Time Series Analysis

Bitcoin Daily Data Analysis

Vedanshee Patel 202203003
Khushi Prajapati202201062

Mentor :Prof. Mukesh Tiwari

Introduction and Motivation

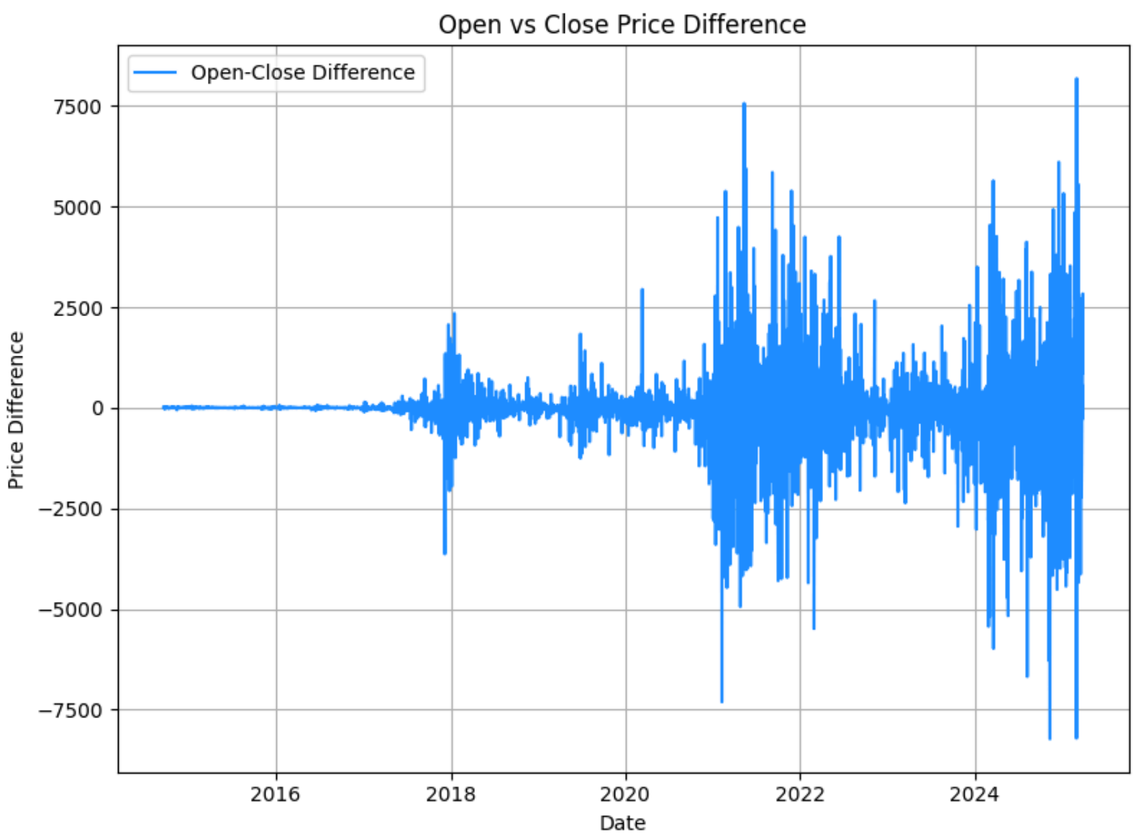
- Bitcoin is a decentralized digital currency, free from central bank control, that enables peer-to-peer transactions on the blockchain.
- **Extreme Volatility:** Unlike traditional assets, Bitcoin's price can swing massively in short timeframes. This volatility presents both challenges and opportunities for forecasting and risk management
- **Growing Popularity:** Bitcoin has experienced exponential growth in popularity over the last few years, moving from a focused digital asset to a widely used financial tool.
- **Objective :** We aim to analysis the daily closing of the Data.

