**Work in teams of 2 people. Use the Workhop4-ch4.xlsx file.**

**Calibrate the models using data from** **June 4, 2007 to August 29, 2008. To compute VaR and the breaches, assume that you are long 1 unit of the IPC index.**

Do exercise 1 of chapter 4. Use initial variance of 0.0004. Calibrate the GARCH (1,1) model with variance targeting and report the following

* 1. Sample variance for the period June 4, 2007 to August 29, 2008
  2. Alpha
  3. Beta
  4. Loglikelihood
  5. What is the 1-day 1% VaR assuming normality for October 22, 2008

Use the initial values from the previous question and calibrate the GARCH (1,1) model for α, β, and ω. Report the following numbers for the estimation of the 3 parameters

* 1. Alpha
  2. Beta
  3. Omega
  4. Loglikelihood (without the π term)
  5. Log likelihood ratio test between the model with 3 and 2 parameters.
  6. Is the model with 3 parameters better than the one with 2 parameters at the 99%? (YES=1, NO=0)
  7. What is the 1-day 1% VaR assuming normality for October 22, 2008

1. Do exercise 2 of chapter 4 with leverage effect. Use initial variance of 0.0004. Use initial values from the previous question. Report the following parameters:
   1. Alpha
   2. Beta
   3. Omega
   4. Theta
   5. Loglikelihood (without the π term)
   6. Log likelihood ratio test between the models with 4 and 2 (Q1) parameters.
   7. Is this model with 4 parameters better than the one of Q1 with 2 parameters at the 99%? (YES=1, NO=0)
   8. Log likelihood ratio test between the models with 4 and 3 (Q1) parameters.
   9. Is this model with 4 parameters better than the one of Q1 with 3 parameters at the 99%? (YES=1, NO=0)
   10. What is the average autocorrelation of R2/σ2 from lag 1 to lag 10 using all data available
   11. Does the autocorrelation for lag 1 to 10 look like the one in the book? (YES=1, NO=0)
   12. What is the 1-day 1% VaR assuming normality for October 22, 2008
2. Do exercise 3 of chapter 4 with leverage effect and the implied volatility VIMEX index. Use initial variance of 0.0004. Use initial values from the previous question. Report the following parameters:
   1. Alpha
   2. Beta
   3. Omega
   4. Theta
   5. Gamma
   6. Loglikelihood (without the π term)
   7. Log likelihood ratio test between the models with 5 and 2 (Q1) parameters.
   8. Is this model with 5 parameters better than the one of Q1 with 2 parameters? (YES=1, NO=0)
   9. Log likelihood ratio test between the models with 5 and 3 (Q1) parameters.
   10. Is this model with 5 parameters better than the one of Q1 with 3 parameters? (YES=1, NO=0)
   11. Log likelihood ratio test between the models with 5 and 4 (Q2) parameters.
   12. Is this model with 5 parameters better than the one of Q2 with 4 parameters? (YES=1, NO=0)
   13. What is the average autocorrelation of R2/σ2 from lag 1 to lag 10 using all data available
   14. Does the autocorrelation for lag 1 to 10 look like the one in the book? (YES=1, NO=0)
   15. What is the 1-day 1% VaR assuming normality for October 22, 2008
3. Do exercise 4 of chapter 4 for the component GARCH model with 4 parameters. Use initial variances of 0.0004 for both process. Use initial values from the previous question. Report the following parameters:
   1. Alpha sigma
   2. Beta sigma
   3. Alpha v
   4. Beta b
   5. Loglikelihood (without the π term)
   6. Log likelihood ratio test between the models with 4 and 2 (Q1) parameters.
   7. Is this model with 4 parameters better than the one of Q1 with 2 parameters? (YES=1, NO=0)
   8. Log likelihood ratio test between the models with 4 and 3 (Q1) parameters.
   9. Is this model with 4 parameters better than the one of Q1 with 3 parameters? (YES=1, NO=0)
   10. Log likelihood ratio test between the models with 4 and 5 (Q3) parameters.
   11. Is this model with 4 parameters better than the one of Q3 with 5 parameters? (YES=1, NO=0)
   12. What is the average autocorrelation of R2/σ2 from lag 1 to lag 10 using all data available?
   13. Does the autocorrelation for lag 1 to 10 look like the one in the book? (YES=1, NO=0)
   14. What is the 1-day 1% VaR assuming normality for October 22, 2008
4. Repeat question 3 but add an indicator function the takes the value of 1 if it’s Monday and zero otherwise. Use initial values from the previous question.
   1. Alpha
   2. Beta
   3. Omega
   4. Theta
   5. Gamma
   6. Parameter for the indicator function
   7. Loglikelihood (without the π term)
   8. Log likelihood ratio test between the models with 6 and 5 (Q3) parameters.
   9. Is this model with 6 parameters better than the one of Q3 with 5 parameters? (YES=1, NO=0)
5. Compute the QLIKE function (sum of individual QLIKES) for the month of September 2008
   1. GARCH with 2 parameters from Q1 and report the QLIKE total
   2. GARCH with 3 parameters from Q1 and report the QLIKE total
   3. GARCH with 4 parameters from Q2 and report the QLIKE total
   4. GARCH with 5 parameters from Q3 and report the QLIKE total
   5. GARCH with 6 parameters from Q5 and report the QLIKE total
6. How many breaches are there between September and December 2008 for
   1. GARCH with 2 parameters from Q1
   2. GARCH with 3 parameters from Q1
   3. GARCH with 4 parameters from Q2
   4. GARCH with 5 parameters from Q3
   5. GARCH with 6 parameters from Q5