Wikipedia

Mathematical Model

- Make sure how it is well posed.

Stochastic Process

- Special type of Probability function

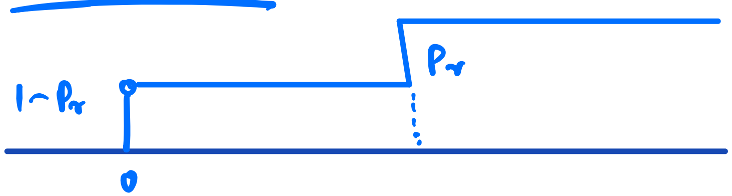
1. Counting Process : Sequencing Model
2. Poisson Process :
3. Renewable Process : → Markov Chains
4. Random Walk and Nightingale

Expectations

$$E(X) = \int F_X^c(x) \xrightarrow{\text{Reimmen sum}} \int x \, f(x) \, dx$$

Monotonic increasing with x.

Indicator Random Variable



Stochastically Independent between Each-Other.

$$\frac{S_n}{n} = \frac{x_1 + x_2 \ldots x_n}{n} \rightarrow \text{becomes deterministic when } n \rightarrow \infty$$

First Gain of Detail

$$\Pr\left\{ \frac{S_n - n\bar{x}}{\sqrt{n}\,\sigma} \leq y \right\} = \int_{-\infty}^{y} \frac{1}{\sqrt{2\pi}\,\sigma} e^{-x^2/2}.$$

$$\left.\frac{P_{S_n}(k+1)}{P_{S_n}(k)} = \frac{n-k}{k+1}\,\frac{p}{q}\;\right] \rightarrow \text{strictly decreasing.}$$

Central Limit Theorem.

$k = np + i \rightarrow$ Putting in the value

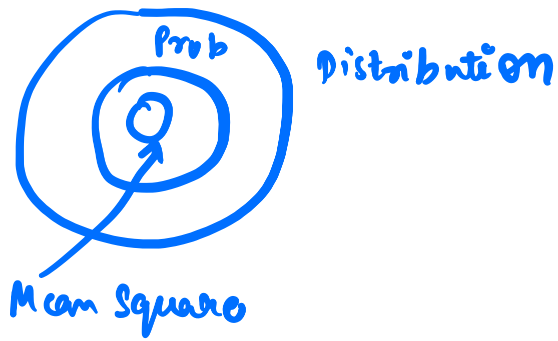
$$= \frac{n - (np + i)}{(np + i + 1)}\left(\frac{p}{q}\right) \qquad 1, 2, 3 \ldots,$$

$$= \ln\left(1 - \frac{i}{nq}\right) - \ln\left(1 + \frac{i+1}{np}\right)$$

$$= \sum \sim\!\sim\!\sim \approx -\frac{j^2}{2npq}$$

$$P_{S_n}(pn+j) = P_{S_n}(pn)\exp\left[-\frac{j^2}{2npq}\right] \to \text{PMF}$$

Convergence in Probability $\Rightarrow$ Convergence in Distribution.



Weak Law of Large Number

↳ less powerful but More general

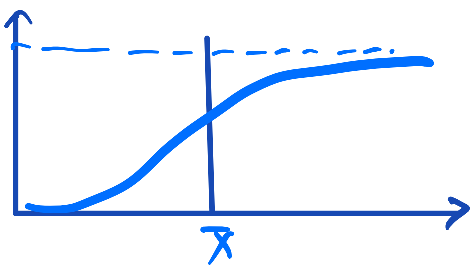
$$\omega \in \Omega$$

$$\left\{ \lim_{n\to\infty} Z_n(\omega) = Z(\omega) \right\} = 1$$

maps into sample path

might converge to something else $l(\omega)$.

Central Limit Theorem



Strong Law of Large Number $\to$