

ID6

ARMAX Identification



6.15 COVARIANCE AND ASYMPTOTIC PROPERTIES OF PEM ESTIMATES

It is possible to show that PEM estimates of ARMAX processes are asymptotically unbiased and that the distribution of the random variable

$$\sqrt{N}(\theta^\circ - \theta^*), \quad (6.15.1)$$

tends for $N \rightarrow \infty$, to a Gaussian distribution with null mean value and covariance given by

$$\sigma_\varepsilon^2 \mathbb{E}[\psi(t, \theta) \psi^T(t, \theta)]^{-1}. \quad (6.15.2)$$

Considering (6.12.10) and (6.13.17), (6.15.2) can be approximated as

$$J_N(\theta) \left[\frac{H_\psi^T H_\psi}{N} \right]^{-1}. \quad (6.15.3)$$

In the applications of the PEM algorithm it is of interest to evaluate the covariance of the estimate θ° and not that of (6.15.1); the corresponding expression is given by

$$\text{cov } \theta^\circ = J_N(\theta) [H_\psi^T H_\psi]^{-1}. \quad (6.15.4)$$

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