About the Dataset

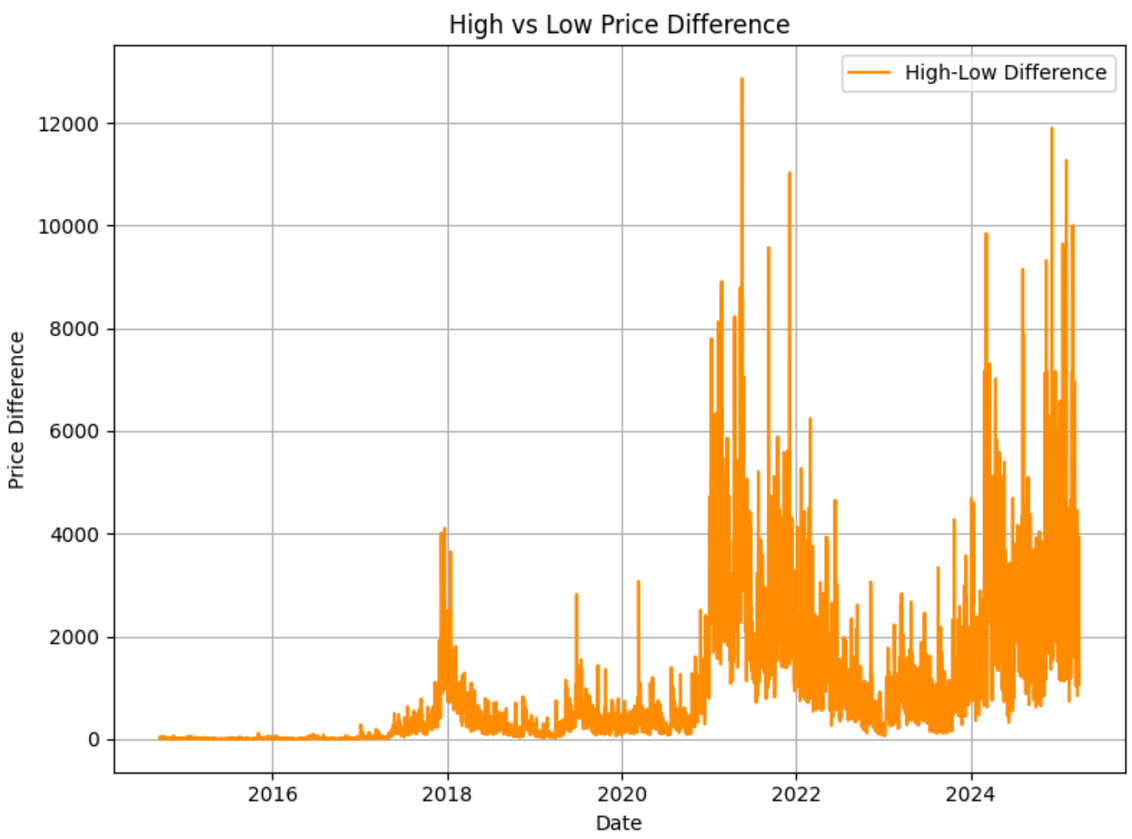
	Date	Open	High	Low	Close	Volume	Dividends	Stock Splits
0	2014-09-17 00:00:00+00:00	465.864014	468.174011	452.421997	457.334015	21056800	0.0	0.0
1	2014-09-18 00:00:00+00:00	456.859985	456.859985	413.104004	424.440002	34483200	0.0	0.0
2	2014-09-19 00:00:00+00:00	424.102997	427.834991	384.532013	394.795990	37919700	0.0	0.0
3	2014-09-20 00:00:00+00:00	394.673004	423.295990	389.882996	408.903992	36863600	0.0	0.0
4	2014-09-21 00:00:00+00:00	408.084991	412.425995	393.181000	398.821014	26580100	0.0	0.0
5	2014-09-22 00:00:00+00:00	399.100006	406.915985	397.130005	402.152008	24127600	0.0	0.0
6	2014-09-23 00:00:00+00:00	402.092010	441.557007	396.196991	435.790985	45099500	0.0	0.0
7	2014-09-24 00:00:00+00:00	435.751007	436.112000	421.131989	423.204987	30627700	0.0	0.0
8	2014-09-25 00:00:00+00:00	423.156006	423.519989	409.467987	411.574005	26814400	0.0	0.0
9	2014-09-26 00:00:00+00:00	411.428986	414.937988	400.009003	404.424988	21460800	0.0	0.0

