

Project Report: Ethereum Price Forecasting using ARIMA

1. Introduction

Cryptocurrency markets, particularly Ethereum (ETH), have shown significant growth and volatility in recent years. Accurately forecasting Ethereum prices can help investors make better decisions, reduce risks, and understand market dynamics. This project aims to implement a time series forecasting model using ARIMA (AutoRegressive Integrated Moving Average) to predict future Ethereum prices based on historical data.

2. Objective

The primary objective of this project is to:

- Analyze historical Ethereum price data.
- Apply the ARIMA model for price forecasting.
- Visualize actual vs. predicted values to assess model performance.
- Lay a foundation for advanced forecasting models in financial domains.

3. Tools and Technologies

- Python 3.x
- Libraries: pandas, numpy, matplotlib, seaborn, statsmodels, sklearn.metrics

4. Dataset

The dataset includes historical Ethereum price data with columns such as Date, Open, High, Low, Close, Volume.

Data Source: Cryptocurrency market APIs or pre-downloaded CSV from trusted sources like CoinMarketCap or Yahoo Finance.

5. Methodology

Step 1: Data Collection and Preprocessing

- Load dataset and preprocess timestamps and missing values.
- Focus on Close prices.

Step 2: Exploratory Data Analysis (EDA)

- Plot trends and rolling averages.

Step 3: Stationarity Check

- Use Augmented Dickey-Fuller test and apply differencing if necessary.

Step 4: Model Selection and Tuning

- Use ACF/PACF plots and AIC/BIC scores to tune ARIMA parameters.

Step 5: Model Training and Forecasting

- Fit ARIMA and generate predictions.

Step 6: Model Evaluation

- Evaluate with RMSE/MAE.

Step 7: Visualization

- Plot actual vs. forecasted values.

6. Results

- ARIMA captured short-term trends effectively.
- Best ARIMA configuration selected by AIC.
- Forecast showed good accuracy during low-volatility periods.

Sample Metrics:

- RMSE: ~[insert value]
- MAE: ~[insert value]

7. Limitations

- ARIMA assumes linearity and may fail with market shocks.
- Not ideal for long-term forecasting.
- Does not account for external factors like news or regulations.

8. Future Work

- Use SARIMA for seasonal patterns.
- Apply LSTM for deep learning-based prediction.
- Integrate real-time data APIs.
- Incorporate additional features like volume and sentiment.

9. Conclusion

This project shows that ARIMA is a strong baseline for Ethereum price forecasting using historical data.

It sets the stage for more advanced models in financial prediction tasks.

10. References

- Box, G. E. P., Jenkins, G. M., & Reinsel, G. C. (Time Series Analysis)
- Statsmodels Documentation: <https://www.statsmodels.org/>
- CoinMarketCap: <https://coinmarketcap.com/>
- Yahoo Finance: <https://finance.yahoo.com/>