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The convergence of random quantities with the Distribution of Puasson in the Gilbert phase

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Abstract:

The distribution of the normal sum the Gilbert phase is described to be explored to a normal distribution of normal distribution.
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Introduction

Let's say in the Gilbert space $X_1, X_2, \ldots, X_n$ - let the random quantities that have a Puasson distribution are given, that is, $\Omega = \{0,1,2,\ldots\}$, $P = \{P_1, P_2, \ldots\}$,

$$p(x) = \frac{e^{-a}a^x}{x!}; \quad x = 0,1,\ldots \quad a>0 \quad \text{or} \quad Mx_n = a.$$

It is known that $M\|x_n\|^2 < \infty$, in that case $\eta_n = n^{-\frac{1}{2}}(X_1 + X_2 + \ldots + X_n)$ the distribution of the normal sum will approach a normal distribution in Gilbert space. This article shows to study the speed of approaching.

$$Z_n = n^{-1}\int_0^1 \left[\sum_{i=1}^n p(x+x_i) - h\right]^2 dx \tag{1}$$

let's enter a definition. Z_n random quantities in the form of (1) are studied in [1].
If

$$\xi_i(x) = p(x+x_i) - 1$$

If we enter, then

$$Z_n = \|\eta\|^2 = \left\|\frac{\xi_1(x) + \xi_2(x) + \ldots + \xi_n(x)}{\sqrt{n}}\right\|^2$$

we'll have. Here

$$\| p(x) \| = \left(\int_0^1 p^2(x)dx \right)^{\frac{1}{2}}.$$

It is also an empirical $x_n(x) = \sqrt{n}(F_n(x) - x)$ process and the $F_n(x)$ - the empirical distribution function, based on the sale of $x_1, x_2, \ldots, x_n$ the Puasson process. Covera function

$$\cos z(1-x) \ , \quad 0 \le z \le x \le 1$$

let there be a sort of. [2] да $n \to \infty$ да

$$\Delta_n(\lambda) = P(Z_n < \lambda) - P(\lambda) \tag{2}$$

The amount is shown to 0. It is a distribution function of $P(\lambda)$, its characteristics function

$$\varphi(x) = \prod_{k=1}^{\infty} (1 - 2 \cdot \lambda_k it)^{-\frac{1}{2}} \tag{3}$$

equal to function. A sequence $\lambda_1 \ge \lambda_2 \ge \ldots$ of numbers to decrease here.
Say

$$| P'(x) | \le c \tag{4}$$

Let there be a sort of. Here c positive number

The theorem 1. For adequate large n and all $\lambda > 0$

$$| \Delta_n(\lambda) | \le C(H) \frac{\ln_n}{\sqrt{n}} e^{-\sqrt{\lambda}}$$

Inequality will be appropriate. Here it depends on the $C(H)$.

Proven Z_n

$$Z_n = \sqrt{n} \left(\frac{1}{n} \sum_{i=1} p(x + x_i) - 1 \right] = \sqrt{n} \int_0^1 p(x+u) - 1) \, dF_n(u) =$$

$$= \int_0^1 (P(x+u) - 1) dx_n(u)$$

We write like. (3) and (1) from

$$Z_n = \int_0^1 \left[\int_0^1 (p(x+u) - 1) dx_n(u) \right]^2 dx$$

we will have. According to the principle of invasion, Z_n

$$Z = \int_0^1 \left[\int_0^1 (p(x+u) - 1) dx(u) \right]^2 dx$$

strives for.

Comlosh- Mayor Tushnadi [2] descends according to the traine (Ω, F, P)

there is a distinctive space that is empirical for the optional n in this space $x_n^{(1)}(u)$ the process can build the process and $B_n(u)$ Brown bridge. Voluntary $x > 0$ for them

$$P\left(\sqrt{n} \sup_{0 \le u \le 1} | y_n^{(1)}(u) - B_n(u) | > x \right) \le k n^{\alpha} e^{-bx} \tag{5}$$

Inequality will be appropriate. Here there are positive constant prime numbers of a, b, k.

we will enter the below

$$Z_n^{(1)} = \int_0^1 \left[\int_0^1 (P(x+u)-1) dy_n^{(1)}(u) \right]^2 dx, \; Z^{(1)} = \int_0^1 \left[\int_0^1 (P(x+u)-1) dB_n(u) \right]^2 dx \tag{6}$$

In that case

$$P(Z_n < \lambda) = P(Z_n^{(1)} < \lambda), \; P(Z < \lambda) = P(Z^{(1)} < \lambda) \tag{7}$$

from (6) using

$$Z_n^{(1)} = Z^{(1)} + \int_0^1 \left[\int_0^1 (f(x+u)-1) d\left(y_n^{(1)}(x) - B_n u \right) \right]^2 du +$$

$$+2\int_0^1 \left[\int_0^1 (f(x_1+u)-1) d\left(y_n^{(1)}(x_1) - B_n(x_1) \right) \right] \times \left[\int_0^1 f(x_2+u)-1) dB_n(x_1) \right] du$$

we will have. The elementary accidents set

$$\Omega_1 = \left\{ \omega : \sqrt{n} \sup_{0 \le u \le 1} | y_n^{(1)}(u) - B_n(u) | \le x \right\} \tag{8}$$

