Computational Exercise 1

Part a, b See MATLAB code.

Part c, d Quantiles for the three cases are reported in Table 1, while Figures 1,2,3 plot histograms and QQ plots for the three cases. The histograms visually reveal that all three seem to have an asymptotically normal distribution centered around zero. The homoskedastic case is the one that appoximates the standard normal more closely, but it does so only on a part of the values (i.e. between -1.5 and 1.5), so it is not a standard normal. This is also revealed in the QQ plot, where we don't have a 45 degree line (the axis have different scales). In the other two cases, instead, even if extremes are not on entirely on the QQ line, the distributions overall match the standard normal asymptotically. Therefore, while in the latter two cases tests on the parameter work well asymptotically, in the homoskedastic case I would not reject as much as I should because all the values for the statistic are bounded between -1.5 and 1.5.

Computational Exercise 2

Part a, b See MATLAB code.

Part c Quantiles for the three cases are reported in Table 2, while Figure 4 plot the histogram and QQ plot. Clearly in this case the distribution is not standard normal as it is clear by looking at the QQ plot. If the model was correctly specified we would have got an asymptotically standard normal distribution. From this model we would draw wrong conclusion about the parameter β_1: for example, if we want to test its significativeness we would almost always reject.

Table 1: Quantiles - exercise 1

Quantile	t_n^0	$\tilde{t}_n$	$\bar{t}_n$
0.0100	-0.8819	-2.4097	-2.4344
0.0250	-0.7327	-2.0260	-2.0448
0.0500	-0.6019	-1.6671	-1.6829
0.1000	-0.4713	-1.2784	-1.2908
0.2000	-0.3124	-0.8506	-0.8589
0.3000	-0.1945	-0.5284	-0.5334
0.4000	-0.0966	-0.2581	-0.2605
0.5000	-0.0031	-0.0089	-0.0090
0.6000	0.0909	0.2456	0.2480
0.7000	0.1908	0.5168	0.5214
0.8000	0.3116	0.8473	0.8559
0.9000	0.4729	1.3133	1.3254
0.9500	0.6188	1.7113	1.7279
0.9750	0.7359	2.0405	2.0605
0.9900	0.8743	2.4556	2.4801

Table 2: Quantiles - exercise 2

Quantile	t_n^0
0.0100	-37.7796
0.0250	-27.1309
0.0500	-20.5822
0.1000	-13.9042
0.2000	-7.7097
0.3000	-4.4091
0.4000	-1.9865
0.5000	0.1478
0.6000	2.1244
0.7000	4.6351
0.8000	8.0582
0.9000	14.0004
0.9500	21.0600
0.9750	28.4068
0.9900	40.3642

