Stat 349 Spring 2020 Final Take-home Exam Instructions

Zhengjun Zhang
Department of Statistics
University of Wisconsin-Madison, WI 53706

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There are two options for a student to choose her/his preferred final take-home exam. The answers are due on May 4, 2020 at 9:45 AM electronically in a PDF file on CANVAS.

Please only submit your answers for one option. If answers are submitted for more than one option, only the first pages correspond to any particular option will be graded.

Option 1

This option is a continuing of Midterm 2.

Things to do:

1. For the ith stock data, compute the daily return $r_{it} = \log \frac{P_{it}}{P_{i,t-1}}$ from 01/01/2005 to 03/21/2020, where P_{it} is the closing price at day t of Stock i, $i = 1, 2, \ldots, 10$. Note in Midterm 2, you used longer data, and the returns were negative returns.

2. Run the codes on the last page of the slides.

3. Identify and report your final model GARCH(p, q), i.e., give p =?, q =?, and the estimated parameter values and corresponding standard errors (use summary(mpq) to get the values). The criterion is the final chosen model having the smallest sum of squared residuals (use mpq$res to get residuals ϵ_{it}).

4. Suppose $c_1, c_2, \ldots, c_{10}$ are nonnegative values such that $c_1 + c_2 + \cdots + c_{10} = 1$. Define

$$r_t(c_1, c_2, \ldots, c_{10}) = c_1 r_{1t} + c_2 r_{2t} + \cdots + c_{10} r_{10,t}. \tag{0.1}$$

$$r_t^{\epsilon}(c_1, c_2, \ldots, c_{10}) = c_1 \epsilon_{1t} + c_2 \epsilon_{2t} + \cdots + c_{10} \epsilon_{10,t}. \tag{0.2}$$

$$r_t^p(c_1, c_2, \ldots, c_{10}) = \log \frac{c_1 P_{1t} + c_2 P_{2t} + \cdots + c_{10} P_{10,t}}{c_1 P_{1,t-1} + c_2 P_{2,t-1} + \cdots + c_{10} P_{10,t-1}}. \tag{0.3}$$

5. When $(c_1, c_2, \ldots, c_{10}) = (1/10, 1/10, \ldots, 1/10)$, compute the sample mean $mean(1/10, 1/10, \ldots, 1/10)$ and sample standard deviation $std(1/10, 1/10, \ldots, 1/10)$ of r_t. Find the best $(c_1, c_2, \ldots, c_{10})$ such that the sample mean $mean(c_1, c_2, \ldots, c_{10})$ of $r_t(c_1, c_2, \ldots, c_{10})$ is maximized, but $std(c_1, c_2, \ldots, c_{10}) <= std(1/10, 1/10, \ldots, 1/10)$.

6. Do the same computation for $r_t^r(c_1, c_2, \ldots, c_{10})$ in Step 5.

7. Do the same computation for $r_t^p(c_1, c_2, \ldots, c_{10})$ in Step 5.

8. For $(c_1, c_2, \ldots, c_{10}) = (1/10, 1/10, \ldots, 1/10)$ in Step 7, do Step 2 and Step 3 to get $\epsilon_t(1/10, 1/10, \ldots, 1/10)$. Compute the sample mean $mean(1/10, 1/10, \ldots, 1/10)$ and sample standard deviation $std(1/10, 1/10, \ldots, 1/10)$ of $\epsilon_t(1/10, 1/10, \ldots, 1/10)$.

9. For the best $(c_1, c_2, \ldots, c_{10})$ in Step 7, do Step 2 and Step 3 to get $\epsilon_t(c_1, c_2, \ldots, c_{10})$. Compute the sample mean $mean(c_1, c_2, \ldots, c_{10})$ and sample standard deviation $std(c_1, c_2, \ldots, c_{10})$ of $\epsilon_t(c_1, c_2, \ldots, c_{10})$.

10. Compare the results of the best $(c_1, c_2, \ldots, c_{10})$ and mean values. Also report any problems you may find in your computation.

Option 2

Things to do:

1. Download 100 stock datasets from 01/01/2005 to 03/21/2020 up to your own preference from global financial market.

2. Complete an analysis as presented in the class using AcF model.

3. The AcF paper can be downloaded from https://doi.org/10.1016/j.jeconom.2018.07.004. You may need to use UW VPN and library service. If you decide to do this option, you will need to submit your data to CANVAS. I can then provide you the basic R code for maximum likelihood computation.