Instructions:
Be verbose. Explain clearly your reasoning, methods, and results in your written work. Write clear code that is well documented. With 99% certainty, you cannot write too many code comments.

Written answers are worth 8 points. Code is worth 2 points. 10 points total.

1. When finished, respond to the questions in Sakai as "done." We will record your grade there.
2. In your code repository, create a folder called "Week04."
3. In that folder, include
    a. a document (preferably a PDF) with your responses.
    b. Slides for presenting your results.
    c. All code
    d. A README file with instructions for us to run your code

Everything must be checked into your repository by 8am Saturday 2/5. A pull will be done at that time. Documents and code checked in after the instructors pull will not be graded.

Data for problems can be found in CSV files with this document in the class repository.

Problem 1
Calculate and compare the expected value and standard deviation of price at time t $\left(P_t\right)$, given each of the 3 types of price returns, assuming $r_t \sim N\left(0, \sigma^2\right)$. Simulate each return equation using $r_t \sim N\left(0, \sigma^2\right)$ and show the mean and standard deviation match your expectations.

Problem 2
Implement a function similar to the "return_calculate()" in this week's code. Allow the user to specify the method of return calculation.

Use DailyPrices.csv. Calculate the arithmetic returns for INTC. Remove the mean from the series so that the mean(INTC)=0

Calculate VaR
1. Using a normal distribution.
2. Using a normal distribution with an Exponentially Weighted variance ($\lambda = 0.94$)
3. Using a MLE fitted T distribution.
4. Using a Historic Simulation.

Compare the 4 values. Look at the empirical distribution of returns, in sample.

Download from Yahoo! Finance the prices since the end of the data in the CSV file (about 2 weeks). Look the empirical distribution of returns, out of sample.

Discuss the ability of these models to describe the risk in this stock.

Problem 3
Using Portfolio.csv and DailyPrices.csv. Assume the expected return on all stocks is 0.

This file contains the stock holdings of 3 portfolios. You own each of these portfolios. Calculate the VaR of each portfolio as well as your total VaR (VaR of the total holdings).

Discuss your methods, why you chose those methods, and your results.