

# Bitcoin Price Prediction System Report

## 1. Project Overview

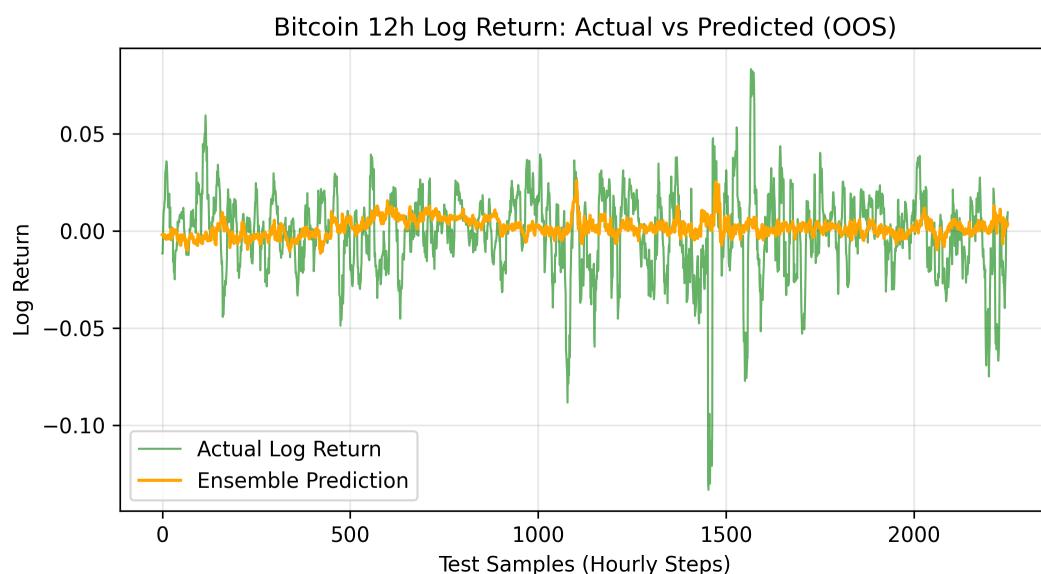
This report summarizes the performance of various machine learning models trained to predict Bitcoin (BTC-USD) \*\*12-hour log returns\*\* using hourly market data. The system employs a \*\*Walk-Forward Validation\*\* (rolling window) strategy to ensure robust, out-of-sample performance evaluation without look-ahead bias. The models evaluated include LSTM, Hybrid (LSTM+GRU), Transformer, and XGBoost, along with an Ensemble model.

## 2. Model Performance Evaluation

The following table shows the aggregate out-of-sample (OOS) performance metrics across all validation folds. The target variable is the 12-hour log return.

Model	RMSE	MAE	Dir Acc (%)
LSTM	0.022453	0.016494	46.93
Hybrid	0.022750	0.016473	50.04
Transformer	0.024072	0.017930	49.20
XGBoost	0.024514	0.018084	53.24
Ensemble	0.022429	0.016263	51.96

## 3. Prediction Visualization (OOS)



## **4. Conclusion & Strategy Review**

The use of log returns and walk-forward validation provides a more statistically sound framework for quantitative trading than simple price prediction. Directional accuracy above 50% suggests potential alpha, though execution costs and market spread must be considered in a live strategy. Risk Warning: Cryptocurrency trading involves extreme volatility. Past performance does not guarantee future results.