NETFLIX STOCK PRICE ANALYSIS

SC475 - TIME SERIES ANALYSIS
PROF. MUKESH TIWARI

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Introduction

Today, Netflix is one of the most prominent streaming services in the entertainment industry and it’s volatile stock price is a sought after subject for analysis. We aim to perform a time series analysis on the ‘Close’ stock price of Netflix by analyzing the dataset, handling outliers, working on stationarity, detrending and model selection.

Data preprocessing

- Read dataset
- Sanity check on the dataset to make sure there are no missing values and no duplicates.

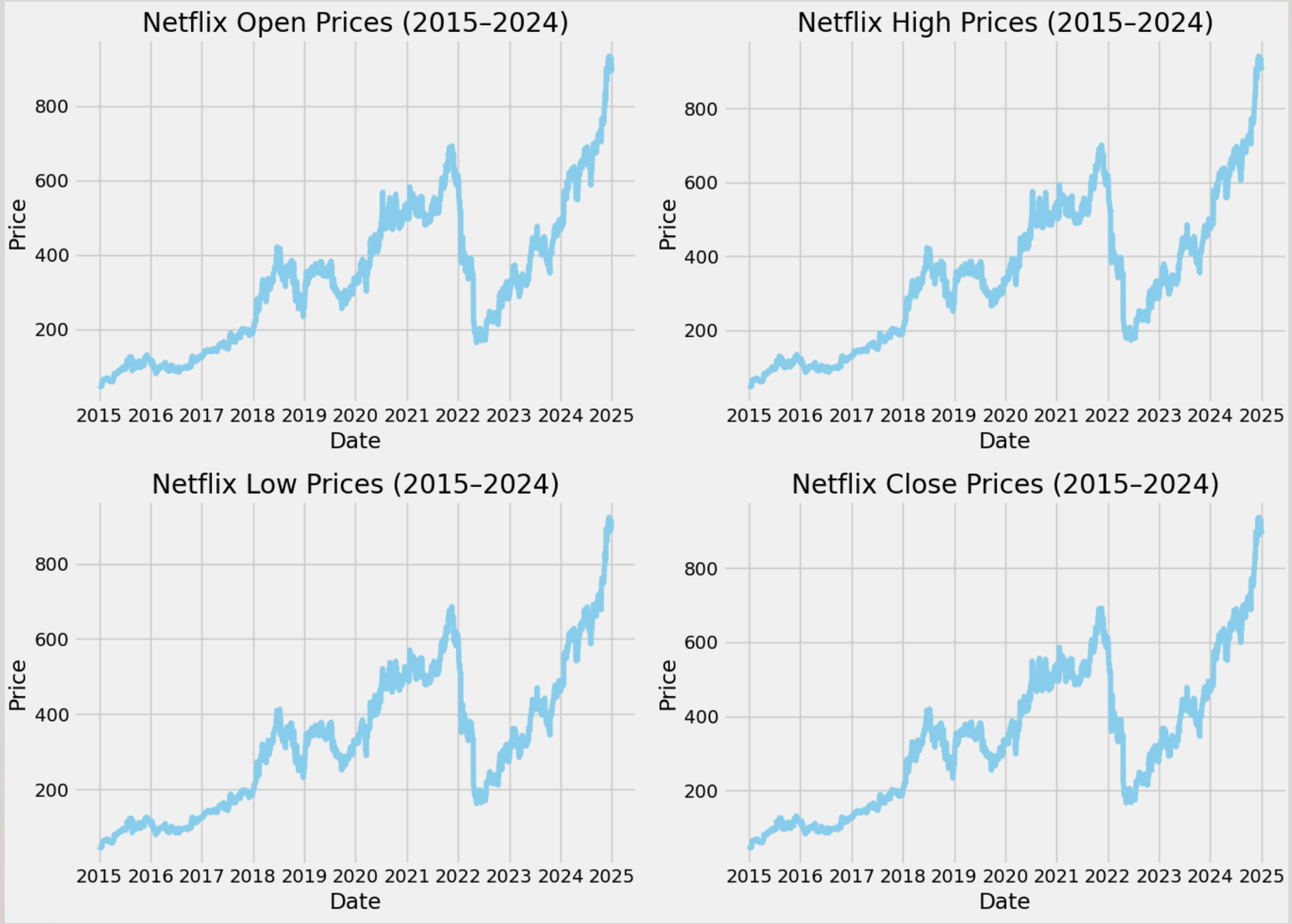
	Date	Open	High	Low	Close	Adj Close	Volume
0	2025-02-25	989.40	994.40	955.00	977.24	977.24	4733000
1	2025-02-24	1008.00	1015.17	984.48	988.47	988.47	4426200
2	2025-02-21	1029.42	1032.38	999.39	1003.15	1003.15	3738700
3	2025-02-20	1042.00	1045.00	1015.59	1024.54	1024.54	3111800
4	2025-02-19	1035.18	1045.00	1024.51	1043.33	1043.33	2600000