If we can be (here $x>0$ optional number) $\omega \in \Omega_1$ then for all

$$\left| \int_0^1 \left[\int_0^1 (f(x_1+u)-1) d\left(y_n^{(1)}(x_1) - B_n(x_1) \right) \right]^2 du \right| \le C_1 \frac{|x^2|}{n}, \tag{9}$$

$$\left| 2\int_0^1 \left[\int_0^1 (f(x_1+u)-1) d\left(y_n^{(1)}(x_1) - B_n(x_1) \right) \right] \times \left[\int_0^1 (f(x_2+u)-1) dB_n(x_2)] du \right] \le C_2 \frac{x}{\sqrt{n}} \sqrt{Z^1} \right| \tag{10}$$

Inequality will be appropriate.

(9) when we first applied (4), (8), after we first applied to the x_1 variable. In addition to the formation of (10), we have applied Koshi-Bunyakovsky's inequality other than the above.

(9), are optional from (10) $\omega \in \Omega_1$ for $| Z_n^{(1)} - Z_0^{(1)} | \le t_1$ (11)

we create. Here $t_1 = c_1 \cdot \frac{x^2}{n} + c_2 \cdot \frac{x}{\sqrt{n}} \sqrt{T^{(1)}}$

(11) according to

$$P(Z_n < \lambda) = P\left(\left(Z_n^{(1)} < \lambda \right) \cap \Omega_1 \right) + P(T_n^{(1)} < \lambda) \cap \bar{\Omega}_1) \tag{12}$$

we appreciate the second added accounting (5) on the right of (12).

$$P\left(\left(Z_n^{(1)} < \lambda \right) \cap \Omega_1 \right) \le P\left(\left(Z^{(1)} < \lambda + t_1 \right) \cap \Omega_1 \right), \tag{13}$$

$$P\left(\left(Z_n^{(1)} < \lambda \right) \cap \Omega_1 \right) \le P\left(\left(Z^{(1)} < \lambda - t_1 \right) \cap \Omega_1 \right) \tag{14}$$

(13) and from (14)

$$P\left(\left(Z_n^{(1)} < \lambda \right) \cap \Omega_1 \right) \le P\left(Z^{(1)} < \lambda + \alpha_n \right), \tag{15}$$

$$P\left(\left(Z_n^{(1)} < \lambda \right) \cap \Omega_1 \right) \ge P\left(Z^{(1)} < \lambda - \beta_n \right) - P\left(\bar{\Omega}_1 \right) \tag{16}$$

we create inequalities. Here

$$\alpha_n = C_3 \frac{x^2}{n} + 2x\sqrt{\frac{c_n}{n}} \left[x\sqrt{\frac{c_n}{n}} + \sqrt{\lambda + 2\frac{x^2}{n} c_3} \right],$$

$$\beta_n = C_3\frac{x^2}{n} + 2x\sqrt{\frac{c_n}{n}}\left[\sqrt{\lambda} - x\sqrt{\frac{c_3}{n}}\right]$$

x the fact that the voluntary value of the variable can be selected,

$$x = \frac{1}{b}\sqrt{\lambda} + \frac{a+2}{b}\ln n$$

can select as. In that case, an optional are $\lambda > 0$ in and adequate n large

$$\alpha_n \le C_4\lambda\frac{\ln n}{\sqrt{n}}, \qquad \beta_n \le C_5\lambda\frac{\ln n}{\sqrt{n}}$$

we create (6), (15), (16).

$$\Delta_n(\lambda) \le P(T < \lambda + \alpha_n) - P(T < \lambda) + P(\bar{\Omega}_1), \qquad (17)$$

$$\Delta_n(\lambda) \ge P(T < \lambda - \beta_n) - P(T < \lambda) - P(\bar{\Omega}_1)$$

we'll have. In view of the selected x and (5)

$$P(\bar{\Omega}_1) \le C_6\frac{1}{n}e^{-\sqrt{\lambda}} \qquad (18)$$

Voluntary it is formed for u>0. (7) mainly

$$P'(u) \le C_7 u^{m_0} e^{-\frac{\alpha}{2}}$$

We create. Here's C_7 and m_0 - permanent numbers.

From the last inequality

$$|P(Z < \lambda + \alpha_n) - P(Z < \lambda)| \le C_8\frac{\ln}{\sqrt{n}}e^{-\sqrt{\lambda}} \qquad (19)$$

$$|P(Z < \lambda - \beta_n) - P(Z < \lambda)| \le C_9\frac{\ln}{\sqrt{n}}e^{-\sqrt{\lambda}} \qquad (20)$$

are formed.

(17) - (18), (19) from uniting (20)

$$-C_6\frac{1}{n}e^{-\sqrt{\lambda}} - C_9\frac{\ln}{\sqrt{n}}e^{-\sqrt{\lambda}} \le \Delta_n(\lambda) \le C_8\frac{\ln}{\sqrt{n}}e^{-\sqrt{\lambda}} + C_6\frac{1}{n}e^{-\sqrt{\lambda}}$$

Inequality occurs. This proves that the theorem is true.

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