

Methodology

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1 Exploration and Pre-processing

The dataset was imported from a CSV file and initially explored using functions like `head()` and `str()`. To enhance usability, column names were renamed. The date column was formatted correctly as a `Date` type, while the Bitcoin column was converted to numeric. Missing values were effectively managed through linear interpolation using the `na.approx()` function. A comprehensive plot was created to visualize the overall trend of the data.

2 Modeling and Diagnostic Techniques

I first drew ACF and PACF plots, then applied an ARIMA(1,1,0) model. This was followed by a TAR (2-regime) model and then a TAR (3-regime) model. Residuals of each model were analyzed, and AIC and RMSE metrics were used to compare the performance of each model.

3 R Packages and Functions Used

The `zoo` package provided infrastructure for working with regular and irregular time series data. the `ggplot2` package was employed for data visualization, particularly for creating complex plots. the `forecast` package provided methods and tools for forecasting time series data. the `tseries` package included tools for time series analysis and financial time series analysis. the `tsDyn` package was used for fitting TAR models and the `Metrics` package was used for the evaluation of the model.