Data analysis

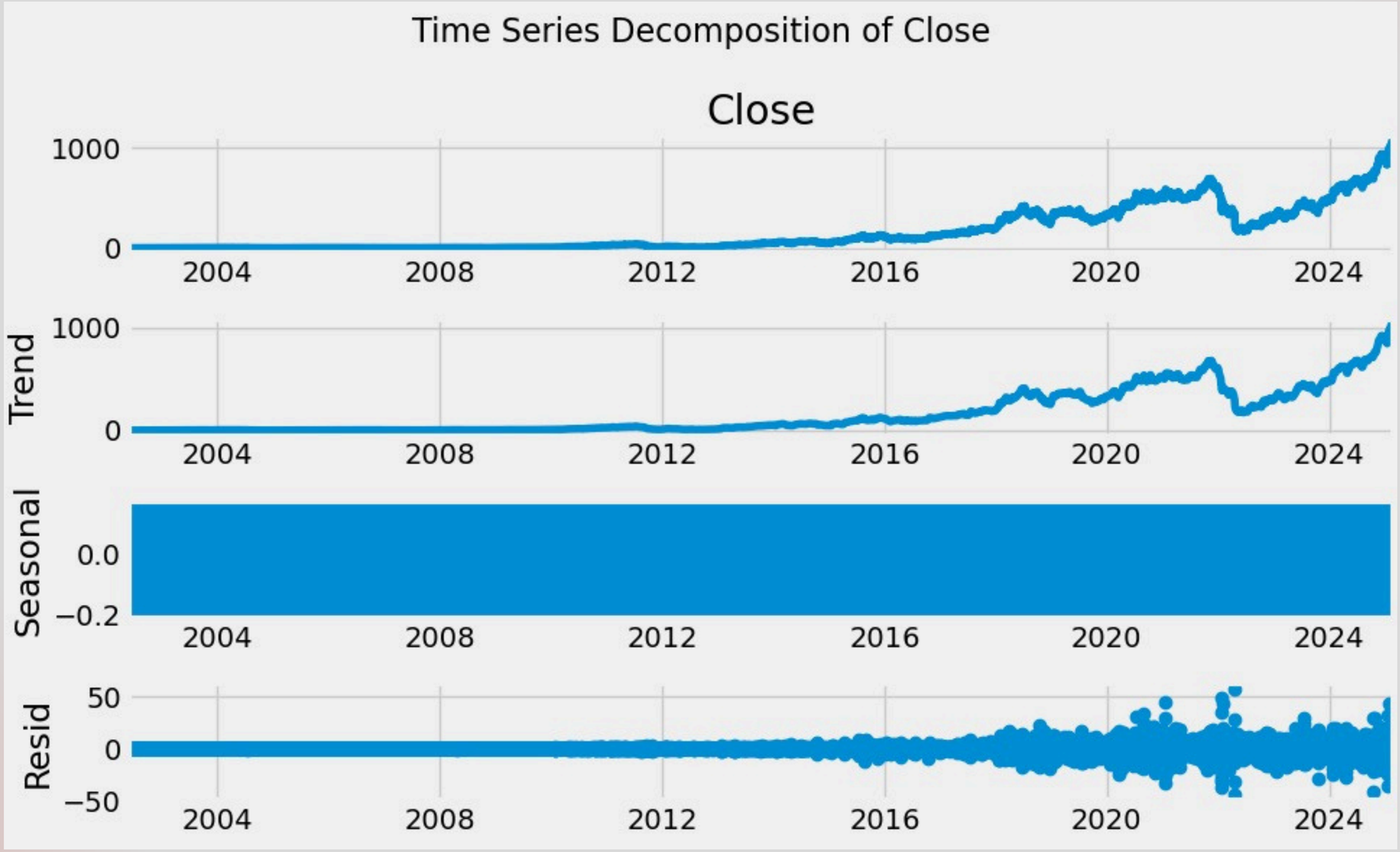
- The median << mean which indicates right skewness
- There is a huge gap between the 25th and the 75th percentile that shows high variability
- Excess Kurtosis: 1.2413299869751668 (>0) so leptokurtic

	count	mean	std	min	25%	50%	75%	max
Open	5727.0	1.612611e+02	2.131627e+02	0.38	4.265	44.97	3.087700e+02	1.060000e+03
High	5727.0	1.636277e+02	2.159504e+02	0.41	4.355	45.93	3.134900e+02	1.064500e+03
Low	5727.0	1.588396e+02	2.102681e+02	0.35	4.190	43.93	3.031850e+02	1.041690e+03
Close	5727.0	1.612933e+02	2.131595e+02	0.37	4.260	44.86	3.093150e+02	1.058600e+03
Adj Close	5727.0	1.612933e+02	2.131595e+02	0.37	4.260	44.86	3.093150e+02	1.058600e+03
Volume	5727.0	1.529105e+07	1.845139e+07	285600.00	5460550.000	9531100.00	1.820050e+07	3.234140e+08

