Final Project: Milestone 2

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Crypto-Currency and Stock Data

```
## Warning: BTC-USD contains missing values. Some functions will not work if
## objects contain missing values in the middle of the series. Consider using
## na.omit(), na.approx(), na.fill(), etc to remove or replace them.


## Warning: ETH-USD contains missing values. Some functions will not work if
## objects contain missing values in the middle of the series. Consider using
## na.omit(), na.approx(), na.fill(), etc to remove or replace them.


## Warning: ADA-USD contains missing values. Some functions will not work if
## objects contain missing values in the middle of the series. Consider using
## na.omit(), na.approx(), na.fill(), etc to remove or replace them.


## [1] "RIOT"    "COIN"    "HOOD"    "BTC-USD" "ETH-USD" "ADA-USD"


##      Index           RIOT.Adjusted
##  Min.   :2016-10-03  Min.   : 0.650
##  1st Qu.:2018-01-03  1st Qu.: 2.300
##  Median :2019-04-05  Median : 3.487
##  Mean   :2019-04-05  Mean   : 9.347
##  3rd Qu.:2020-07-07  3rd Qu.: 7.850
##  Max.   :2021-10-05  Max.   :77.900
```

Graphing the Time Series

Figure 1 shows the time series for Ethereum over the past 5 years. It appears to be a multiplicative, non-stationary time series with an exponential positive trend that has exploded most recently in 2021.

```
autoplot(data)
```

Figure 2, we can see the time series with a log transformation. It has transformed the exponential behavior into something more linear. There still remains a general increasing trend, and appears to be more additive.
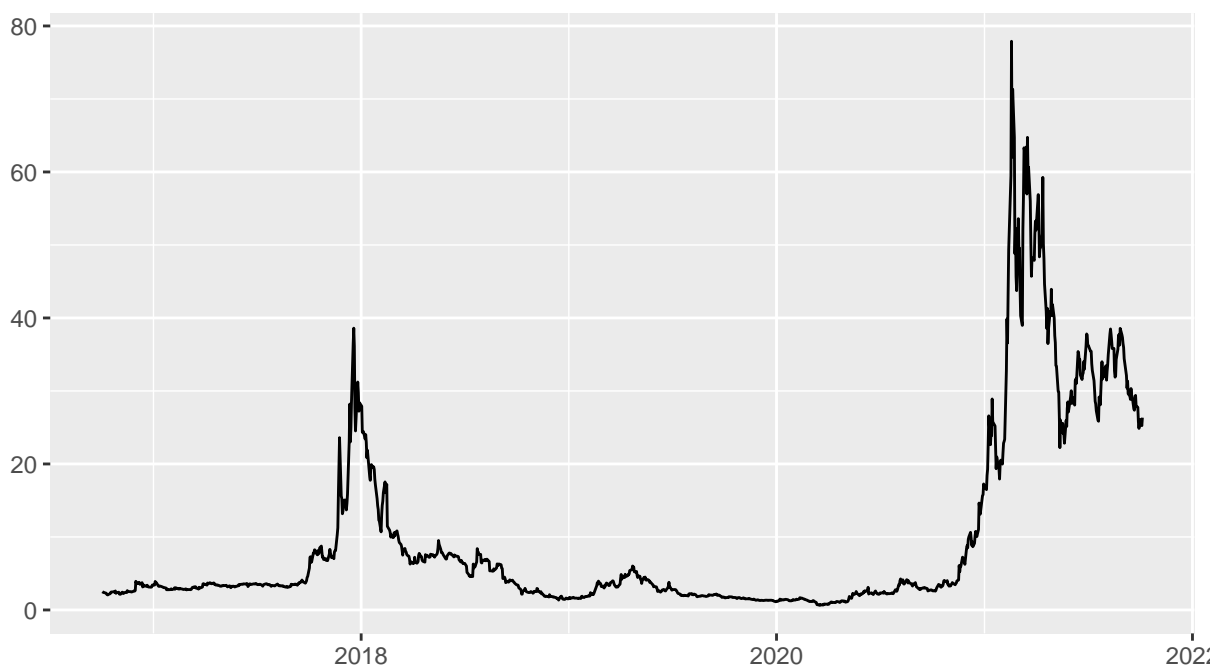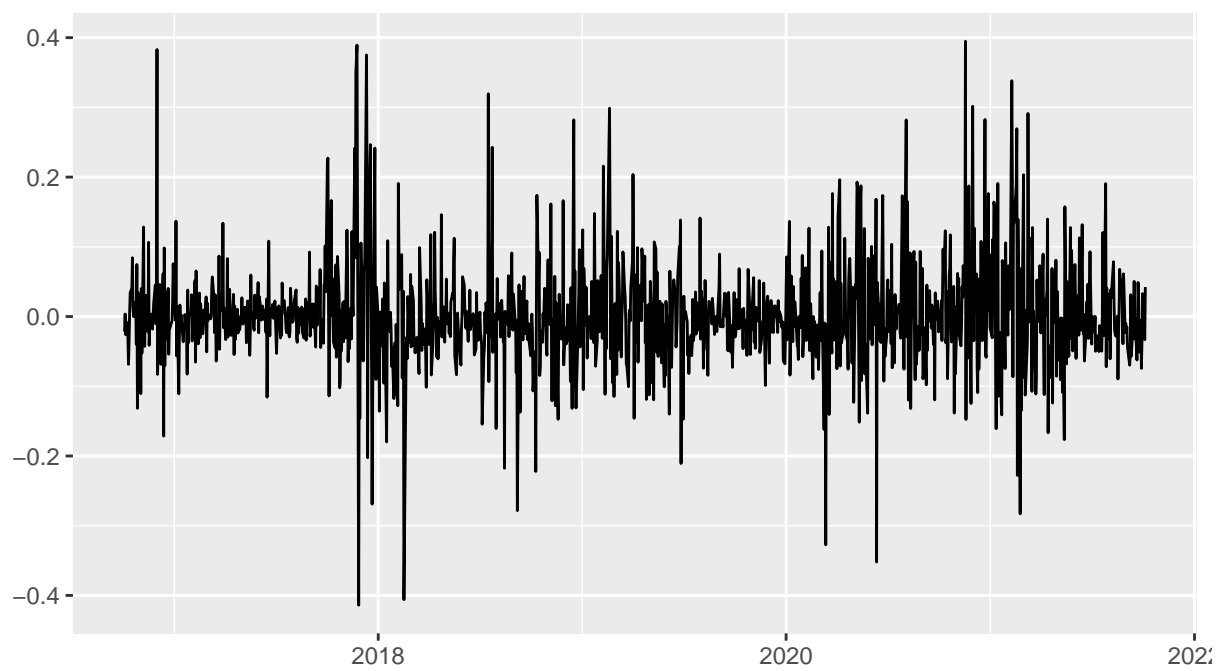
Figure 1

```
autoplot(log(data))
```

