Assignment 3-4

1. You have a portfolio of $1,000,000 of stock all in XLE which is an energy ETF. What is the 1% one day Value at Risk for this portfolio on Monday Jan 20, 2020? Use the attached dataset. Hint(the EViews function to calculate the 1% quantile of y is @quantile(y,.01)).

a) Using the quantile from one year history it is?

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b) Using the quantile from the full data set it is?

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c) Using the normality assumption and a GARCH(1,1) model, it is?

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d) Using the GJR-GARCH model model with normality, it is?

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e) Using the GJR-GARCH model with bootstrapped residuals, it is?

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2. Which asymmetric form of ARCH model works best for SPY, (an ETF for sp500) in the attached data set?

a) Compare GJR-GARCH and EGARCH with GARCH using the Schwarz criterion.

b) Can you find something even better?

c) Describe the strength of the asymmetry in SP as compared with XLE.

3. Go to V-LAB and

A. find the volatility forecasts *one day* and *one year* ahead for the following assets using the GJR-GARCH model:

a) S&P500
b) Merval, the Argentina Stock Index
c) Barclays Aggregate Government Bond Index
d) Coca Cola
e) MBIA
f) Ruble Exchange rate
g) Cohen and Steers Realty Majors Index

B. Are any of these out of line with your expectations from class? If so, can you say why?

4. If the government introduced a policy that was widely viewed as being able to reduce the future uncertainty in the stock market by requiring more transparency in accounting

principles, what effect would this have on stock prices today? Relate this to the asymmetric volatility effect.

5. Using the attached data on the VIX and SPY.

a) Plot the VIX and annualized GJR-GARCH volatilities to see whether there is a bias. What are two explanations for this bias?

b) Plot the histogram of the bias. What is the interpretation of the mean?

c) Find the correlation between the log changes in VIX and the log changes in SP500.

d) Describe whether this is consistent with an Asymmetric Volatility model.

e) Describe whether this correlation violates the Efficient Market Hypothesis.

f) Regress SPY returns on lagged VIX squared. Assume the errors are GJR-GARCH. What is the interpretation of this regression?

6. If you are long a 1 month variance swap on a market index,

a) What will happen to your position on a day of large absolute returns?

b) How will index option implied volatility change following a large positive return or a large negative return?

c) Do you think variance swaps will respond differently to positive and negative returns? Why?

7. Compute the log change in the VIX.

a) Does this show autocorrelation?

b) Does this have volatility clustering?

c) Build a model for the volatility of the vix that incorporates both these features. This is a model of the volatility of volatility.