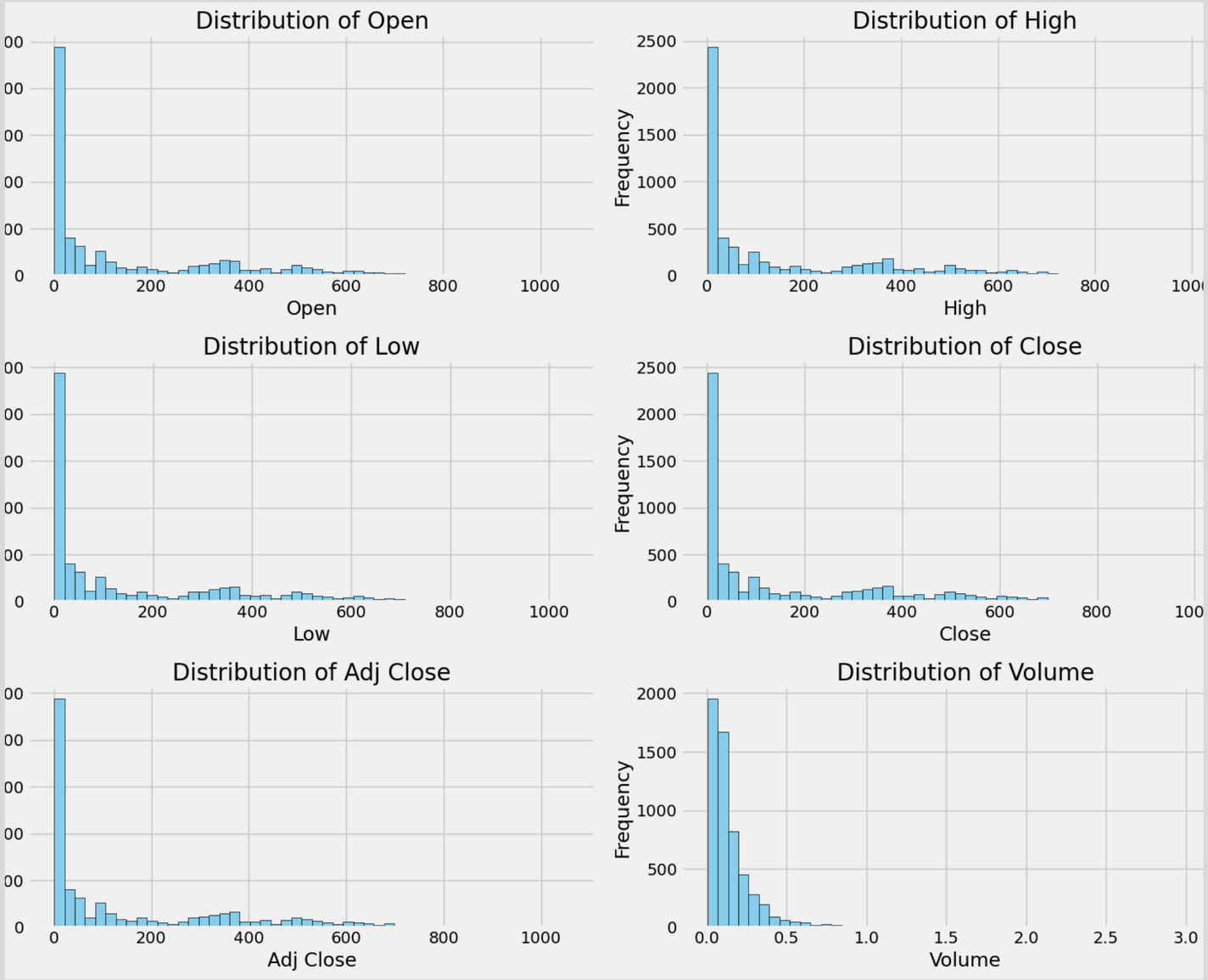
Visualizing the distribution



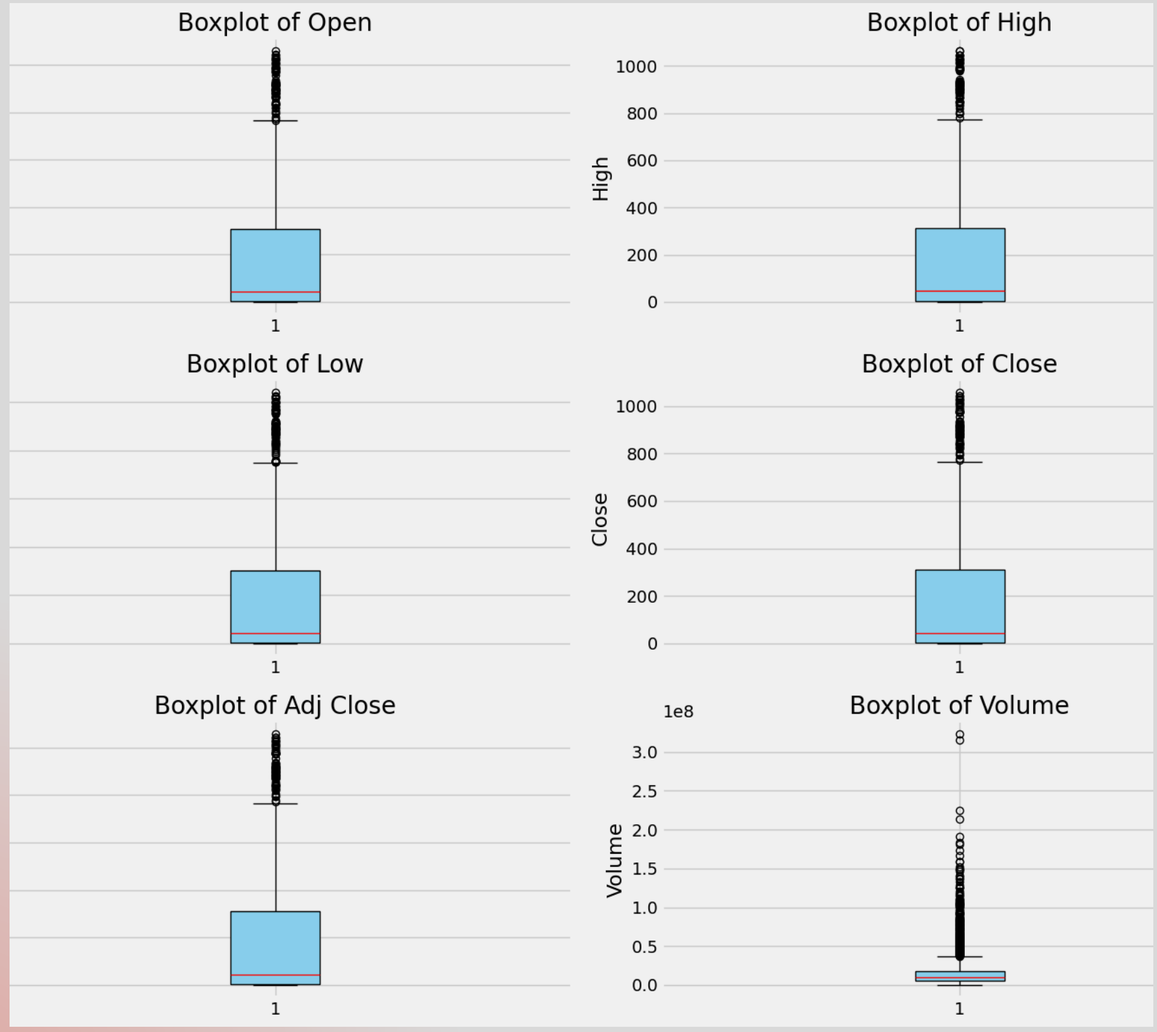
Decomposition of ‘Close’ price



Visualizing the distribution



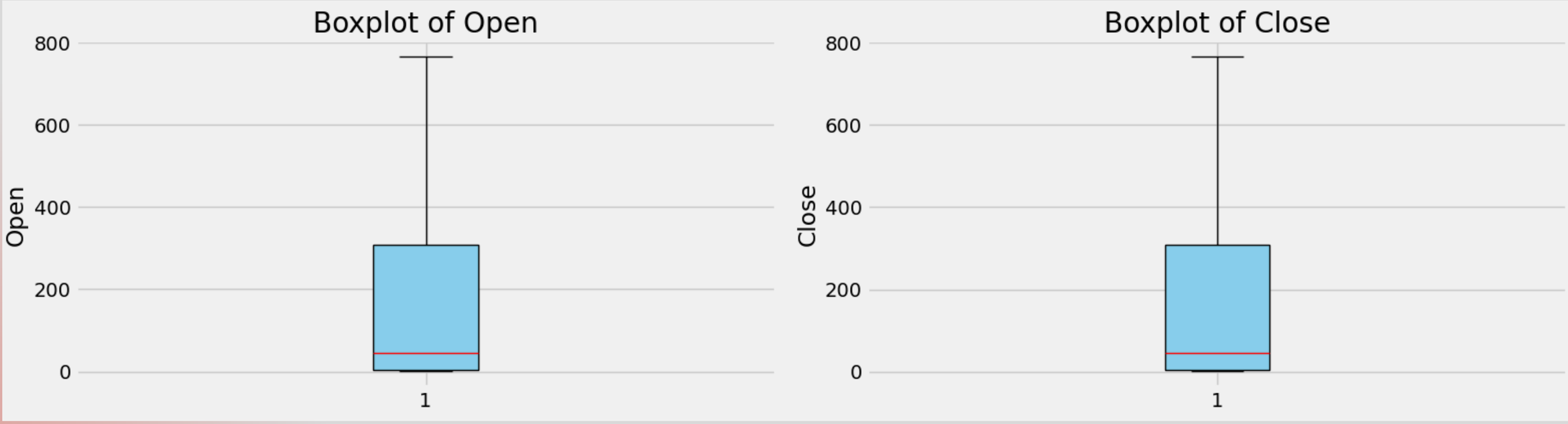
