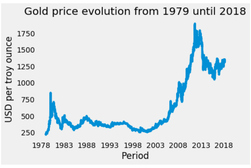
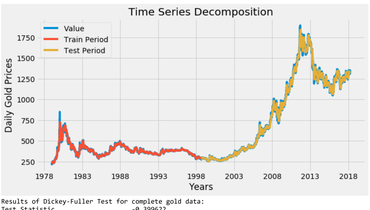
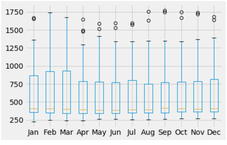
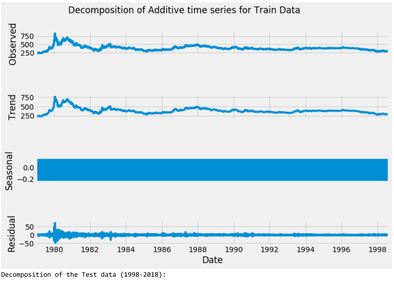
```
In [198]: %clear

In [199]: runfile('C:/Users/Tawanda Vera/Econ_Final_Project/Final_Project1.py',
wdir='C:/Users/Tawanda Vera/Econ_Final_Project')
gold.tail(5):                    Value
Date
2018-03-26  1352.40
2018-03-27  1341.45
2018-03-28  1332.45
2018-03-29  1323.85
2018-03-30  1323.85
Log of Gold price: [5.420535   5.42406857 5.38724358 ... 7.19477463 7.18829944 7.18829944]
beta, alpha: 0.9997459336163325 0.0014155602269276812
R-squared= 0.9995492634278497
p-value = 0.0
Forecast_gold 4 steps: 1321.6775540682704
Train:                 Value Month  Year
Date
1998-08-10  285.60   Aug  1998
1998-08-11  284.80   Aug  1998
1998-08-12  285.05   Aug  1998
1998-08-13  283.40   Aug  1998
1998-08-14  284.40   Aug  1998
Test:                  Value Month  Year
Date
1998-08-17  284.15   Aug  1998
1998-08-18  284.25   Aug  1998
1998-08-19  285.50   Aug  1998
1998-08-20  285.30   Aug  1998
1998-08-21  283.50   Aug  1998
```



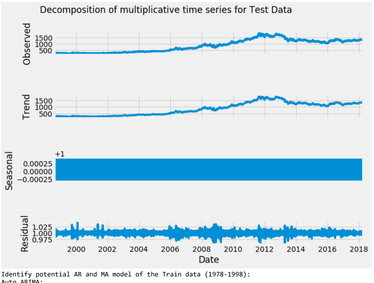



```
Results of Dickey-Fuller Test for complete gold data:
Test Statistic                  -0.399622
p-value                          0.910162
#lags Used                      39.000000
Number of Observations Used   10200.000000
Critical Value (1%)              -3.430991
Critical Value (5%)              -2.861823
Critical Value (10%)             -2.566921
dtype: float64
Results of Dickey-Fuller Test for Train Data:
Test Statistic                  -0.399622
p-value                          0.910162
#lags Used                      39.000000
Number of Observations Used   10200.000000
Critical Value (1%)              -3.430991
Critical Value (5%)              -2.861823
Critical Value (10%)             -2.566921
dtype: float64
Results of Dickey-Fuller Test for Test Data:
Test Statistic                  -0.839689
p-value                          0.807210
#lags Used                      32.000000
Number of Observations Used    5087.000000
Critical Value (1%)              -3.431636
Critical Value (5%)              -2.862108
Critical Value (10%)             -2.567073
dtype: float64

 If the ADF p-values are higher or less negative compared to the       critical values of(1%)=
-3.43,(5%) = -2.86 and (10%) = -2.57.       Then, there is strong evidence to suggest that we
cannot reject the null       hypothesis (unit root).The results show that the Train period data is
stationary, while the Test Data is nonstationary
Seasonality of the Test data (1998-2018): AxesSubplot(0.08,0.07;0.87x0.81)
Decomposition of the Train data (1998-2018):
```

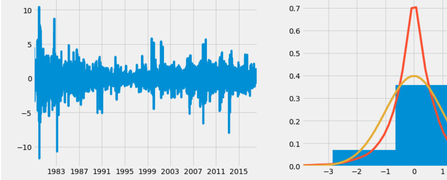


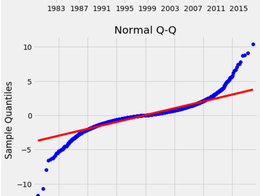


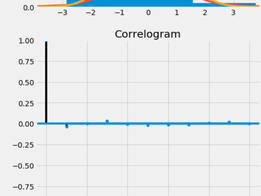

```
Decomposition of the Test data (1998-2018):
```

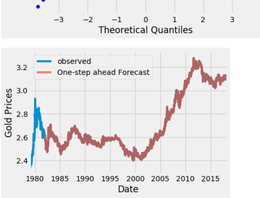



```
Identify potential AR and MA model of the Train data (1978-1998):
Auto.ARIMA:
Best SARIMAX(3, 1, 0)x(0, 0, 0, 11)12 model - AIC:-38415.35343964627
The model fit results:                                Statespace Model Results
==============================================================================================
Dep. Variable:                                Value   No. Observations:                10240
Model:               SARIMAX(0, 1, 0)x(1, 0, 0, 11)   Log Likelihood              39232.141
Date:                              Mon, 09 Apr 2018   AIC                        -78460.282
Time:                                      20:02:35   BIC                        -78445.813
Sample:                                  01-01-1979   HQIC                       -78455.390
                                       - 03-30-2018
Covariance Type:                                opg
==============================================================================
                 coef    std err          z      P>|z|      [0.025      0.975]
------------------------------------------------------------------------------
ar.S.L11      -0.0161      0.005     -3.285      0.001      -0.026      -0.006
sigma2      2.728e-05   1.41e-07    193.042      0.000    2.7e-05    2.76e-05
===================================================================================
Ljung-Box (Q):                      126.26   Jarque-Bera (JB):             67624.69
Prob(Q):                              0.00   Prob(JB):                         0.00
Heteroskedasticity (H):               0.58   Skew:                             0.04
Prob(H) (two-sided):                  0.00   Kurtosis:                        15.60
===================================================================================

Warnings:
[1] Covariance matrix calculated using the outer product of gradients (complex-step).
```










```
The Mean Squared Error of our forecasts is 0.0
x takes the value of the forecasted gold price for any day between       1 and 11
1323.682514113883

In [200]:
```