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KODAI MATH. J.
5 (1982), 408—415

POISSON APPROXIMATION FOR SUMS OF INDEPENDENT BIVARIATE BERNOULLI VECTORS

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1. Introduction. It is well known fact as Poisson's theorem that for a given sequence of $\{p_n, n\geqq 1\}$ such that $p_n\to 0$ $(n\to\infty)$ we have

$$P_n(m)-(\lambda_n^m/m!)e^{-\lambda_n} \longrightarrow 0 \qquad \text{as} \quad n\to\infty$$

for all non-negative integer m where

$$\lambda_n=np_n, \qquad P_n(m)=\binom{n}{m}p_n^m(1-n)^{n-m}.$$

Furthermore, if $np_n\to\lambda$ $(n\to\infty)$ then we have

$$P_n(m) \longrightarrow (\lambda^m/m!)e^{-\lambda} \qquad \text{as} \quad n\to\infty.$$

R. von Mises in the paper [3] has showed that if $\{X_{kj}, k\geqq 1, j=1, 2, \cdots, n_k\}$ is a sequence of independent random variables such that

$$P[X_{kj}=1]=1-P[X_{kj}=0]=p_{kj}, \qquad j=1, 2, \cdots, n_k$$

and

$$\max_{1\leq j\leq n_k} p_{kj} \longrightarrow 0, \qquad \sum_{j=1}^{n_k} p_{kj} \longrightarrow \lambda>0 \quad (k\to\infty), \tag{1.1}$$

then

$$P\left[\sum_{j=1}^{n_k} X_{kj}=m\right] \longrightarrow (\lambda^m/m!)e^{-\lambda} \qquad (k\to\infty).$$

In (1977) J. Mačys (see. [2]) has proved that the conditions (1.1) are necessary as well.

Let $\{(X_k, Y_k), k\geqq 1\}$ be a sequence of random vectors bivariate Bernoulli law, i.e.

$$P[X_k=0, Y_k=0]=p_{00}, \qquad P[X_k=1, Y_k=0]=p_{10},$$

$$P[X_k=0, Y_k=1]=p_{01}, \qquad P[X_k=1, Y_k=1]=p_{11},$$

where $p_{00}+p_{10}+p_{01}+p_{11}=1$.

Received July 30, 1981