ID6

ARMAX Identification

6.11 EXAMPLE 6.3

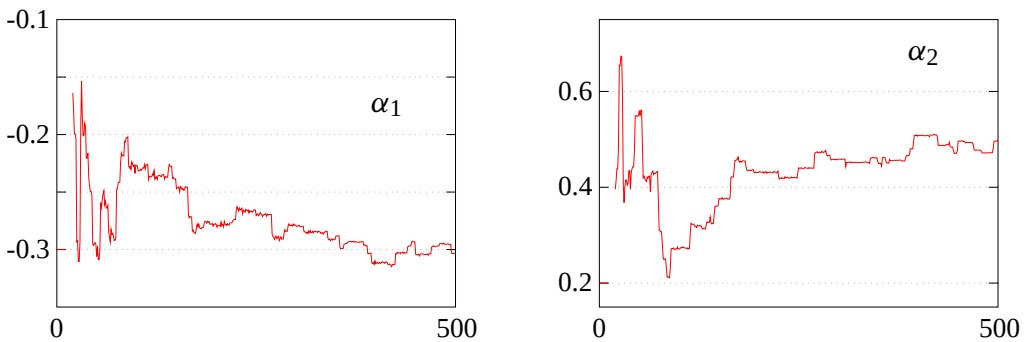
A recursive IV estimate will be performed on the process already considered in Example 6.1 ; we will estimate the α_i and β_i parameters starting from the IV estimate that can be obtained for $N = 20$, performing 480 updates by means of (6.10.2), (6.10.3) and (6.10.7) to reach, eventually, the estimate at time $t = 500$. We will use instruments given by delayed inputs; $z(t)$ is thus given, for the considered system, by

$$z(t) = \left[u(t-4)\ u(t-3)\ u(t-2)\ u(t-1) \right].$$

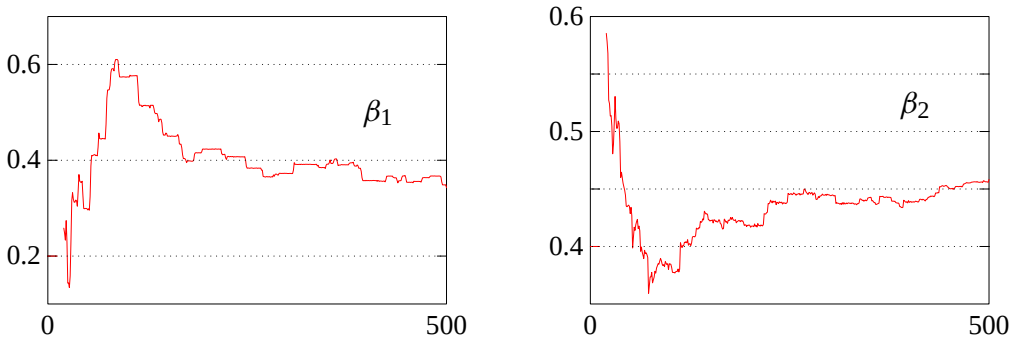
The initial estimate ($N = 20$) is

$$\begin{aligned} \alpha_1 &= -0.1638\ (-0.34) & \beta_1 &= \ \ 0.2582\ (0.2738) \\ \alpha_2 &= \ \ 0.3962\ (0.6) & \beta_2 &= \ \ 0.5853\ (0.4564). \end{aligned}$$

The plot of the estimates of α_1, α_2, β_1 and β_2 is reported in Figures 6.11.1 – 6.11.4 which give significant indications on their dependence from the number of samples.



Figures 6.11.1 and 6.11.2 – Estimates of α_1 and α_2 from $t = 20$ to $t = 500$



Figures 6.11.3 and 6.11.4 – Estimates of β_1 and β_2 from $t = 20$ to $t = 500$

The final estimate is equal to the estimate obtained in a single step in Example 6.1 ; this confirms the absence of numerical problems in the implementation of the recursive algorithm.

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