Features Added

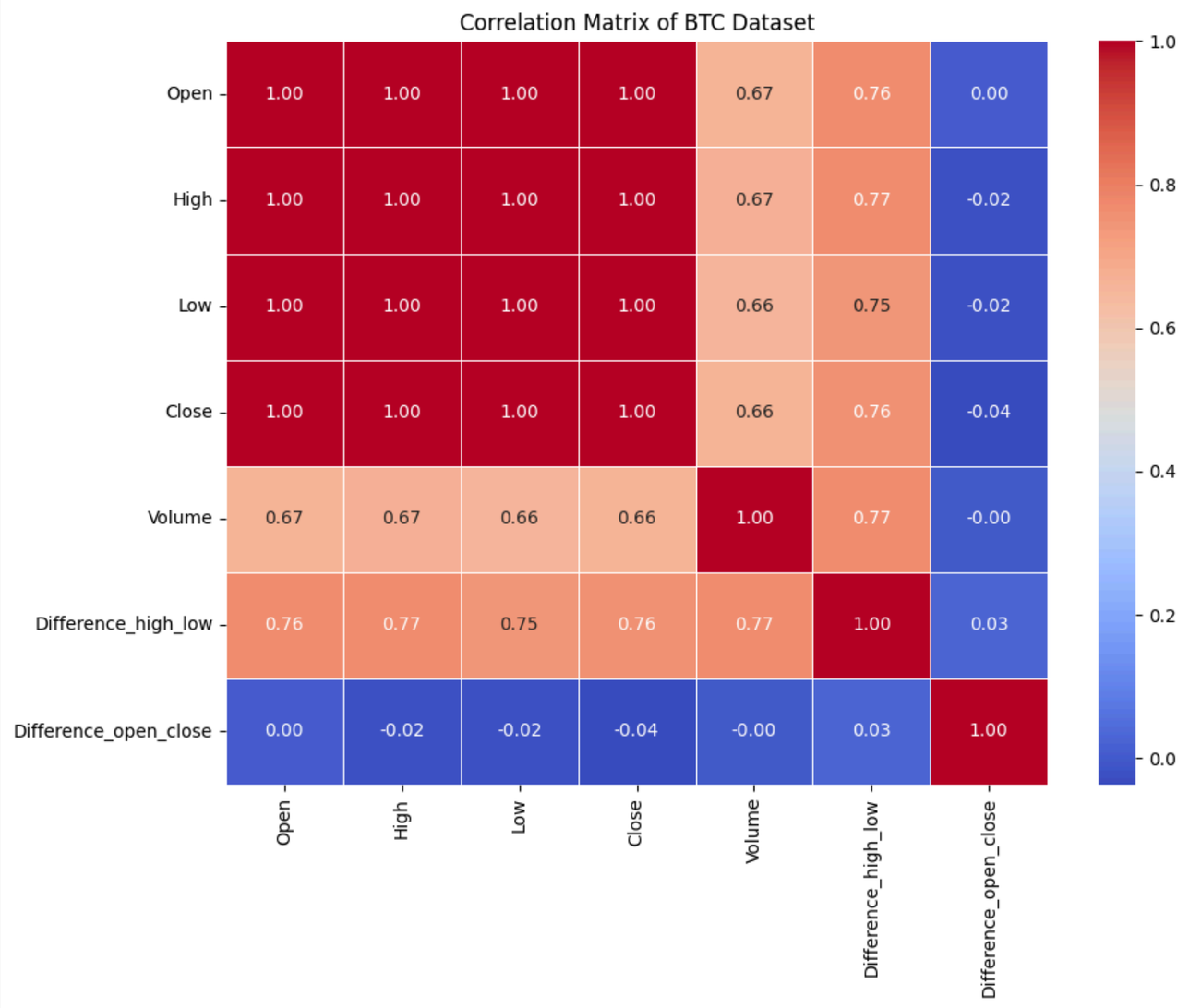
Difference_open_close = Open-Close



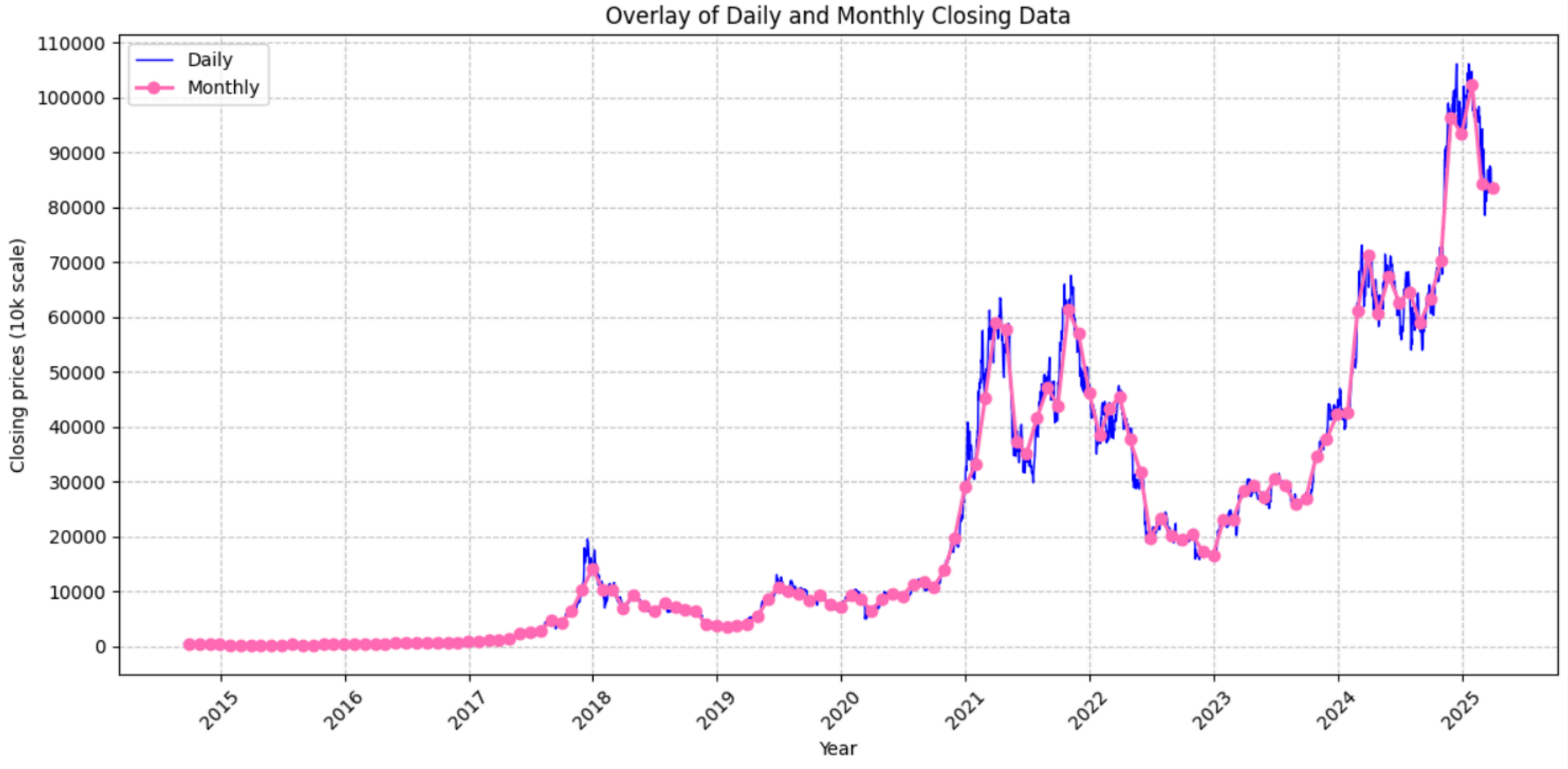
Difference_high_low = High-Low



