

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 the GARCH model, 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” and “forecast” in the upper left hand side in Figure 1.

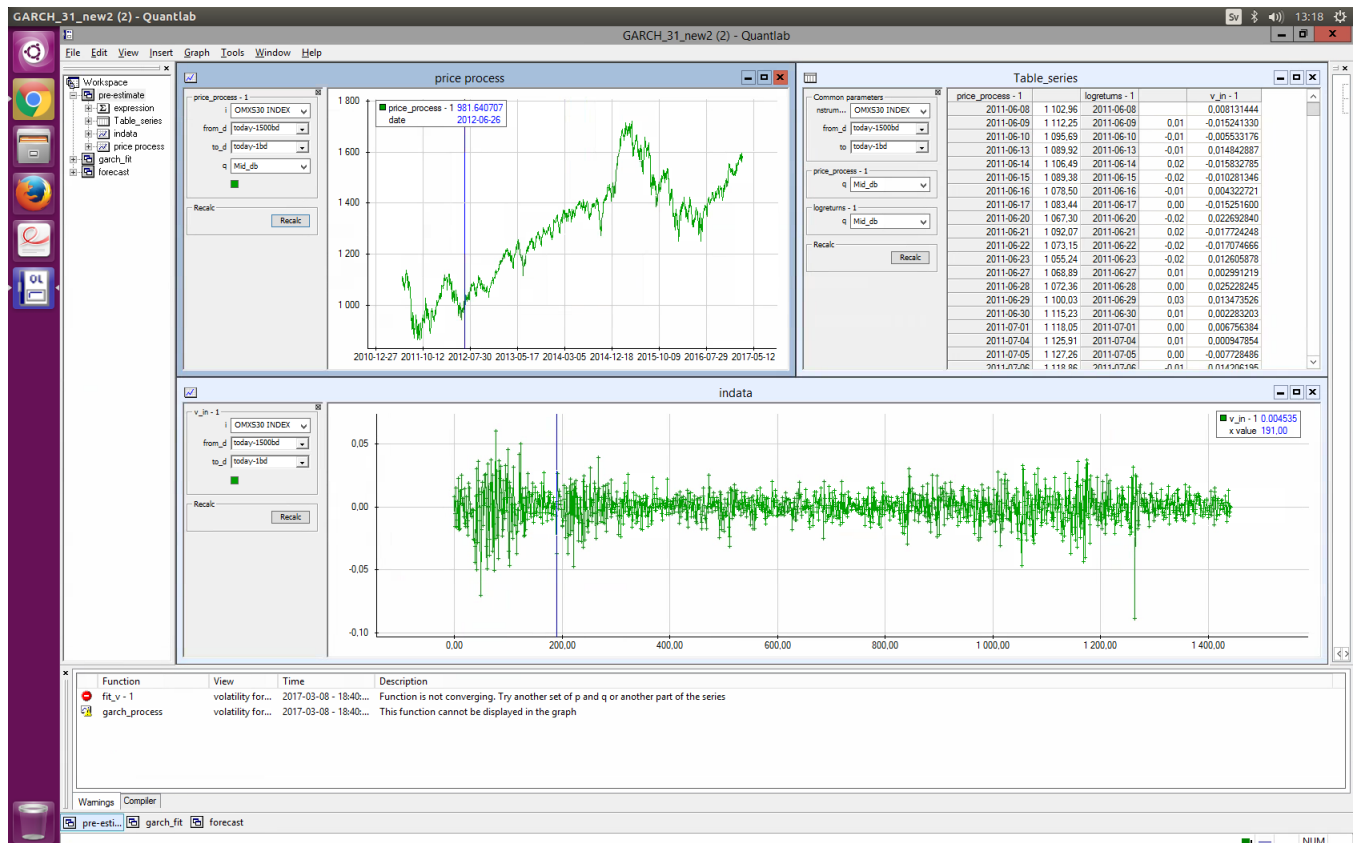


Figure 1: Your first view of the workspace, the tab “pre-estimate”.