Box plots



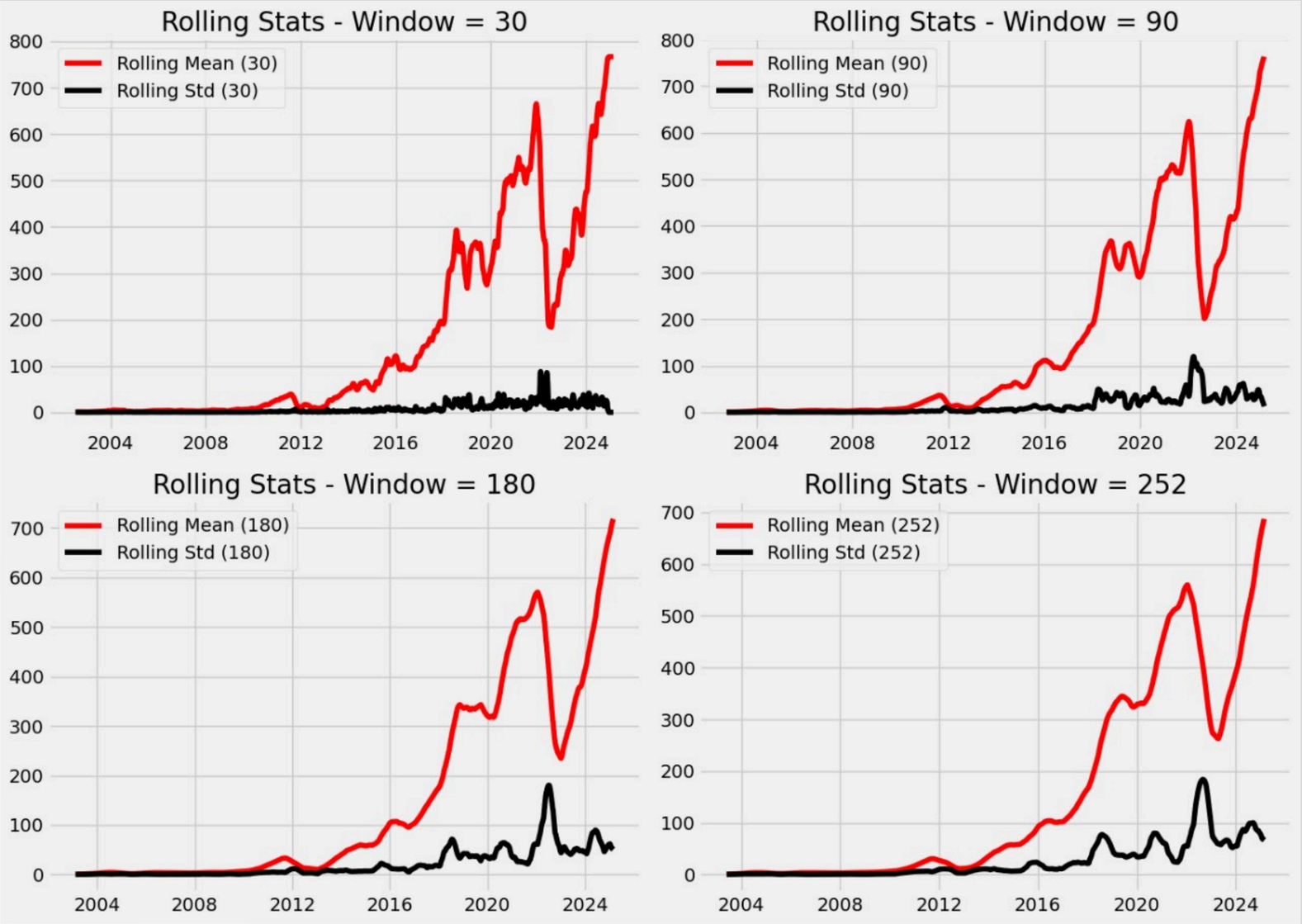
- Many Outliers on the upper side
- Skewed distribution
- IQR: Fairly large, extending up to ~$300–$350. This tells us that prices rose significantly over time.

