**R Exercise**

***Due Date: 11:59pm, Monday April 27, 2020.***

1. **Obtaining and Transforming the Data:**
2. Download daily and monthly adjusted closing prices for 12 years for the same company you used for the first team project (Recall that each team member had to choose a company for the team project that you submitted before Baruch was closed).
3. Annualize the daily data. ***See pages 2 – 6 of your textbook.***
4. Annualize the Monthly data. ***See pages 2 – 6 of your textbook***.
5. Plot the daily prices versus time (days)
6. Plot the annualized prices (obtained from daily prices) versus time (years).
7. Plot the monthly prices versus time (months).
8. Plot the annualized prices (obtained from monthly prices) versus time (years).
9. Describe, Explain, Compare and Contrast.
10. **Calculating Simple and Logarithmic (Continuously Compounded) Returns:**

*Daily Simple and Logarithmic Returns:*

1. Calculate (simple) returns as percentage changes in **daily** prices. ***See pages 2 – 6 of your textbook.*** [This is equal to (p(t) - p(t-1))/(p(t-1)].
2. Calculate **daily** logarithmic returns (continuously compounded). ***See pages 2 – 6 of your textbook.*** [This is equal to Ln((p(t)/(p(t-1))].

*Monthly Simple and Logarithmic Returns:*

1. Calculate (**simple**) returns as percentage changes in **monthly** prices.
2. Calculate **monthly** **logarithmic** returns (continuously compounded).
3. Describe, Explain, Compare and Contrast.
4. **Distributional Properties of Returns (See pages 20-27 of your textbook):**
5. Compute the moments for the continuously compounded (logarithmic) **daily** returns.
6. Do these **daily** logarithmic returns come from a normal distribution? Present JB test results.
7. Compute the moments for the continuously compounded (logarithmic) **monthly** returns.
8. Do these **monthly** logarithmic returns come from a normal distribution? Present JB test results.
9. Describe, Explain, Compare and Contrast.
10. **Working with Autocorrelation Functions (See pages 40 – 50 of your textbook):**
11. Obtain and Plot the Autocorrelation Functions (acf) for **daily** percentage (simple) returns.
12. At the 95% Confidence Level, and using the **daily** percentage (**simple**) returns,
    1. Perform the Box Pierce and the Ljung-Box tests for autocorrelations.
    2. What are your conclusions?
13. Obtain and Plot the Autocorrelation Functions (acf) for **daily** **logarithmic** returns.
14. At the 95% Confidence Level, and using the **daily** **logarithmic** returns,
    1. Perform the Box Pierce and the Ljung-Box tests for autocorrelations.
    2. What are your conclusions?

1. Obtain and Plot the Autocorrelation Functions (acf) for **monthly** percentage (**simple**) returns.
2. At the 95% Confidence Level, and using the **monthly** percentage (**simple**) returns,
   1. Perform the Box Pierce and the Ljung-Box tests for autocorrelations.
   2. What are your conclusions?
3. Obtain and Plot the Autocorrelation Functions (acf) for **monthly** **logarithmic** returns.
4. At the 95% Confidence Level, and using the **monthly** **logarithmic** returns,
   1. Perform the Box Pierce and the Ljung-Box tests for autocorrelations.
   2. What are your conclusions?
5. ***What do your ACF analyses tell you about:*** 
   1. ***Stationarity of the individual time series of daily and monthly returns? EXPLAIN.***
   2. ***Efficient Market Hypothesis with respect to the time series of individual daily and monthly returns? EXPLAIN.***
   3. ***Are the daily and monthly returns “White Noise”? EXPLAIN.***

***Very Important:***

1. Absolute maximum of 2 pages in WORD for all the descriptive portions of Sections **A**, **B**, **C** and **D**.
2. All graphs, Charts, R results, etc, should NOT be part of the 2 pages!! They should be presented in an ***APPENDIX***.

**Theory Questions**

1. State and prove the 3 properties of an ARIMA(2,0,0). For credit, PLEASE show ***ALL*** the steps of your proof, ***EXACTLY*** as we did in class. No credit otherwise!
2. State and prove the 3 properties of an ARIMA(0,0,2). For credit, PLEASE show ***ALL*** the steps of your proof, ***EXACTLY*** as we did in class. No credit otherwise!

***Extra Credit:***

1. State and prove the 3 properties of an ARIMA(1,0,1). For credit, PLEASE show **ALL** the steps of your proof, ***EXACTLY*** as we did in class. No credit otherwise!