The exercise in the “pre-estimate” tab. The “price process” graph shows the underlying price process, selected in field *i* (click “Recalc”!). As default, field *i* is set to OMXS30_INDEX. The OMXS30 index is a weighted mean of 30 stocks on the Stockholm stock exchange. The fields *from_d* and *to_d* allows you to pick a set of days: {*from_d*, *from_d* + 1, ..., *to_d*} (holidays and weekends are automatically removed). Note that the available data goes back only to 2009-

01-01. There is a useful syntax for selecting days: “today” refers to the current date and “bd” stands for business day, i.e. not a weekend or holiday. Specifying the date in the format yyyy-mm-dd is also possible. The tab q selects the price quote type, use the default: Mid_db. Clicking “Recalc” will update the table and the graphs. In the window “indata“, select the same price process and interval of days as above, then by clicking the button ”Recalc“ the log-returns are plotted. The window “Table_series” presents the price data and log-returns in tabulated form.

Model fitting and estimation of parameters is done in the tab “garch_fit”, see Figure 2. The fields i, from_d and to_d have the same functionality as in the

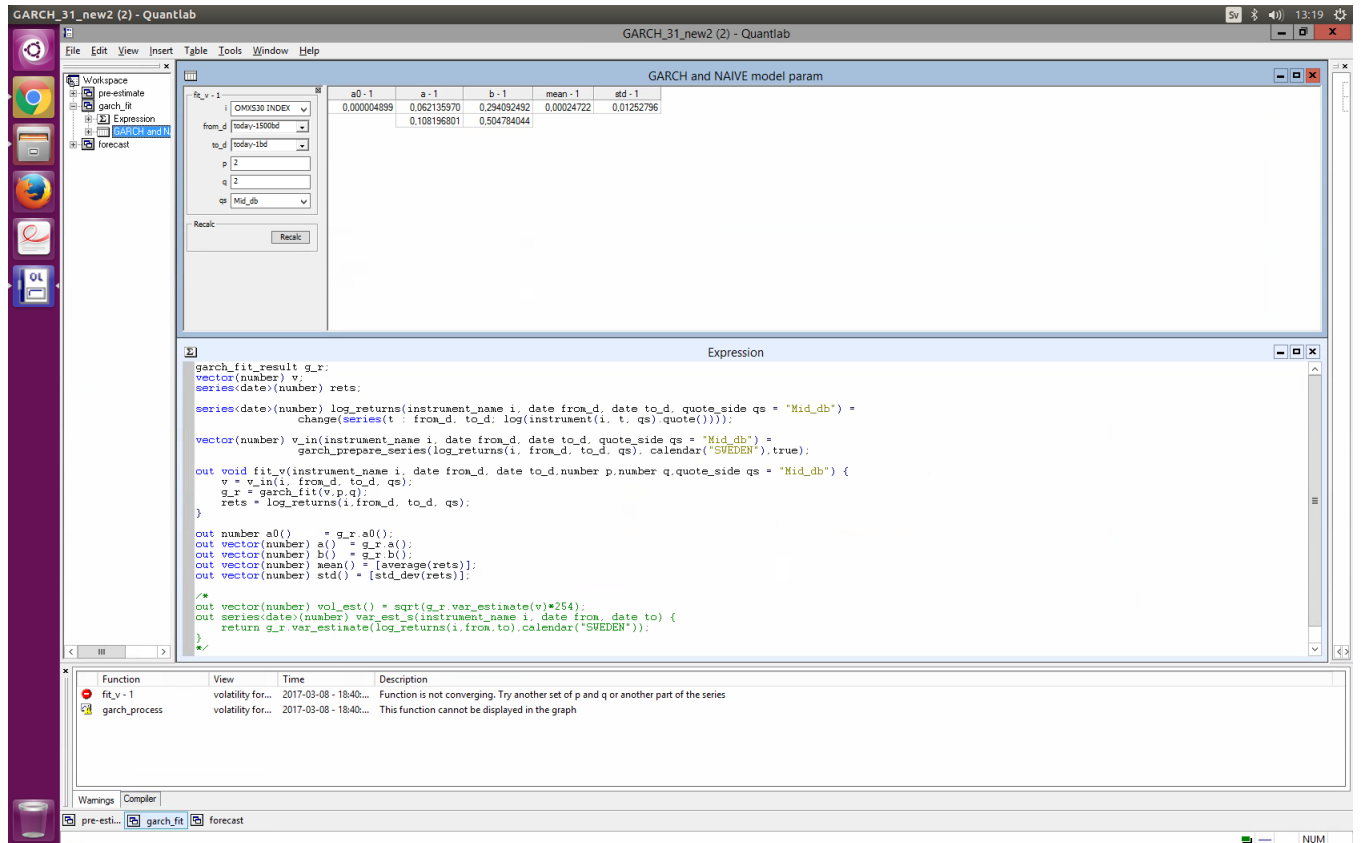


Figure 2: The tab “garch_fit”.

