**FINN 6216 Homework Assignment #4**

**Same rules as for previous assignments**

1. Suppose we create a normal mixture model of the formand in this case is *exponential***,** that is, for Assume that and that and is a nonsingular d x d matrix. Is an elliptical distribution? If it is and tell me what the dispersion matrix and the characteristic generator are.
2. Do problem (1), but now assume that (I am using instead of because I don’t want to confuse it with the function). This would yield a Symmetric Generalized Hyperbolic distribution.
3. Recover the last year’s price data for the following 10 stocks: F, GM, IBM, MSFT, AAPL, AMZN, SPY, XOM, PFE, BA. Use February 2, 2018 as the most recent business day. Assume that you have a long position of $1,000,000 worth of shares in each of these stocks. Use the last year’s price data to compute 251 historical price shifts, using the relative shift method as covered in the first class. Compute the sample covariance matrix. Now use Principal Components Analysis to tell me the top two risk factors of this position (You should find an eigenvalue/eigenvector routine in Matlab or some other package). What *percent of variability* is accounted for by these two factors? Compute 99% historical VaR of your position using just these two factors, and also by using all 10 stocks, and compare.
4. Consider the data for SPY and AAPL from Homework #1. Use the iterative algorithm we discussed in class to estimate the location vector (means) and dispersion matrix (covariance), assuming that this data follows an elliptical distribution. But does it really? Check whether it does by computing for a reasonable sequence of increasing values of where are the absolute shifts of AAPL and SPY, respectively.

**This homework assignment is due Thursday, February 15.**