20. ESTIMATOR G_{20} OF REGULARIZED FUNCTION OF UNKNOWN PARAMETERS

When function $\varphi_n(t,\vec{z})$ satisfies equation (19.6), we use the following operator in equation (19.8),

$$A_\varepsilon = B + \varepsilon q(\vec{z}) + \delta \left[B + \varepsilon q(\vec{z})\right]^2, \quad \varepsilon, \delta > 0.$$

Here $q(\vec{z})$ is any measurable function such that the operator $B + \varepsilon q(\vec{z}), \; \vec{z} \in R^m$ satisfies the above mentioned condition,

$$B = \sum_{l=1}^{p-1} \frac{1}{l!} \mathbf{E} \left(\frac{1}{n} \sum_{i=1}^{m_n} (x_{i1} - a_i) \frac{\partial}{\partial z_i} \right)^l.$$

From the operator spectral theory, it follows that instead of function $q(\vec{z})$ we can choose any measurable function such that

$$\lim_{\|\vec{z}\| \to \infty} q(\vec{z}) = \infty.$$

Let $\lambda_k(\varepsilon)$ and $\varphi_{k\varepsilon}(\vec{z}), \; k = 1, 2, ...$ denote the eigenvalues and eigenfunctions of the operator $B + \varepsilon q(\vec{z}), \; \vec{z} \in R^m$, respectively. Now we can give the main form of G_{20}-estimators of function $f(\vec{a})$;

$$\begin{aligned} G_{20} &= \exp\{A_\varepsilon\} f\left(\hat{\vec{\alpha}} + \vec{z}\right)_{\vec{z}=0} \\ &= \sum_{k=0}^{\infty} \exp\left\{\lambda_k(\varepsilon) - \delta \lambda_k^2(\varepsilon)\right\} \int f\left(\hat{\vec{\alpha}} + \vec{z}\right) \varphi_k(\vec{z})\, \mathrm{d}\vec{z} \varphi_k\left(\vec{0}\right). \end{aligned}$$

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