SF2943: Application of the GARCH model Guide to the Quantlab workspace

This document is intended to assist you with the Quantlab workspace used in the assignment on forward rates, providing short descriptions of the different parameters and data fields. Figure 1 shows a screen shot of the workspace as it looks when you open it the for the first time. Note the three tabs in the workspace, "pre-estimate", "garch_fit", "forecast", visible in the upper left hand side in Figure 1. You will start the exercise in the "pre-estimate" tab. In the



Figure 1: Your first view of the workspace, the tab "pre-estimate".

"price process" window your underlying price process, selected in field i, will be plotted if you click "Recalc". As default, field i is set to OMXS30_INDEX. The OMXS30 index is a weighted mean of the 30 most traded stocks on the Stockholm stock exchange. The fields from_d and to_d allows you to pick an interval of days {from_d, from_d + 1, ..., to_d}. Holidays and weekends are automatically removed from the interval. Note that the data series does not go further back than 2009-01-01. There is a useful syntax for selecting days, which is used in the default settings: "today" is the current date and "bd" is a business day, i.e. not a weekend or holiday. Typing the date in the format yyyy-mmdd is also allowed, but make sure it is a business day! The tab **q** determines what quotes are used, use the default: Mid_db. After a selection is made, clicking "Recalc" will update the table and the graphs. In the window "indata", select a price process and an interval of days as before. By clicking the button "Recalc", the log-returns of the selected price process will be plotted. The window "Table_series" presents the price data and log-returns in tabulated form.

Moving on to the "garch_fit" tab, this is where the model fitting and estimation of parameters will be done. The tab is presented in Figure 2 below. The fields



Figure 2: The tab "garch_fit".

i, from_d and to_d have the same functionality as in the previous tab and qs corresponds to q. The new fields q and p should be selected as integers and

correspond to p and q in the GARCH process,

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^p \alpha_i \sigma_{t-i}^2 + \sum_{j=1}^q \beta_j X_{t-j}^2, \quad X_t = \sigma_t Z_t, \quad Z_t \sim \mathcal{N}(0, 1).$$
(1)

You should be aware of that if your selected interval of days is very long, you might need to select p and q higher than 1 to get an estimate of the parameters! After clicking the "Recalc" button, Quantlab will do the estimation and present the result in the window "GARCH and NAIVE model param". The columns a0-1, a-1 and b-1 correspond to the parameters in (1) while mean and std is the empirical mean and standard deviation of the log-returns in your selected time interval.

In the "forecast" tab, you will compare the GARCH process with the naive volatility and the log-returns. A view of the tab is presented in Figure 3. All



Figure 3: The tab "forecast".

fields except window have the same function as in previous tabs. The window field allows you to select the number of data points for the rolling standard derivation. By clicking the "Recalc" button, you update the plot of the logreturns (green), GARCH process (red) and the rolling standard