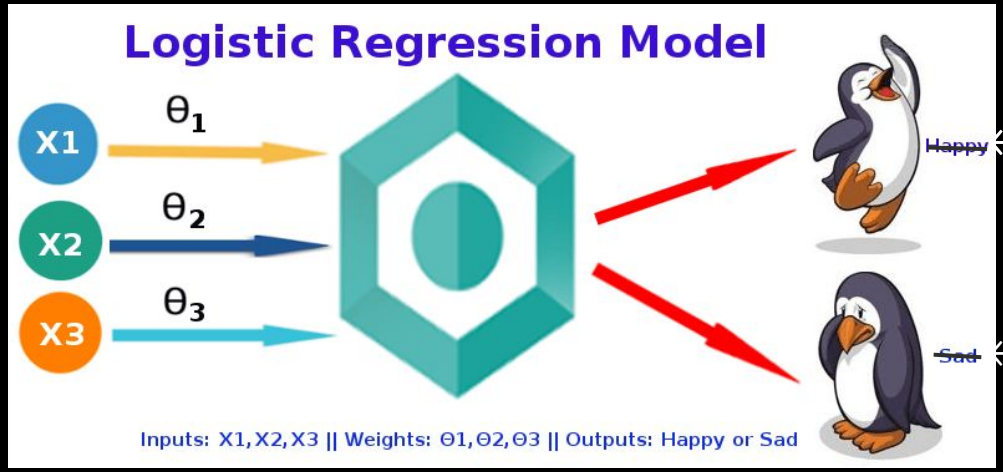
- Minimize number of trades to keep fees low

  ⇒ Tune hyperparameters accordingly

QuantConnect Platform

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

First Approach: Machine Learning



Failed to outperform SPY

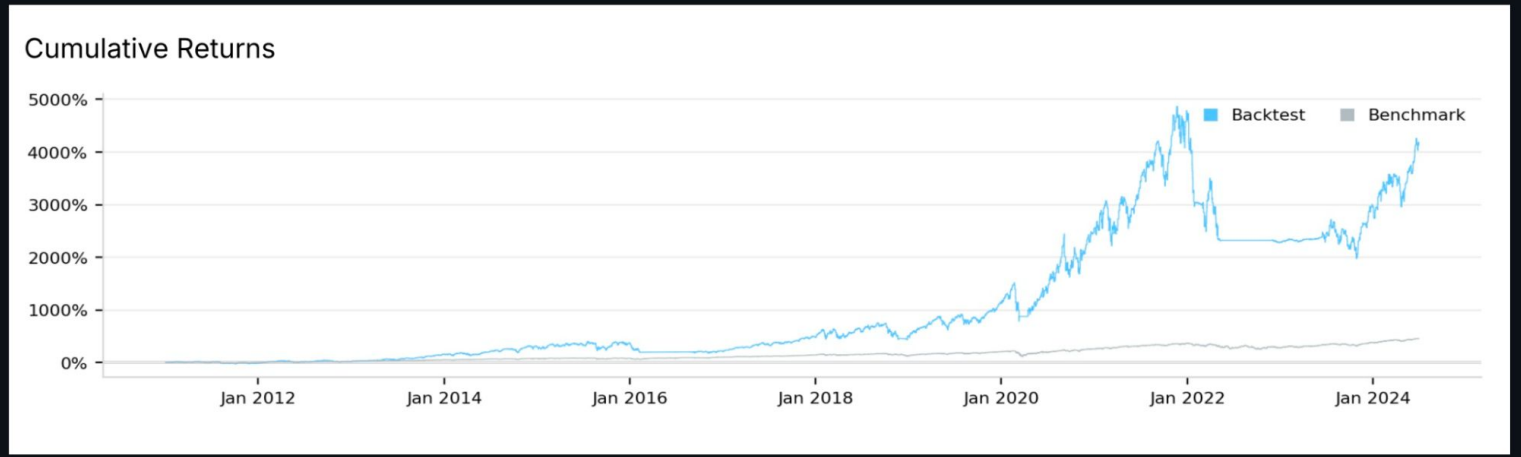
- Not enough data to train model effectively
- Slow backtests - hard to iterate
- Data did not have enough predictive power

Second Approach: Rule-Based Strategy

Results

Aggressive Parameters: `allocation_spy` = 30%, `tqqq_drawdown_threshold` = 40%

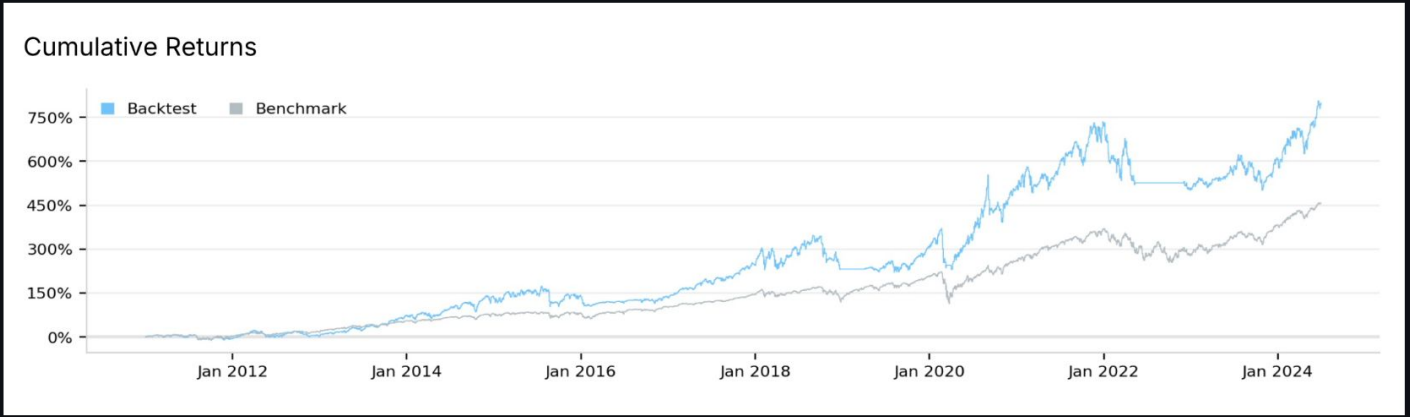
- **Alpha:** 0.116
- **Maximum Drawdown:** 58.2%
- **Market Entries:** The algorithm entered the market 11 times: 4 in SPY and 7 in TQQQ.
- **Total Fees:** $3,467 in total fees.
- **Total Return:** 4,132%
- **Compound Annual Growth Rate (CAGR):** 32%
- **Net Gains:** The strategy netted $4.23 million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



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.



Q&A

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Thanks for listening!