Figure 1: t_n^0

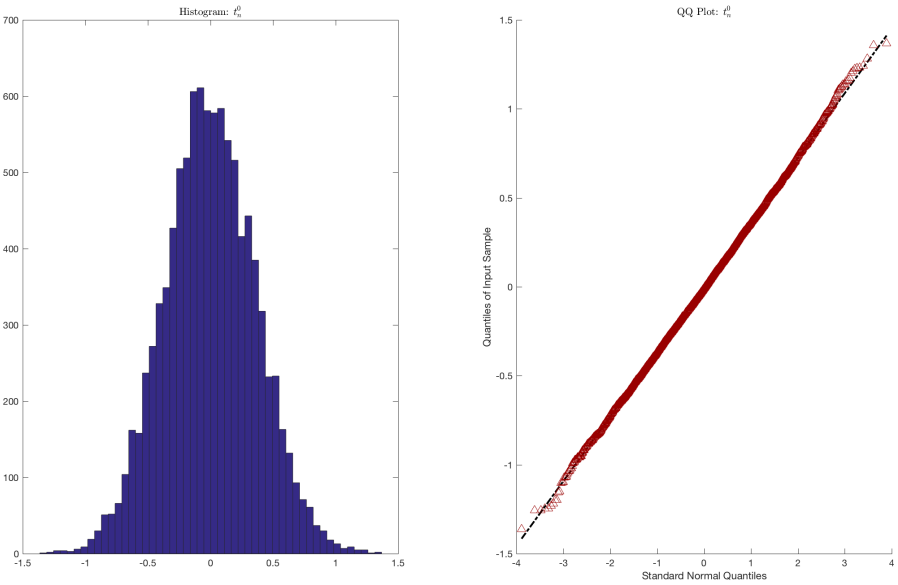

Figure 2: $\tilde{t}_n$

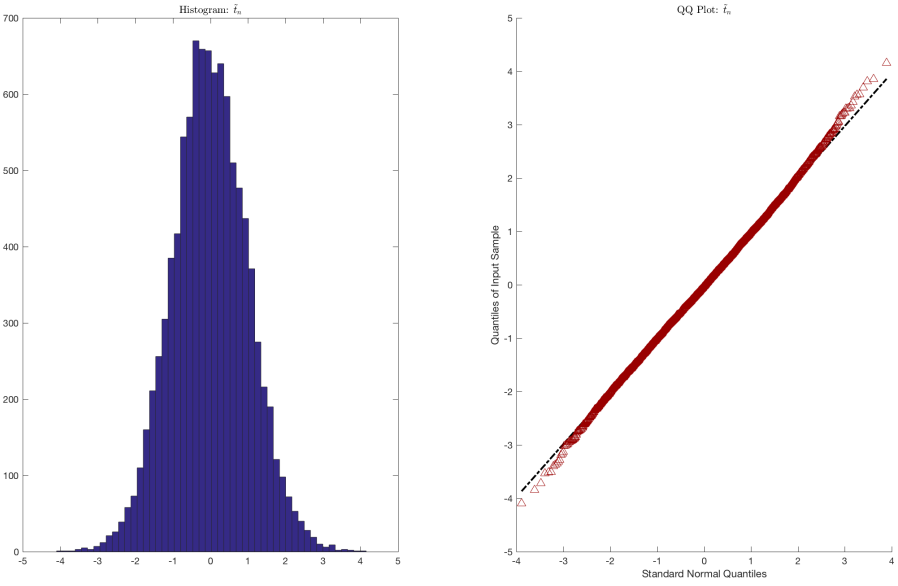

Figure 3: $\bar{t}_n$

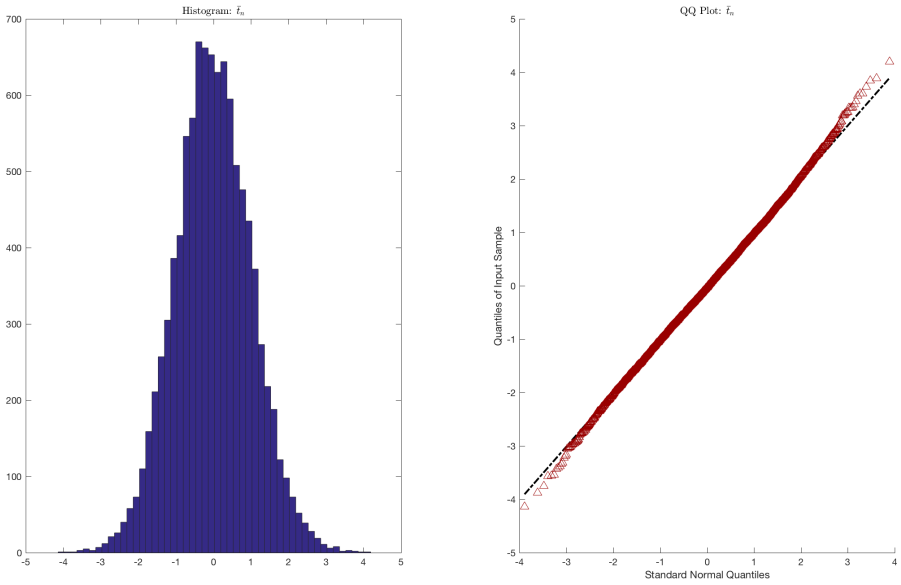

Figure 4: t_n^0-second exercise