Correlation Matrix

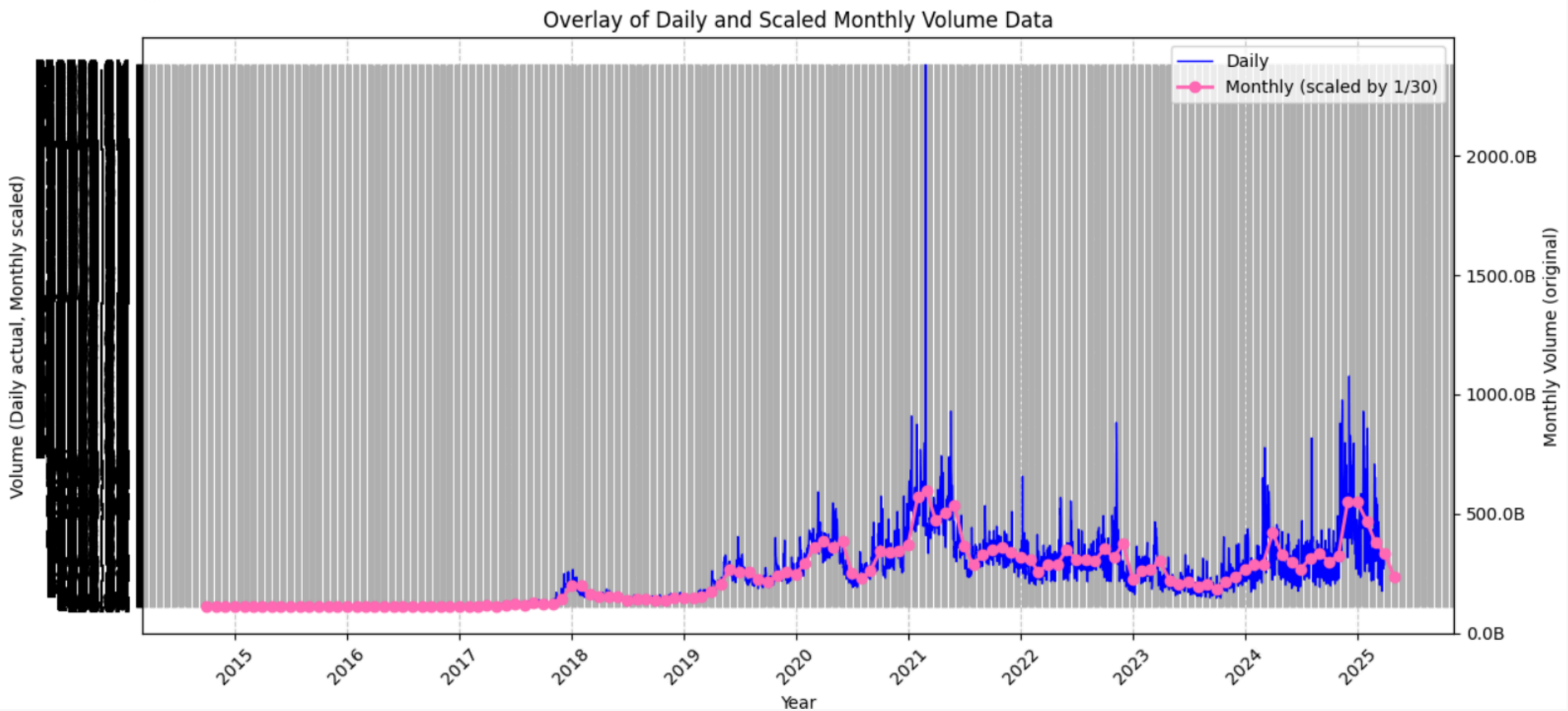


Plotting the Data



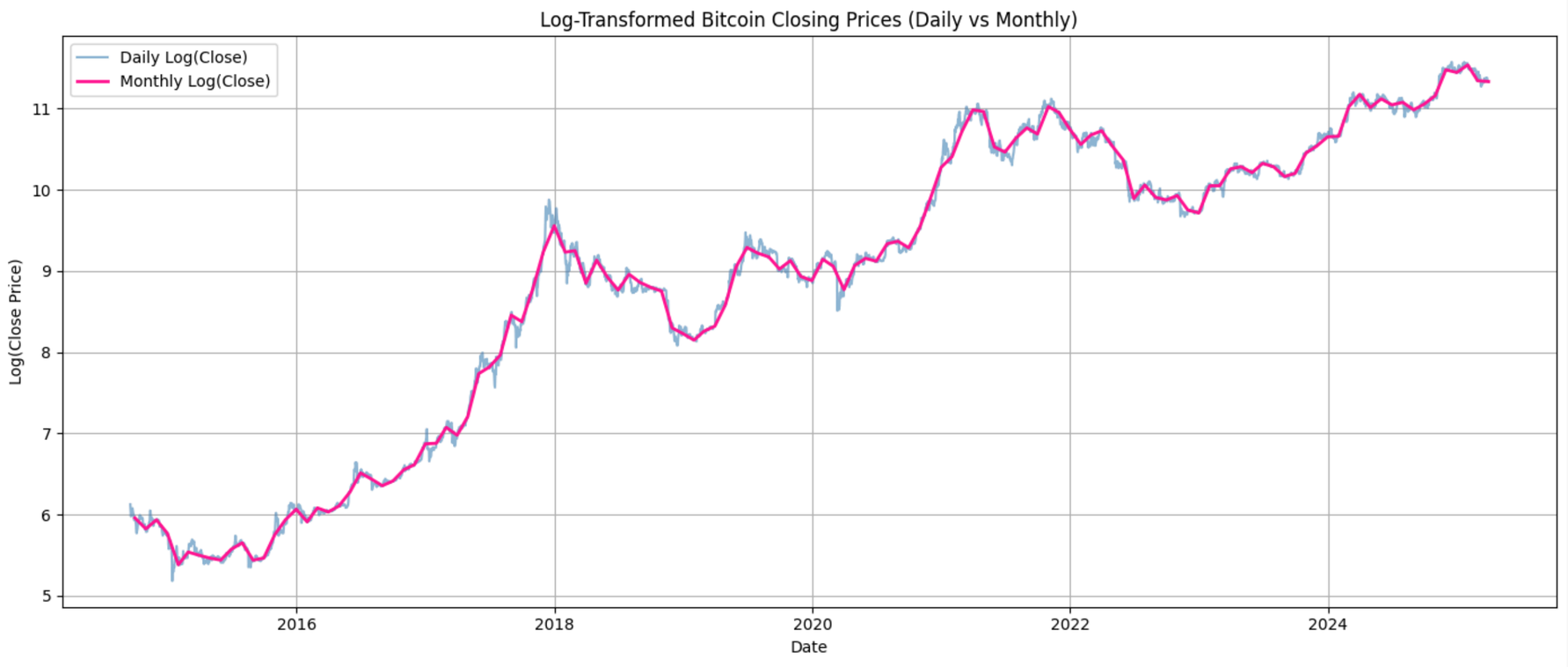
Closing prices of the Daily and Monthly data

