

Assignment of Session 2:

1. Suppose that the parameters in a GARCH (1,1) model are $\alpha = .05$, $\beta = .92$ and $\omega = .000003$
 - a) What is the long-run average volatility?
 - b) If the current volatility is 2% per day, what is your estimate of the volatility in 20, 40, and 60 days?
 - c) Suppose that there is an event that increases the current volatility by 0.5 percentage points to 2.5% per day. Estimate the effect on your forecasted volatility in 20, 40, and 60 days.

2. (Two Spreadsheets Provided)

In the file “HW2Q2Example_GARCHCALCSS&P500.xls”, the maximum likelihood estimation of *parameters in the EWMA and GARCH (1,1) model is illustrated using S&P500 data between July 15, 2005 and August 13, 2010.*

Download the file “HW2Q2_EURUSDExchangerates.xls”. Estimate parameters for the EWMA and GARCH (1,1) model on the euro-USD exchange rate data between July 27, 2005, and July 27, 2010.

3. Suppose that a bank has made a large number of loans of a certain type. The one-year probability of default on each loan is 2%. The bank uses a Gaussian copula for time to default. It is interested in estimating a “99.9% worst case” for the percentage of loans that default on the portfolio. Construct a table to show how this varies with the copula correlation.

4. (One Spreadsheet Provided)

The file “HW2Q4Example_DefaultRates4e.xls” shows the default rate for all rated companies between 1970 and 2013. The procedure for calculating maximum likelihood estimates for PD and ρ of the Vasicek model is also illustrated using this data.

Suppose the default rates in the last 15 years for a certain category of loans is 2%, 4%, 7%, 12%, 6%, 5%, 8%, 14%, 10%, 2%, 3%, 2%, 6%, 7%, 9%. Use the maximum likelihood method to calculate the best fit values of the parameters in Vasicek’s model. What is the probability distribution of the default rate? What is the 99.9% worst case default rate?