The autoregressive model

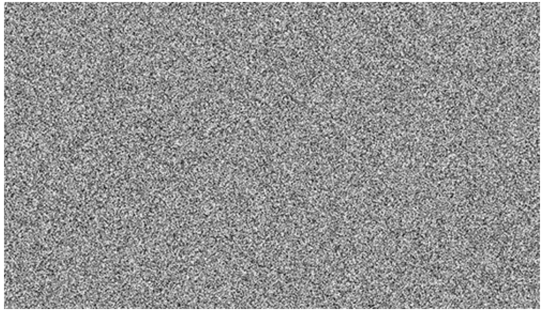
By: Andeos Rigas

The model

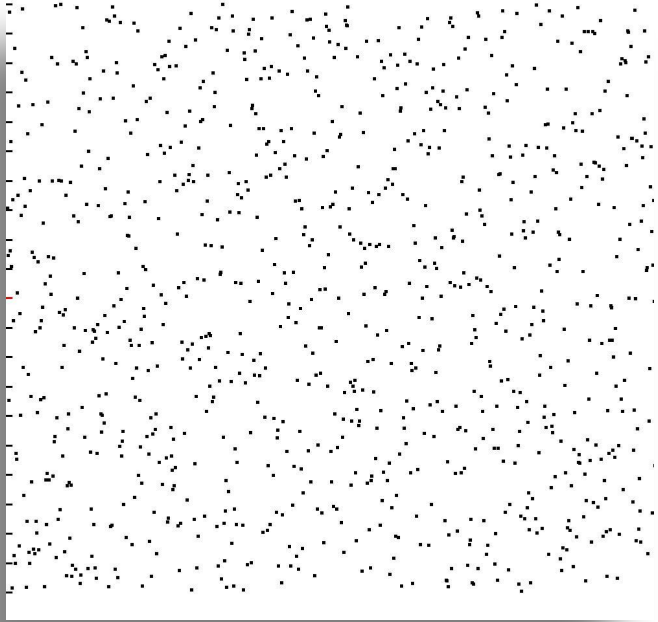
- Noise
- Still be able to make predictions
- Is used to describe processes in nature, of behavior, and economy

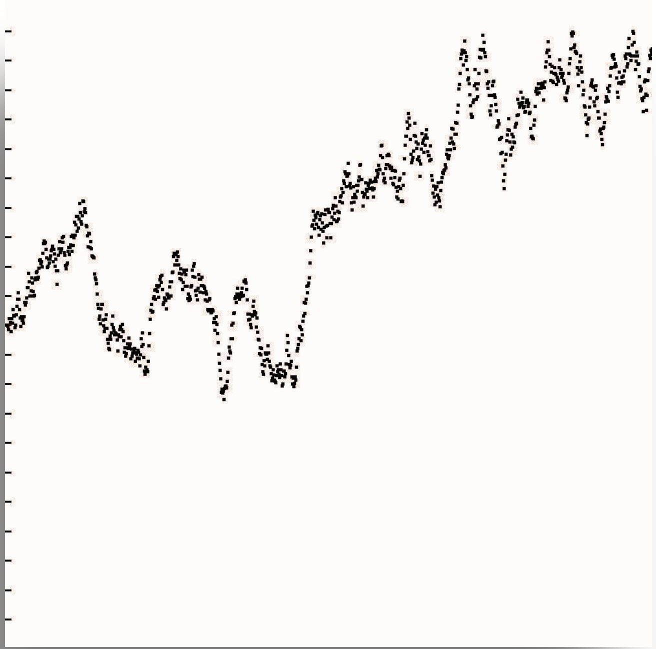
The model

- Noise
- Still be able to make predictions
- Is used to describe processes in nature, of behavior, and economy



Types of noise





Autocorrelation

$$\gamma_m = \langle x_t x_{t+m} \rangle = \sum x_t x_{t+m} / N$$

$\langle\ldots\rangle$: average of ...

Yule-Walker equations

$$x_{t+1} = \sum \varphi_n x_{t-n} + \xi$$

ξ is a random number from -1 to 1

Yule-Walker equations

$$\begin{bmatrix} \gamma_1 \\ \gamma_2 \\ \gamma_3 \\ \vdots \\ \gamma_p \end{bmatrix} = \begin{bmatrix} \gamma_0 & \gamma_{-1} & \gamma_{-2} & \cdots \\ \gamma_1 & \gamma_0 & \gamma_{-1} & \cdots \\ \gamma_2 & \gamma_1 & \gamma_0 & \cdots \\ \vdots & \vdots & \vdots & \ddots \\ \gamma_{p-1} & \gamma_{p-2} & \gamma_{p-3} & \cdots \end{bmatrix} \begin{bmatrix} \varphi_1 \\ \varphi_2 \\ \varphi_3 \\ \vdots \\ \varphi_p \end{bmatrix}$$

correlation vector = correlation matrix * vector of coefficients

$\gamma_1 = \gamma_{-1}$ for most noises

Solve matrix equations

Just like with regular numbers: $a = b*c \rightarrow c = b^{-1}*a$

The same goes for matrices: $A = B*C \rightarrow C = B^{-1}*A$

(but finding B^{-1} (inverse of B) is quite difficult)