

FE570 Homework Assignment #1

Due Date: In class on September 18, 2018 (Tuesday).

Data File: Dataset is available from the course website on Canvas.

Assignment 1: Learn to use R Statistical Computing and Graphics Package. You can find and download the software at <http://www.r-project.org/>. We will use version R-3.0.1 or later.

For this assignment, you will download the simulation dataset generated during the class and create the following:

- (1) Compute log return: $r_t = \ln(p_t) - \ln(p_{t-1})$ where p_t is the price at time t and r_t is the log return at time t .
- (2) Compute summary statistics (mean, median, min, max, standard deviation, skewness, and excess kurtosis) for log return.
- (3) Obtain a density plot of the log returns (e.g. scatter plot and histogram).

Note that prices presented in the dataset is on tick-by-tick basis. Each tick is 0.2 second. For this assignment, you need to aggregate data onto 1 second and 1 minute scale (i.e. take average price for the interval). You will need to do the assignment for both 1 second and 1 minute time scale. Write brief comments about your observations on this E-Mini S&P 500 market. You need to submit your R source code (print only) at attachment to your submission.

Assignment 2: Contingent Convertible Bonds (CoCos) are convertible bonds issued by banks. Like all convertible bonds, CoCos generate a yield and have a strike price at which the bonds are convertible to company stock. Unlike a normal convertible, a CoCo only converts to a company's stock when its capital ratio trigger is hit, which is explained below. It's also important to

note the relative margin of safety a CoCo investment provides as compared to its associated stock, which is based on its superior position in the capital structure. Based on the article posted along with this assignment, please answer the following questions in your own words:

- (1) How are CoCos different from traditional convertible bonds, and why are they attractive to investors?
- (2) What are the major benefits to have banks issues CoCos? Please list at least two.

Assignment 3: Bitcoin originated with the white paper that was published in 2008 under the pseudonym "Satoshi Nakamoto". Bitcoin is one of the first digital currencies to use peer-to-peer technology to facilitate instant payments. Bitcoin offers the promise of lower transaction fees than traditional online payment mechanisms and is operated by a decentralized authority, unlike government-issued currencies. Based on the article posted along with this assignment, please answer the following questions in your own words:

- (1) Price volatility and scaling issues frequently raise concerns about the suitability of Bitcoin as a payment instrument. While scaling issues is a technical issue, can you please explain the reason for high Bitcoin volatility?
- (2) Based on the classification of financial assets from this class, how would you classify Bitcoin? Why?

Homework Honor Policy: You are allowed to discuss the problems between yourselves, but once you begin writing up your solution, you must do so independently, and cannot show one another any parts of your written solutions. The HW is to be pledged (that it adheres to this).