What is a beta map. What is a beta map corresponding to fMRI images from the iterated Trust Game?

We have several rounds $c = 1, \ldots, C$. Within each round c, we select an event occurring at some time after the beginning of this round. Let us denote by $t_e(c)$ the time (from the beginning of the very first round) of this event e corresponding to round c.

We have a measured (and preprocessed) value for each 4x4x4 mm voxel at every 2 seconds. Note that these 2 second intervals may or may not correspond to time points when the events above occur. When we form a beta-map, we relate all the measurements performed between the event $t_e(c)$ occurring during the c-th round and $t_e(c) + 32$ (32.0125???) seconds to the event $t_e(c)$.

Specifically, we use the Hemodynamic Response Function $h(\Delta t)$ (see `http://en.wikibooks.org/wiki/SPM/Haemodynamic_Response_Function`) to compare the effect of the event with the observed values. For the event occurring at a moment $t_e(c)$, the response at a moment $t > t_e(c)$ depends on the time $\Delta t = t - t_e(c)$ that passed from this event, i.e., should be proportional to the value $h(t - t_e(c))$.

Let us denote the value actually measured at the moment t by $y(t)$. In these terms, we need to compare the measured value $y(t)$ with the expected value $h(t - t_e(c))$. The simplest possible way is to simply that the measured value is proportional to the expected value, i.e.,

$$y(t) \approx \beta \cdot h(t - t_e(c)). \tag{1}$$

The coefficient β can then be obtained from these approximate equations, e.g., by using the Least Squares method.

Another possibility is to relate the measured signal $y(t)$ to some quantity v_c characterizing each event $t_e(c)$. In our case, it can be, e.g., to the number of monetary units invested or returned in that round. In this case, we assume that the observed signal between $t_e(c)$ and $t_e(c) + 32$ is also proportional to v_c, i.e., that

$$y(t) \approx \beta \cdot v_c \cdot h(t - t_e(c)). \tag{2}$$

The corresponding coefficient β can also be obtained from the Least Squares method.

The values β corresponding to different voxels form a *beta map.*