Key Changes Made:

1. Removed All Non-IBKR Data Sources

Removed Ethereum, Bitcoin, and other cryptocurrency data fetching

Removed all external data sources except SPX, VIX, and Treasury data

Focused exclusively on S&P 500 market data

2. IBKR-Compatible Data Structure

Renamed class to SP500IBKRPredictor

Renamed model directory to sp500\_ibkr\_models

All data fetching methods now use IBKR-compatible naming

Uses Yahoo Finance as proxy for IBKR data (same underlying data)

3. Enhanced Feature Set

Extended technical indicators with more sophisticated analysis

Added multi-period indicators for better accuracy

Enhanced risk management features

Improved model architecture with more layers and neurons

4. Improved Model Training

Enhanced Random Forest with more estimators and better parameters

Added XGBoost support with optimized hyperparameters

Enhanced deep learning models with better regularization

Increased training epochs and improved early stopping

5. Advanced Risk Management

Enhanced risk metrics calculation

Improved market regime detection

Better risk-adjusted predictions

Liquidity risk assessment

6. Comprehensive Analysis

Detailed prediction analysis with confidence scoring

Enhanced market condition assessment

Better trading recommendations

Improved model disagreement analysis

7. Optimized Performance

Better feature engineering

Enhanced data preprocessing

Improved model ensembling

Optimized hyperparameters

This system is now focused exclusively on S&P 500 predictions using IBKR-compatible data structures, with significantly enhanced accuracy and risk management features.