Handling outliers

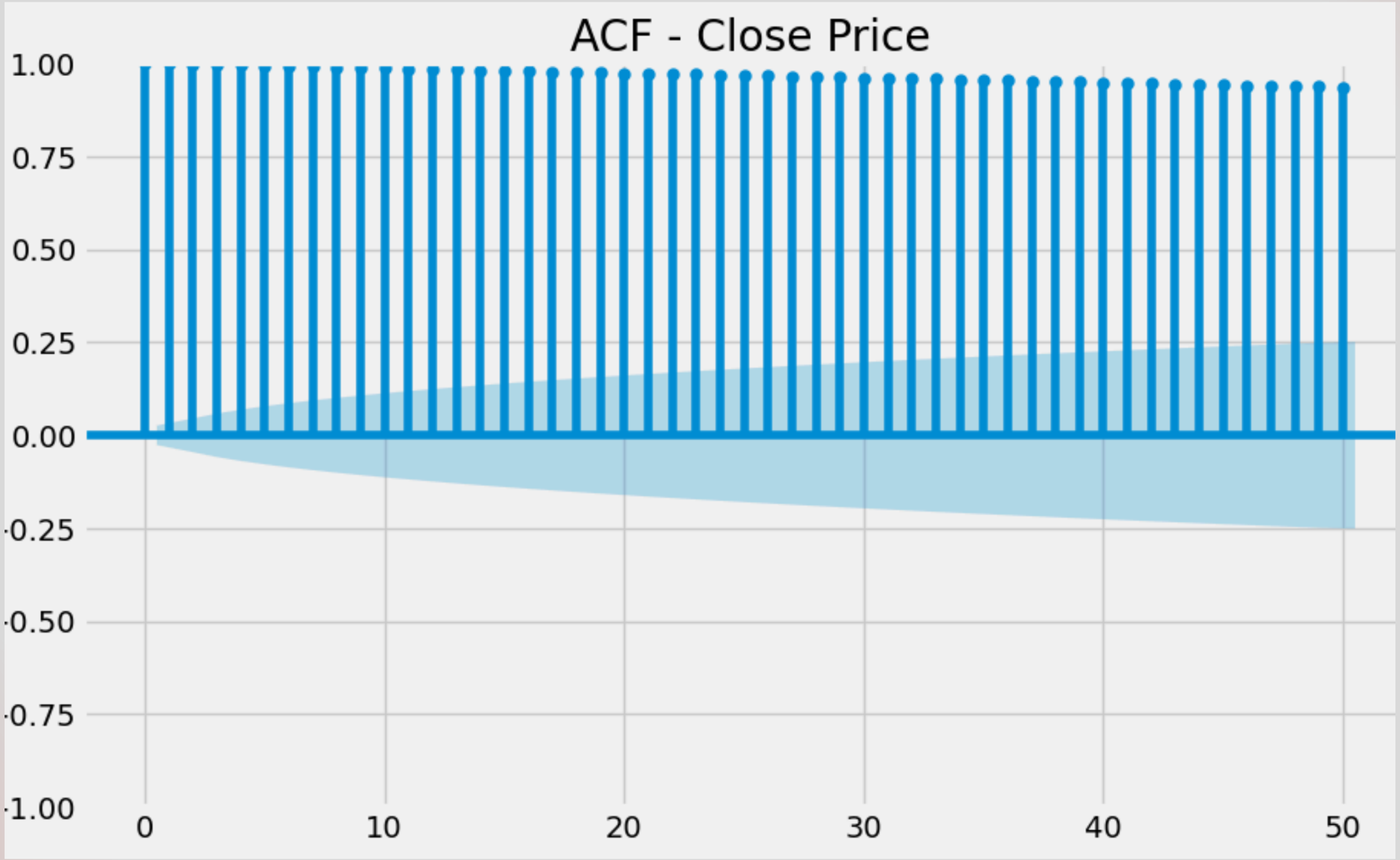
- Why Remove Outliers?
- Outliers can skew analysis and model training Especially important in time series forecasting to improve model accuracy
- Method Used: Interquartile Range (IQR)
- IQR = Q3 − Q1 (spread of the middle 50% of data)
- Outliers are defined as data points outside the range: [Q1−1.5×IQR, Q3+1.5×IQR]
- Result: Retained only data points within the acceptable range



