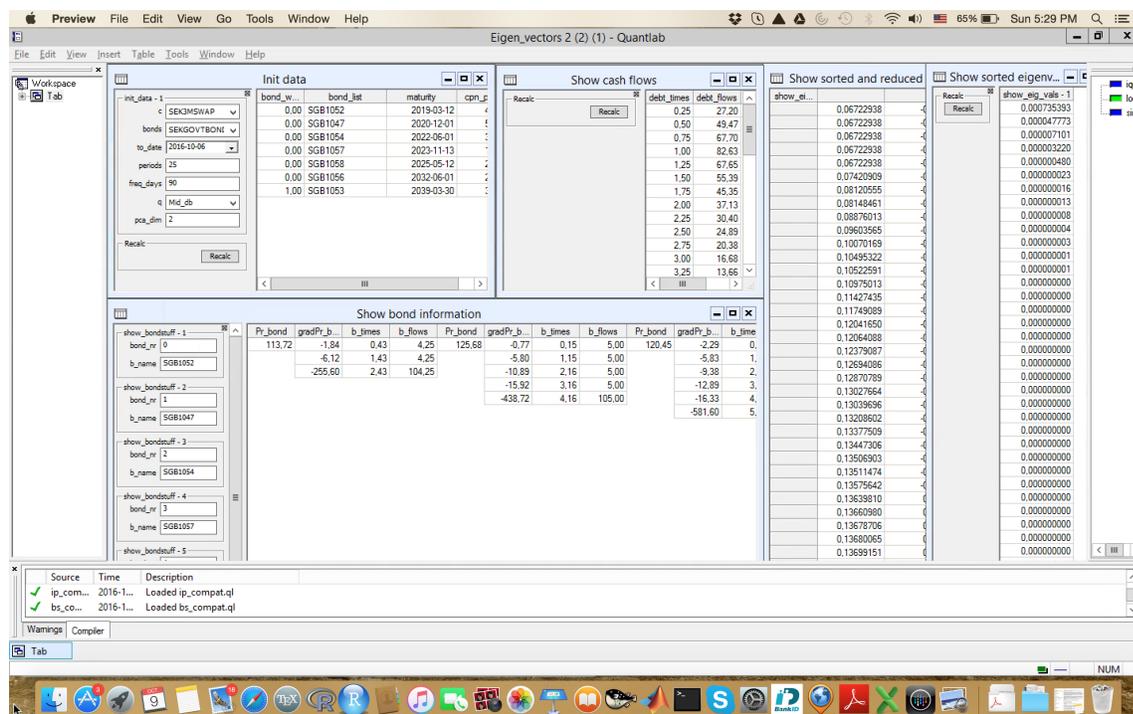# SF2942: ASSIGNMENT 2
QUANTLAB WORKSPACE

This document is intended to assist you with the Quantlab workspace used in the assignment on immunization, providing short descriptions of the different parameters and data fields. Figure 1 shows a screenshot of the workspace as it looks when you open it the for the first time.

FIGURE 1. Screenshot of Quantlab workspace.

First, the "Show cash flow" tab shows the times and amounts of the liability. Time is measured in years and you can readily see that the liability includes payments every quarter, 10 years into the future.

Second, there is the "Init data" tab, shown in Figure 2. This part of the workspace contains the information about the data you want as input. The selection in `c` determines what instrument is used to produce the zero-rate curve. By the selection in `bonds` you

Figure 2. "Init data" tab.

choose what instruments you want to use for your hedge. Once you made a selection, setting a "0" or a "1" in the "bond weights" column decides whether a specific bond will be included or not. In Figure 2 only one bond is selected, namely SGB1053.

In the "Init data" window, `freq_days` sets the length you want to use to compute changes in the zero rates, observations of $\Delta \mathbf{r}$. This is combined with the parameter value in `periods` to create your historical data, i.e., your "sample" of $\Delta \mathbf{r}$ over a certain time period. The current setting is 90 days to compute changes in the zero rates and we use 25 such periods to create our data.

The final parameter you need to consider in "Init data" is `pca_dim`, the number of eigenvectors to show in the corresponding window. Clearly, you should set this parameter to equal the number of eigenvectors you want to use in your immunization.

The next window to consider is "Show bond info", shown in Figure 3. The information in this tab is divided into sequences of four tabs for the bonds shown in "Init data". For each bond you are given the present price, non-zero entries of the gradient w.r.t. the underlying interest rates, cash-flow times and cash amounts (in that order). Note that in the `gradPr_bond` you see **only** the non-zero entries and you then have to match these with the cash-flow times when taking the inner product with the eigenvectors. Also, the information for a particular bond is displayed whether you include that bond as a hedging instrument or not.

Show bond information

show_bondstuff - 1
bond_nr 0
b_name SGB1052

show_bondstuff - 2
bond_nr 1
b_name SGB1047

show_bondstuff - 3
bond_nr 2
b_name SGB1054

show_bondstuff - 4
bond_nr 3
b_name SGB1057

show_bondstuff - 5
bond_nr 4
b_name SGB1058

show_bondstuff - 6
bond_nr 5
b_name SGB1056

show_bondstuff - 7
bond_nr 6
b_name SGB1053

Recalc

Pr_bond	gradPr_b...	b_times	b_flows	Pr_bond	gradPr_b...	b_times	b_flows	Pr_bond	gradPr_b...	b_times	b_flows	Pr_bond	gradPr_b...	b_times	b_flows
113,72	-1,84	0,43	4,25	125,68	-0,77	0,15	5,00	120,45	-2,29	0,65	3,50	109,53	-0,16	0,11	1,50
	-6,12	1,43	4,25		-5,80	1,15	5,00		-5,83	1,65	3,50		-1,67	1,10	1,50
	-255,60	2,43	104,25		-10,89	2,16	5,00		-9,38	2,66	3,50		-3,18	2,10	1,50
					-15,92	3,16	5,00		-12,89	3,65	3,50		-4,70	3,10	1,50
					-438,72	4,16	105,00		-16,33	4,65	3,50		-6,19	4,11	1,50
									-581,60	5,65	103,50		-7,66	5,11	1,50
													-9,06	6,11	1,50
													-703,63	7,11	101,50

FIGURE 3. "Show bond information' tab.

The remaining windows, "Show sorted eigenvectors" and "Show sorted eigenvalues" are self-explanatory. Recall that the number of vectors displayed in the former is decided by the parameter `pca_dim` in "Init data".