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,

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

Be aware that if the selected interval of days is very long, you might need to select p and q higher than 1 for the estimator to converge. After clicking “Recalc”, Quantlab will estimate the parameters and present the result in the window “GARCH and NAIVE model param”. The columns a_0-1 , $a-1$ 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, the GARCH process is compared with the naive volatility and the log-returns. A view of the tab is presented in Figure 3. All fields except

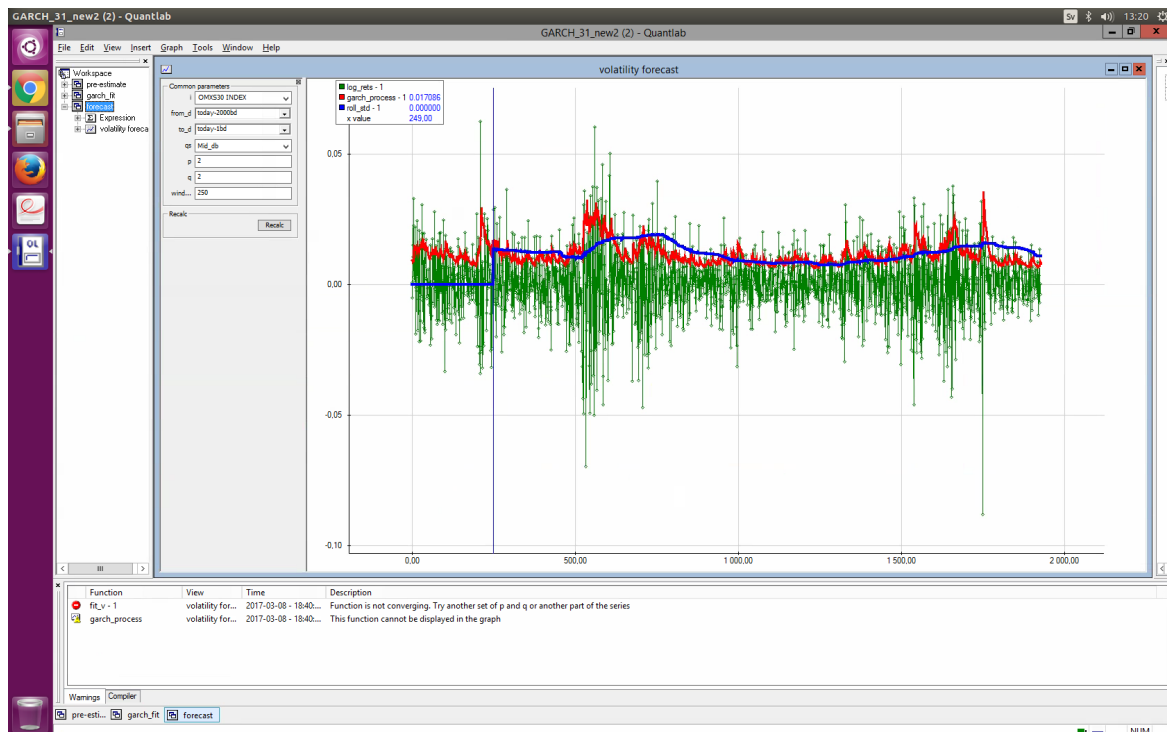


Figure 3: The tab “forecast”.

`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. Clicking “Recalc” updates the plot of the log-returns (green), GARCH process (red) and the rolling standard deviation. Note that the numbers on the x-axis represents business days used in the GARCH estimation. Not all data points are used in the estimation (some extreme values are excluded), and therefore you will find the time series plotted to be somewhat shorter than your chosen interval. Anyhow, the first data point will correspond to your selected `from_d` and the last to your selected `to_d`.