Checking Stationarity



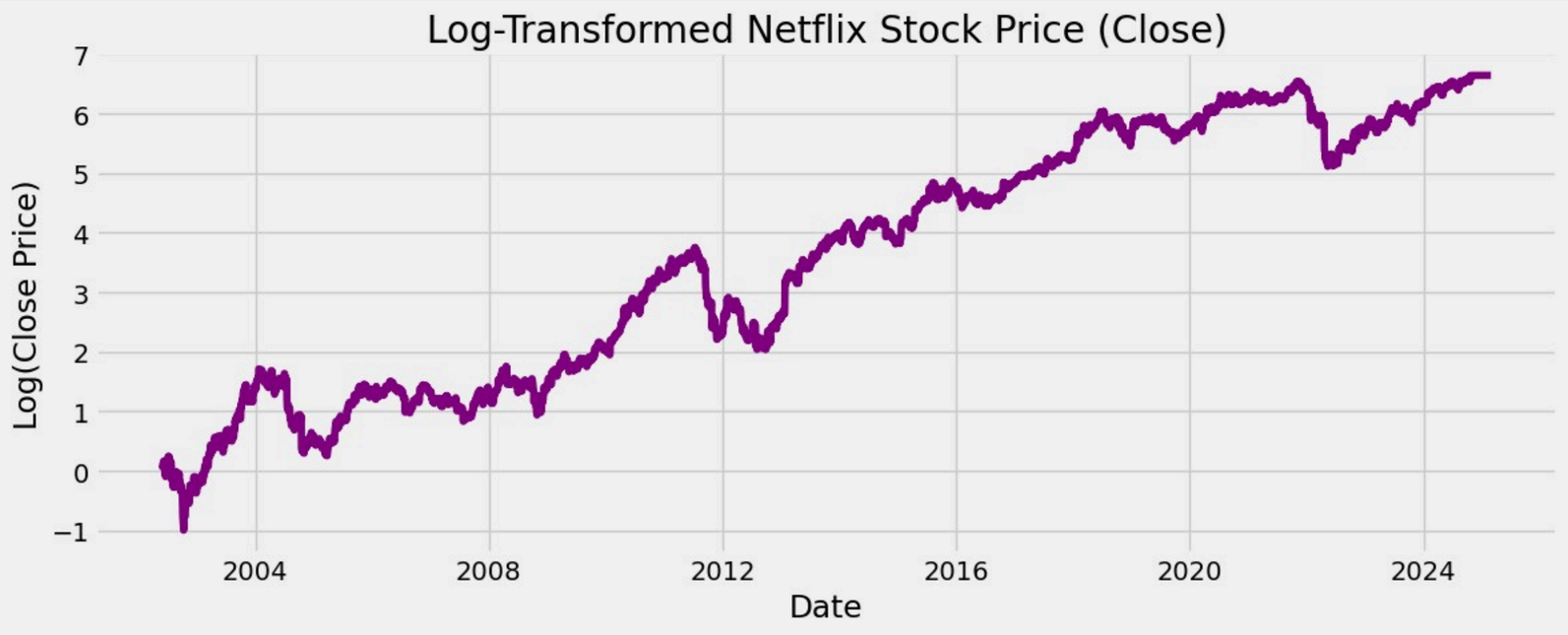
ACF plot


ACF - Close Price
1.00
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00
0
10
20
30
40
50