Plotting the Data



Volume of the Daily and Monthly data

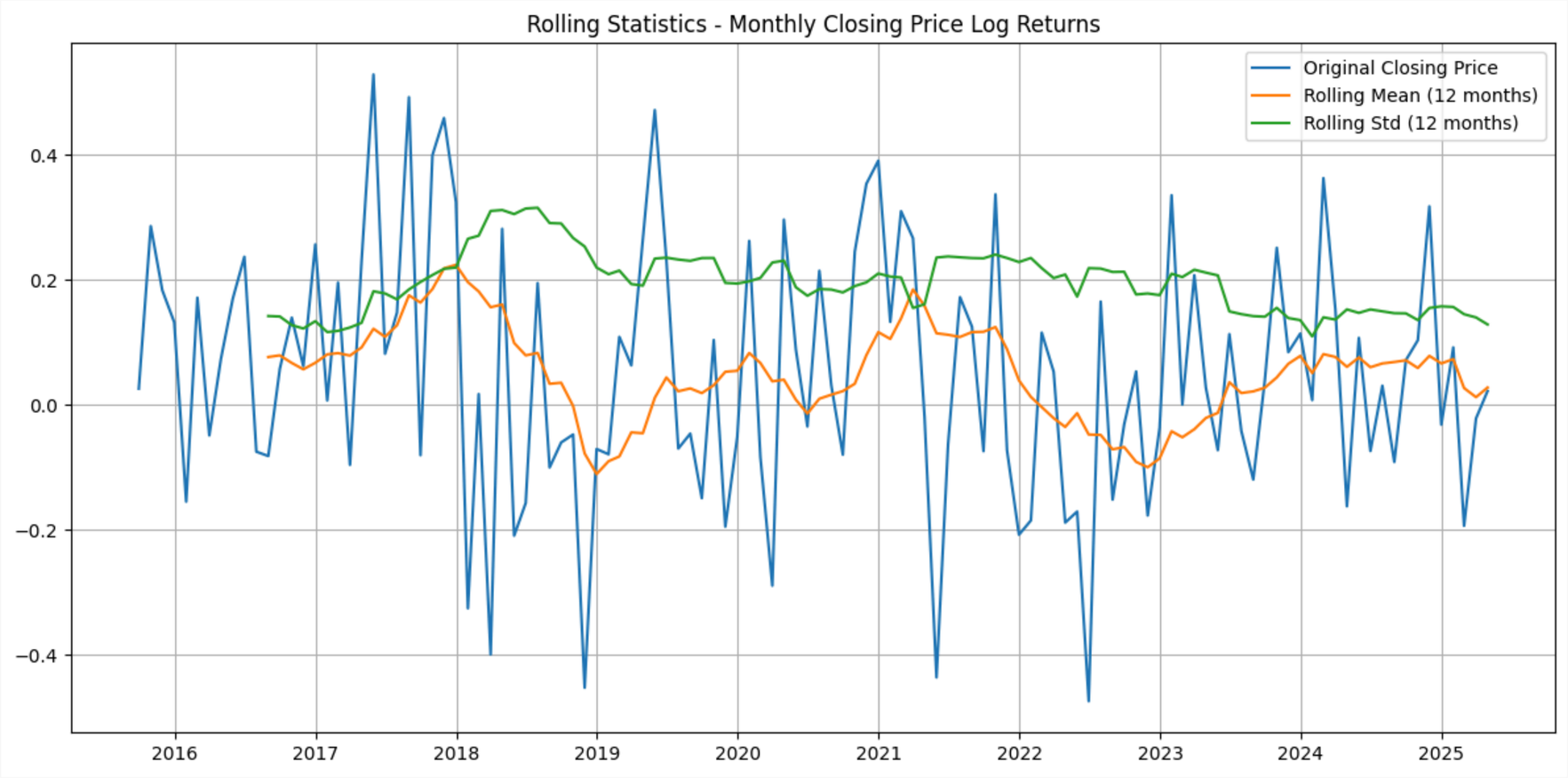
Plotting the Logarithmic Data



Metric	Value
Series	Log Price
ADF Statistic	-0.9611026909895082
p-value	0.7671856197298427
Critical Values	1%: -3.4321
	5%: -2.8623
	10%: -2.5672
Stationary?	No

