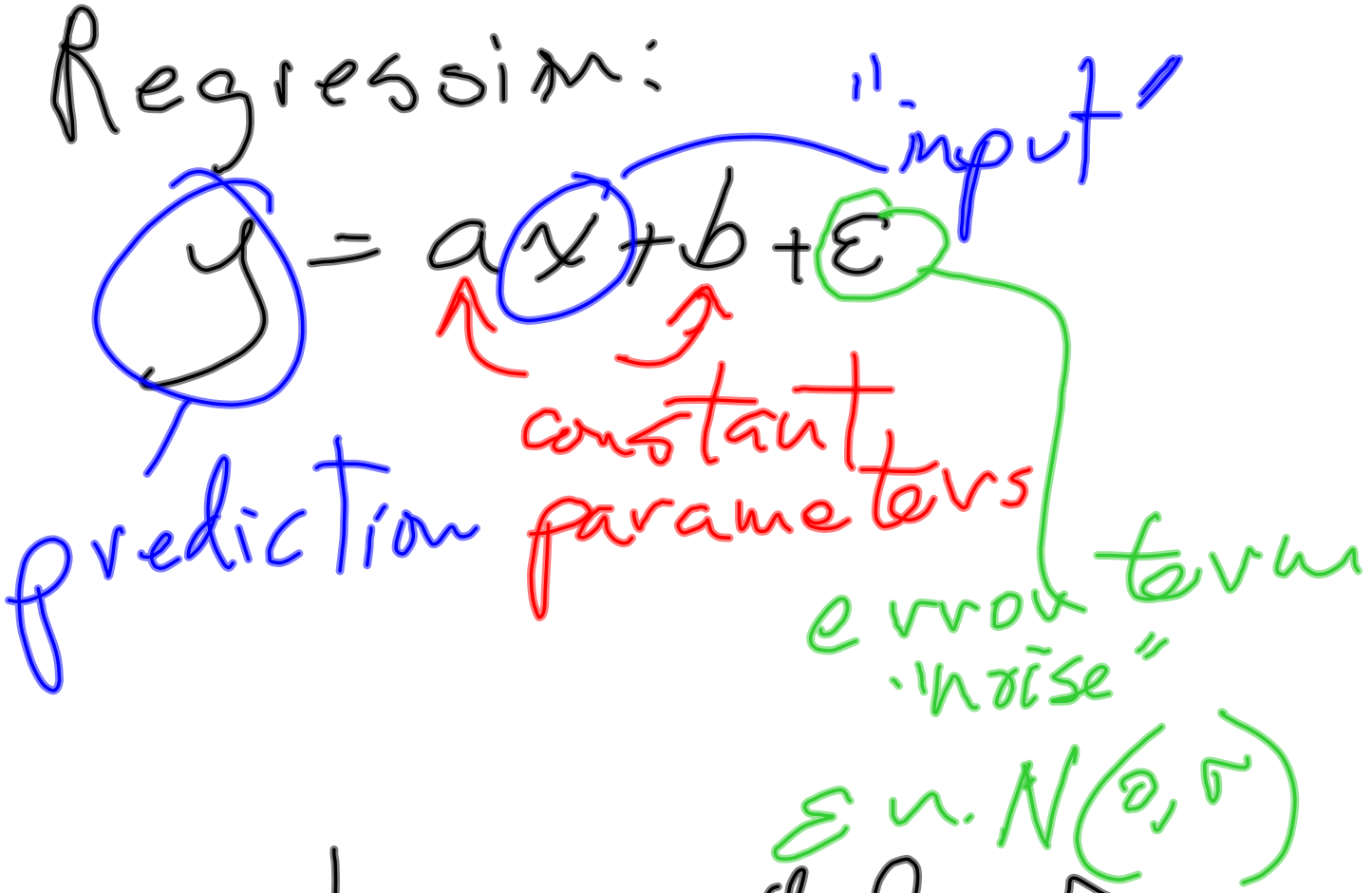
Regression:
$y = ax + b + \varepsilon$
"input"
prediction
constant parameters
error term
"noise"
$\varepsilon \sim N(0, \sigma)$
can be a model of a mechanism

Time Series

$x_1 \; x_2 \; x_3 \; x_4 \; \cdots \; x_n$

Causal?

$x_1 \longrightarrow x_2$

example $x_{t+1} = f(x_t) + \varepsilon_t$

or $x_{t+1} = f(x_t, x_{t-1}) + \varepsilon_t$

Example: AR1

1st order autoregressive

prediction input

$$x_{t+1} = \alpha(x_t - \mu) + \varepsilon_t \sqrt{1-\alpha^2} + \mu$$

noise term

constant parameters

$\varepsilon \sim N(0,1)$

$$E(x) = \mu$$

$$\text{Var}(x) = \sigma^2$$

$$\text{Cov}(x_{t+1}, x_t) = \alpha$$

$$\text{Cov}(x_{t+k}, x_t) = \alpha^k$$