Transformation

1. Log transformation (Stabilizes variance)

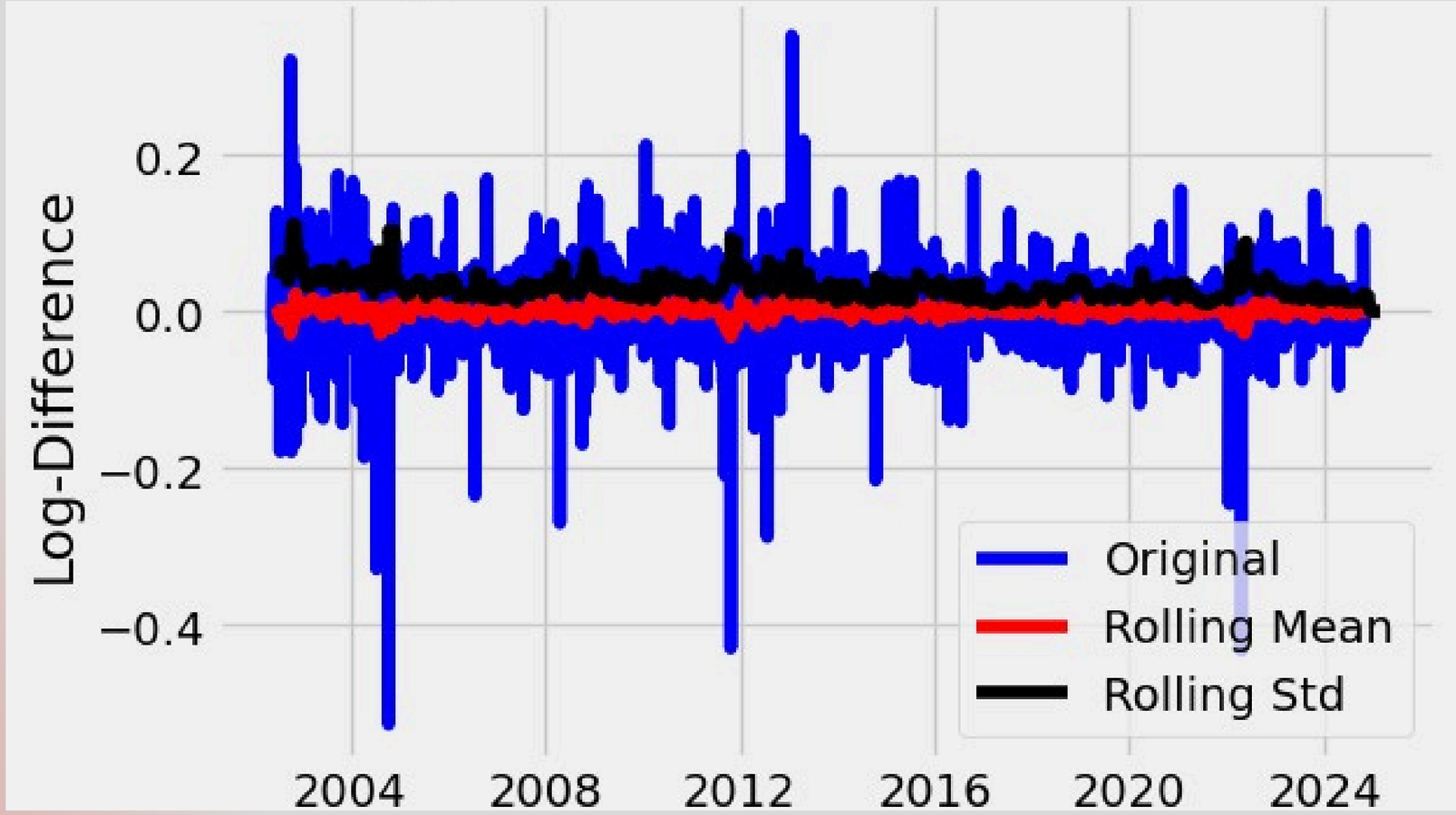
   $Y_t = \log(X_t)$



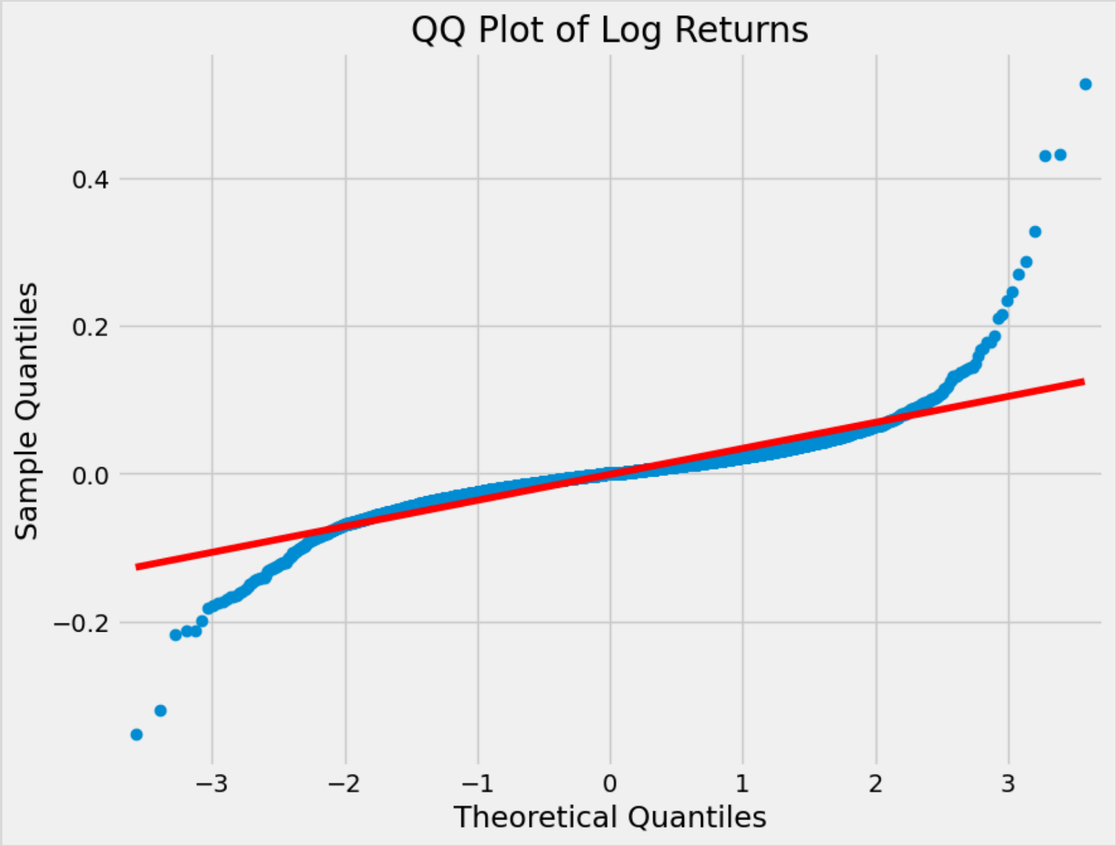
More visually clear upward trend

Transformation

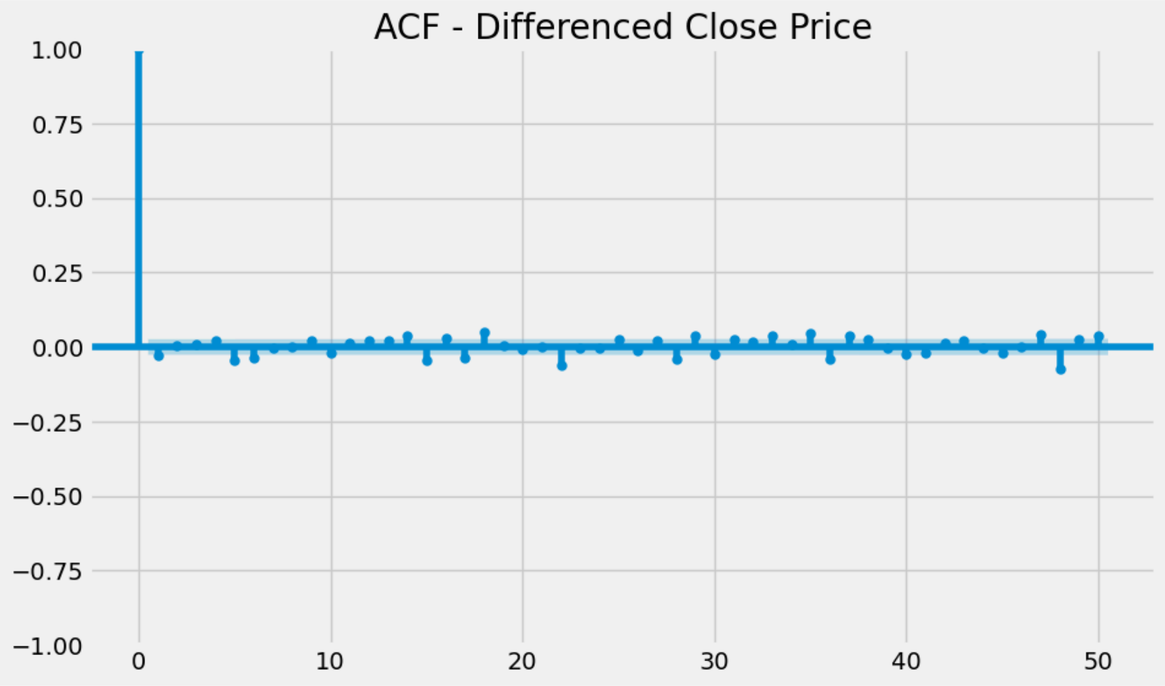
2. Differencing
   - Removes trend (1st order differencing)
   - Transformed series = $Y_t - Y_{t-1} = \log(X_t) - \log(X_{t-1}) = r_t$



QQ plots


QQ Plot of Log Returns
Sample Quantiles
Theoretical Quantiles
0.4
0.2
0.0
−0.2
−3
−2
−1
0
1
2
3

ACF plot of detrended closed price



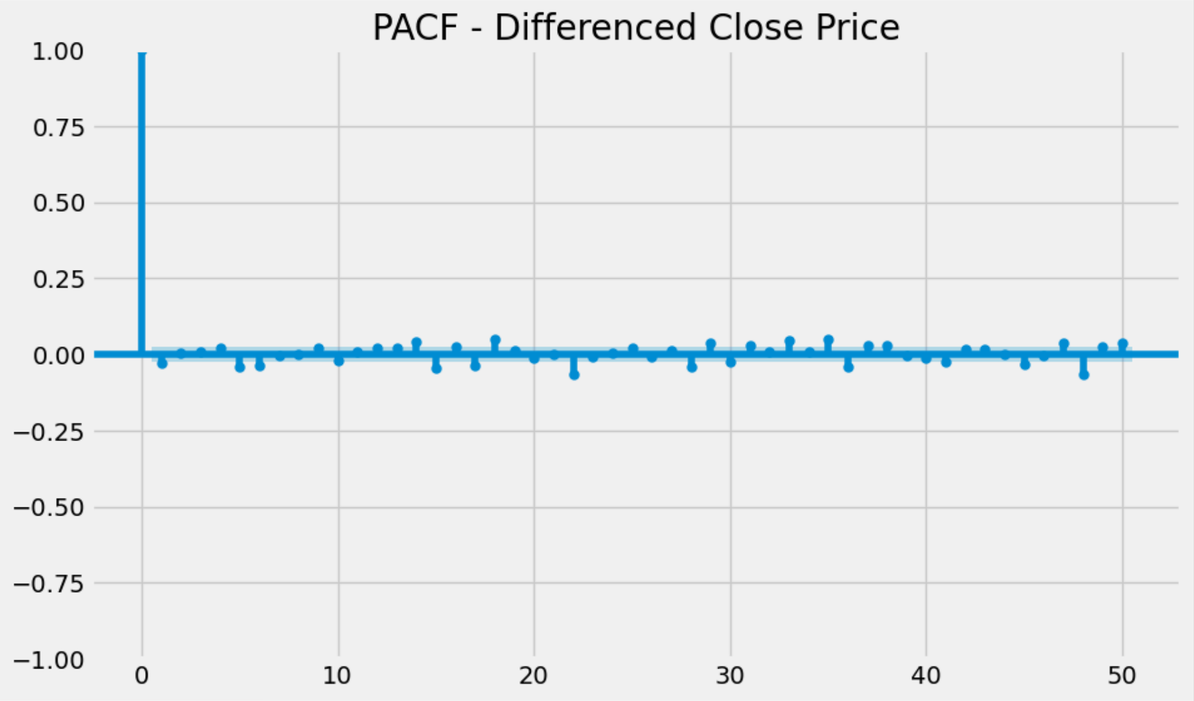
Lag 0

- Shows a value of 1.0 — expected, as a series is perfectly correlated with itself.
- It show sinusoidal pattern lags which means only MA model will not work. We need to include AR.

Result of Transformation

- The transformation has effectively removed trend and seasonality.
- White noise like behaviour

PACF plot of detrended closed price



- PACF tells us the direct correlation between the current value and value B lags behind, removing the effects of intermediate lags.

Model Selection

```
ARIMA(p=9, d=1, q=3) AIC: -19233.72
ARIMA(p=9, d=1, q=4) AIC: -19236.74
ARIMA(p=9, d=1, q=5) AIC: -19236.63
ARIMA(p=9, d=1, q=6) AIC: -19227.60
ARIMA(p=9, d=1, q=7) AIC: -19227.86
ARIMA(p=9, d=1, q=8) AIC: -19227.61
ARIMA(p=9, d=1, q=9) AIC: -19228.60

Best ARIMA Model: ARIMA(1, 1, 1)
Best AIC: -19245.77
```

- Ran a manual search (grid) over ARIMA(p,1,q) based on AIC values.
- The model with the lowest AIC is ARIMA(1,1,1)


THANK
YOU.