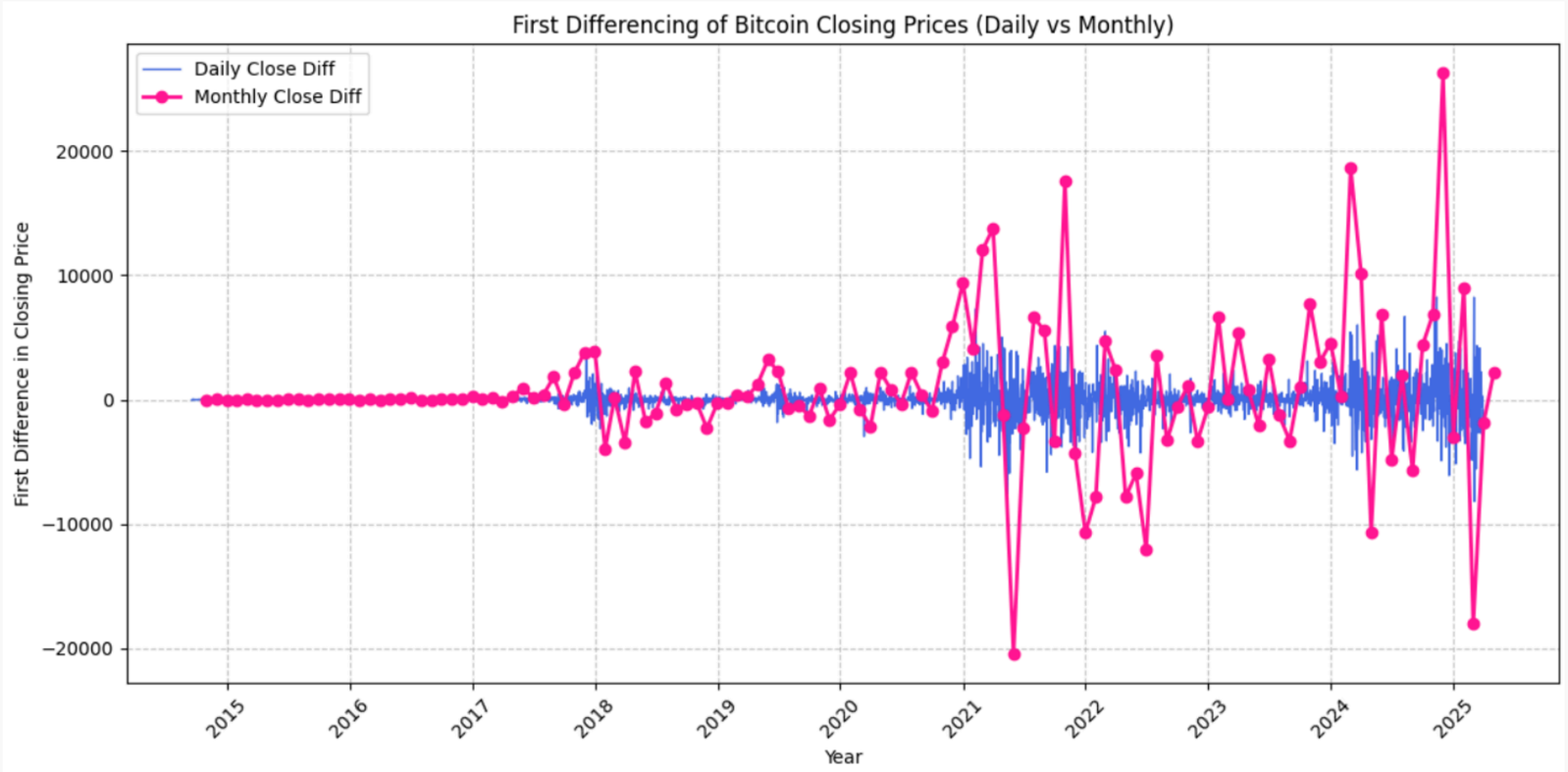
$$Y_t = \log(X_t)$$

Plotting the Log Returns



$$\log(1+R_t) = \log(P_t) - \log(P_{t-1})$$

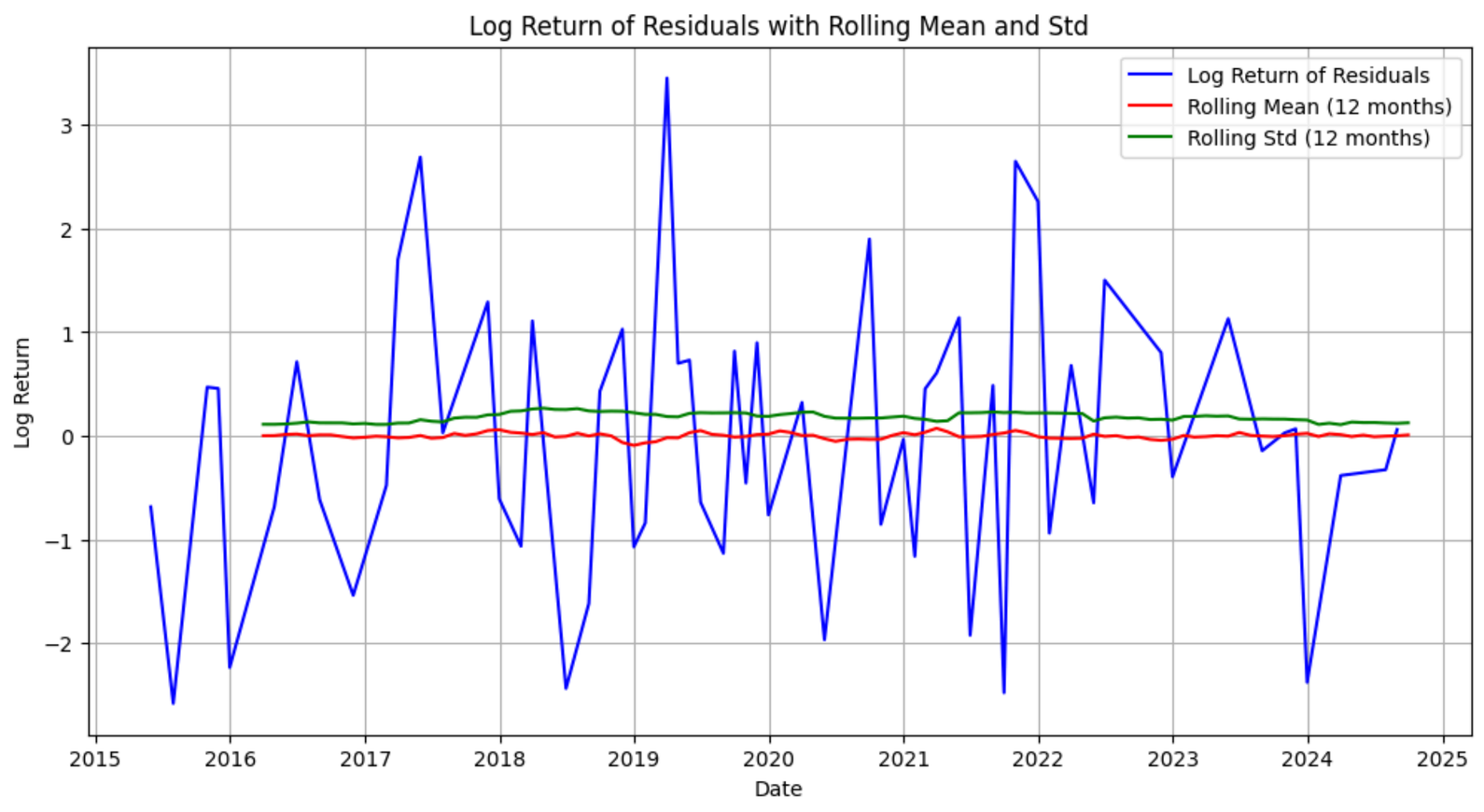
Plotting the Differencing Data



$$Y'_t = Y_t - Y_{t-1}$$

Decomposition of the data

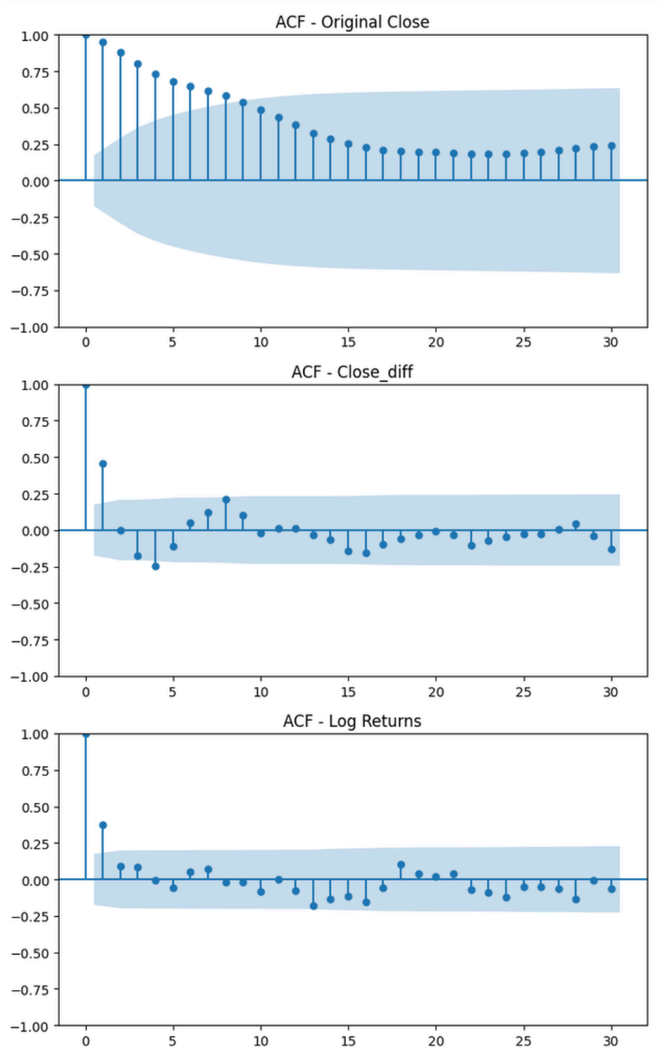
Log returns of the Residuals



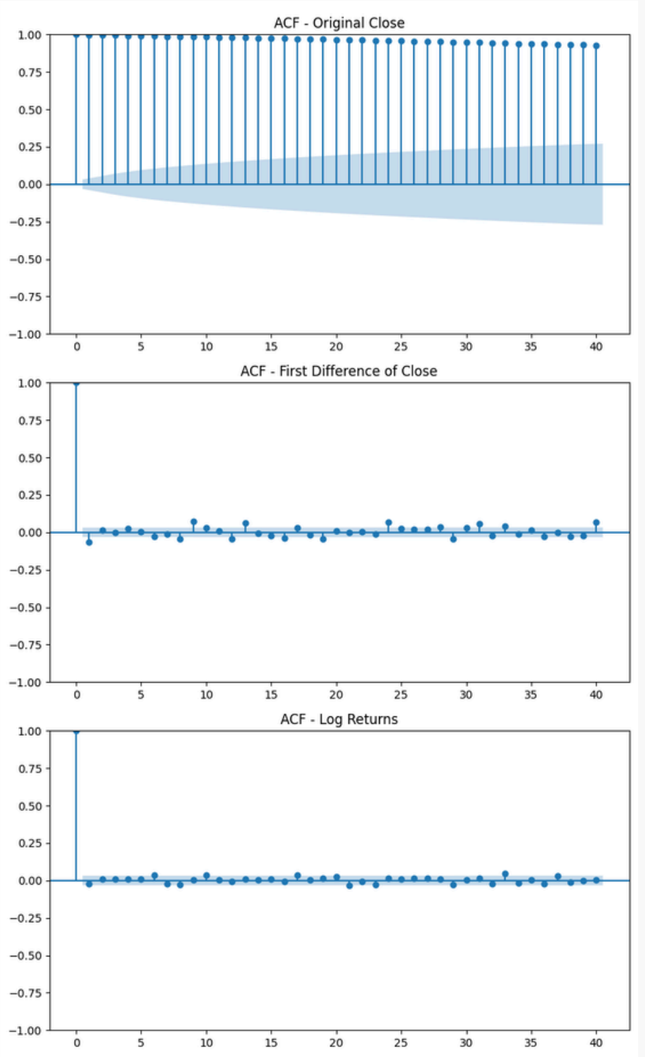
Metric	Value
