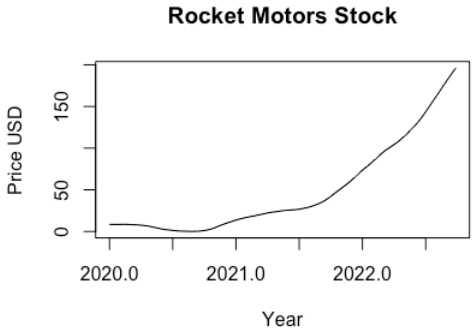
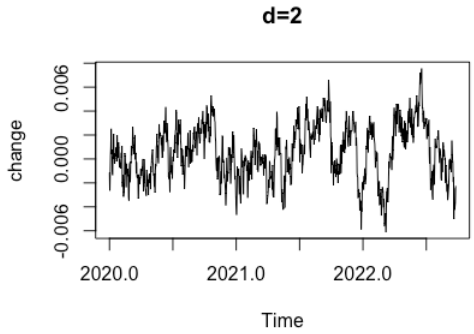
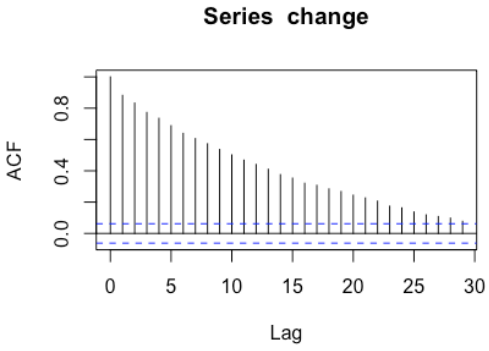
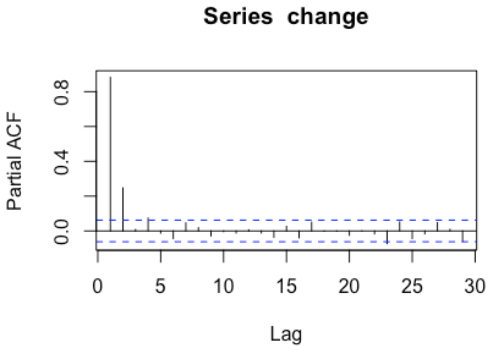
Luke Beebe
Extra Credit [Code is in R file]

1. To start the project, I created a time-series plot of Rocket Motors closing stock price. The first thing that stuck out to me was its rate of increase. It looks like an exponentially increasing series. I took the difference of consequential instances twice over to make it stationary. The plot below shows the difference of the difference (degree of differencing, d = 2) of Rock Motor's closing stock price.









2. In order to fit an ARIMA model to this data, I looked over the ACF and PACF charts of the stationary data. The ACF chart showed an exponential decline towards zero. The PACF showed three statistically significant spikes before hovering near zero. These two factors led me to choose p = 0 and q = 3. Above I reasoned why I chose d = 2.

3. The model equation I received from ARIMA(0,2,3) for Rocket Motors closing stock price is: $Y = 0.8565e_{t-1}+0.7081e_{t-2}+0.3223e_{t-3}$
However, curious to check my own work, I ran the data through auto.arima() to find out which parameters it recommends. It recommended ARIMA(3,2,3), which provided a smaller sigma^2 and an equation of:
$Y = -0.0505y_{t-1}+0.3119y_{t-2}+0.5983y_{t-3}+0.7074e_{t-1}+0.3866e_{t-2}-0.2218e_{t-3}$
(e=epsilon)

```
> auto.arima(Price)
Series: Price
ARIMA(3,2,3)

Coefficients:
          ar1     ar2     ar3     ma1     ma2      ma3
      -0.0505  0.3119  0.5983  0.7074  0.3866  -0.2218
s.e.   0.2754  0.1366  0.2778  0.2753  0.2245   0.0703

sigma^2 = 1.208e-06:  log likelihood = 5450.05
AIC=-10886.1   AICc=-10885.99   BIC=-10851.76
```