Figure 3, we can see the log returns. The plot shows general white noise with a few outliers in 2017 and 2020.
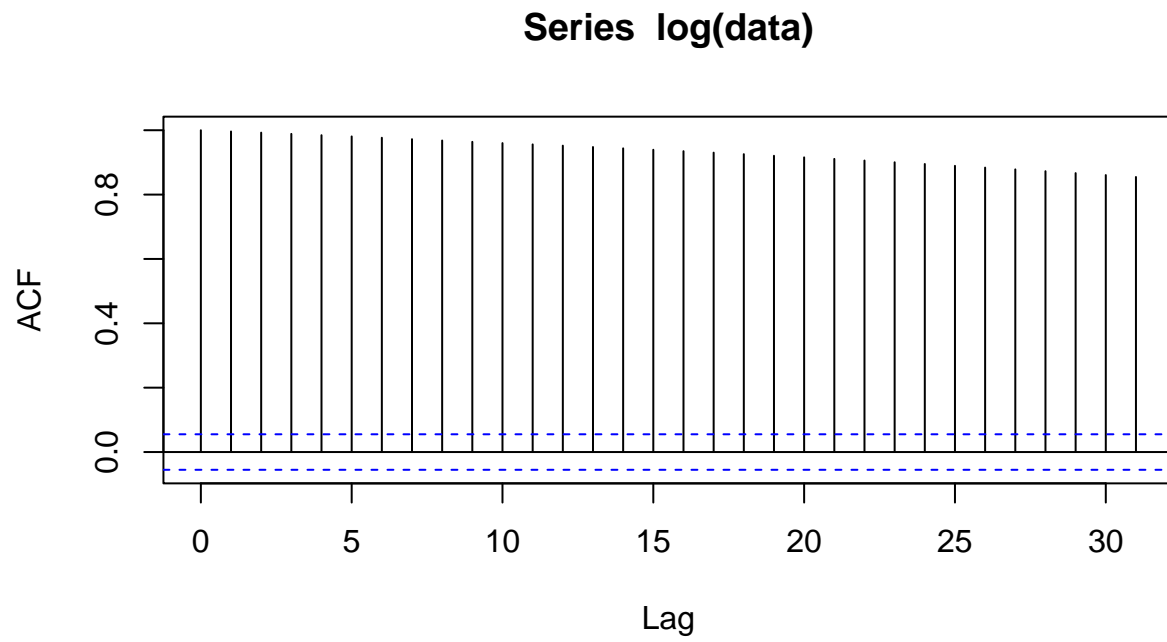
```
autoplot(diff(log(data)))
```

Figure 2

Figure 3

Auto-correlation

Figure 4 is the ACF plot. Auto-correlation has a strong presence in this time series. The ACF gradually decreases indicating a non-stationary series.

```
acf(log(data), na.action = na.pass)
```


Series log(data)

Figure 4

Ljung Box Test

This can be further confirmed by performing the Ljung Box test. At lag 1, the Ljung-Box p-value is close to zero. This indicates that at the 99% confidence, the null hypothesis is rejected and one can conclude that the series is not independently distributed and exhibit serial correlation.

```
Box.test(log(data), lag = 1, type = "Ljung-Box")
```

```
##
##  Box-Ljung test
##
## data:  log(data)
## X-squared = 1254.4, df = 1, p-value < 2.2e-16
```