Series	Log Returns of Residuals
ADF Statistic	-8.360142085817419
p-value	2.8381321418648255e-13
Critical Values	1%: -3.5464 5%: -2.9119 10%: -2.5937
Stationary?	Yes

$$\log(1+R_t) = \log(P_t) - \log(P_{t-1})$$

Plotting the ACF

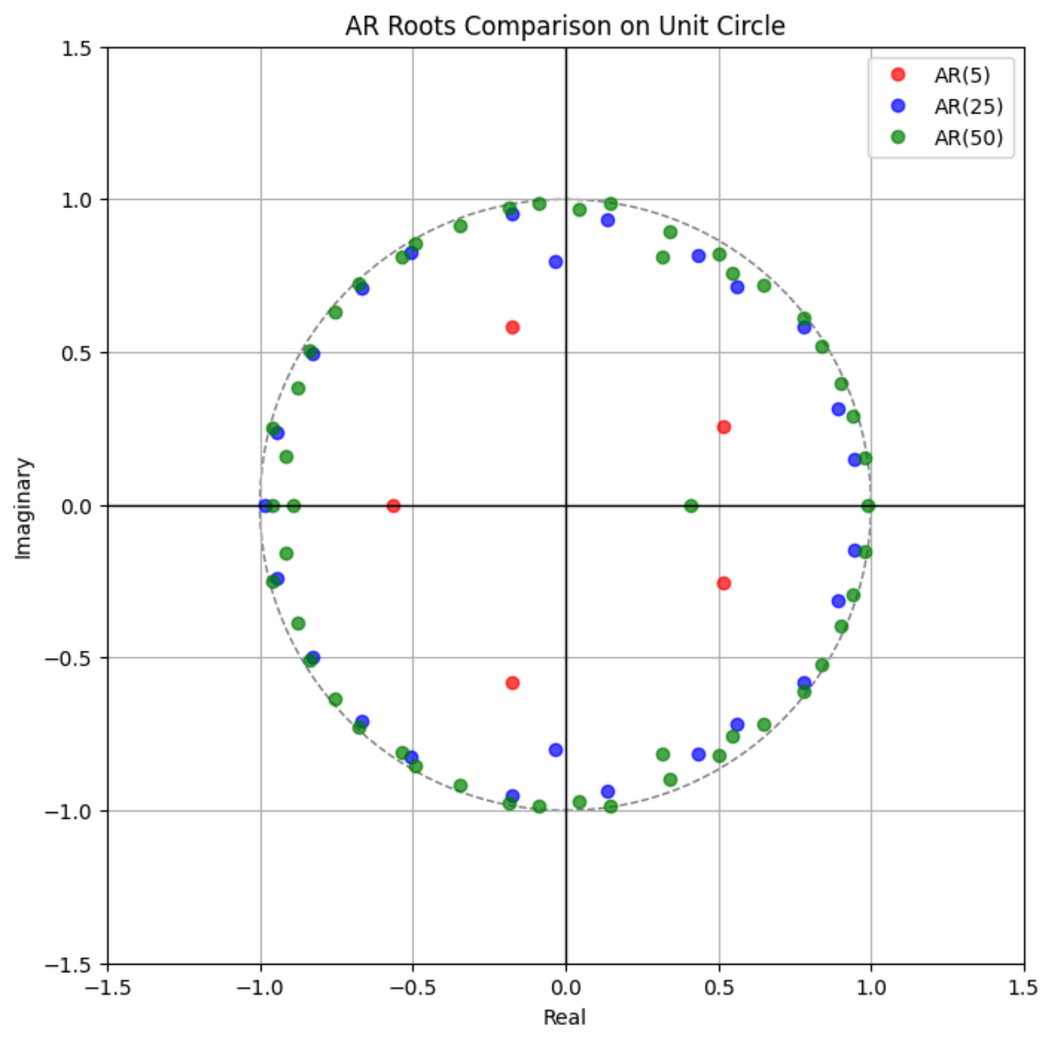


Monthly



Daily

Unit Circle analysis



AR(5) exhibits a simpler structure but with higher risk of instability.

AR(25) and AR(50) models offer increased stability and finer resolution with a risk of overfitting.

Future Scope

Forecasting

For future aspect we can feed the data to various model for prediction of the data.

Multivariate Analysis

We can take other parameters such as stock prices and market situation or public emotions into account make better predictions

Thank you!