

Abstract.

The results of the first two chapters of this thesis derive from the paper of Esseen [3] "Fourier Analysis of Distribution Functions", 1945. If $\sqrt{n}\bar{X} = \frac{1}{\sqrt{n}} \sum_{j=1}^n X^j$ where the X^j are independent, identically distributed random variables in R_k , with zero means unit covariance matrices and finite fourth moments β_{4j} with $\beta_4 = \sum_{j=1}^k \beta_{4j}$, then Esseen gets the result

$$\left| \mu_n(a) - \Phi(a) \right| < \frac{C\beta_4}{n^{\frac{k}{2}}} \quad , \quad C \text{ constant} \quad (1)$$

where $\mu_n(a) = P\left\{ \sum_{i=1}^k \sqrt{n}\bar{X}_i^2 \leq a^2 \right\}$ and $\Phi(a)$ is the normal distribution of the same first and second moments.

The generalization to non-identically distributed r.v.s. is non-trivial; we give one in Chap.1, β_4 being replaced by the maximum of the fourth moments of the $X^j, j=1, \dots, n$.

In Chap.2 the r.v.s. X^j are non-identically distributed but are infinitely divisible and a somewhat better inequality than that of Chap.1 is obtained, β_4 being now replaced by the mean of the fourth moments of the X^j . We consider the case, for $k=2$, where the X^j have non-unit covariance matrices and also the case where the (non-unit) covariance matrix of $\sqrt{n}\bar{X}$ (still in R_2) converges to a limit with positive

determinant. In the latter case the r.h.s. of (1) contains a term involving the mean of the fourth moments of the X^v and one measuring the rate of convergence of the matrix of ${}^n\bar{X}$.

A different method is employed in the last chapter for the case where the X^v (in R_2) are of the form $(a_v \xi_v, b_v \xi_v)$, ξ_v being identically distributed r.v.s. in R_1 with finite third moments. ${}^n\bar{X}$ becomes $\frac{\sum_{v=1}^n X^v}{\left[\sum_{v=1}^n (a_v^2 + b_v^2) \right]^{1/2}}$

and the r.h.s. of (1) is of a more complicated form, more parameters being involved.