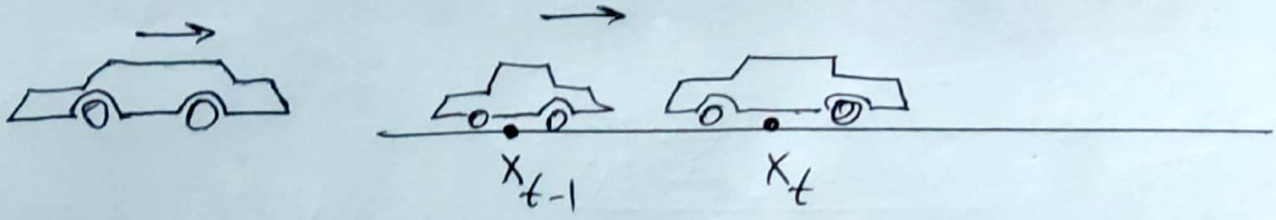
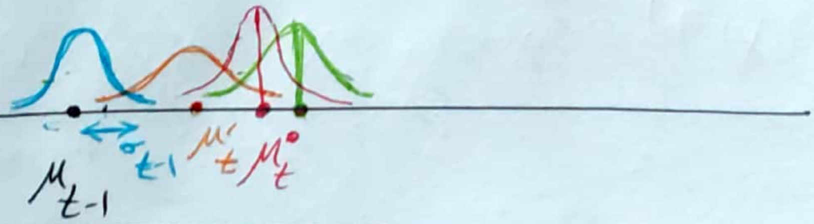
$$N(O_t - BX_t ; 0, \Sigma_o) =$$

$$= \frac{1}{\sim} \exp\left(-\tfrac{1}{2}(O_t - BX_t)^T \Sigma_o^{-1} (O_t - BX_t)\right)$$

$$= N(O_t ; BX_t , \Sigma_o)$$

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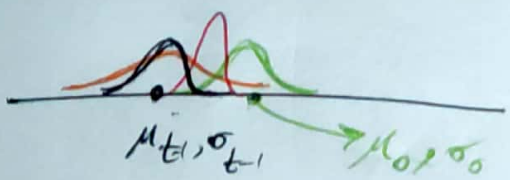
$$X_{t+1} = X_t + \varepsilon_x \longrightarrow \mu_x , \sigma_x$$

$$O_t = X_t + \varepsilon_O \longrightarrow \mu_o , \sigma_o$$




$$\mu'_t = \mu_{t-1}$$

$$\sigma'^2_t = \sigma_t^2 + \sigma_x^2$$

$$K = \frac{\sigma_t^2 + \sigma_x^2}{\sigma_o^2 + \sigma_t^2 + \sigma_x^2}$$

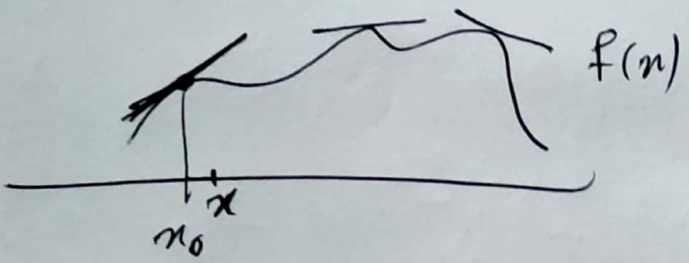
$$K = \frac{\sigma'^2}{\sigma_o^2 + \sigma'^2}$$

$$\mu_t = \mu_{t-1} + \frac{\sigma'^2}{\sigma_o^2 + \sigma'^2}(\mu_o - \mu_{t-1})$$

$$\mu_t = \frac{\sigma_o^2}{\sigma_o^2 + \sigma'^2}\mu_{t-1} + \frac{\sigma'^2}{\sigma_o^2 + \sigma'^2}\mu_o$$

$$\sigma_t^2 = \sigma'_t - \frac{\sigma'^2}{\sigma'^2 + \sigma_o^2}\sigma'^2_t$$

$$\sigma_t^2 = \frac{\sigma_o^2}{\sigma'^2 + \sigma_o^2}\sigma'^2_t$$




$$f(x) = f(x_0) + f'(x_0)(x - x_0)$$

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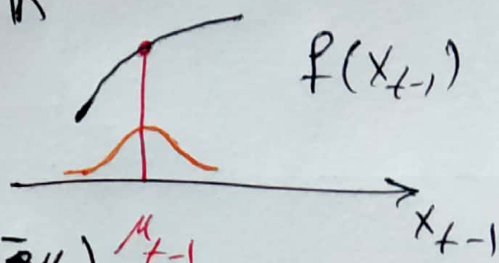
$$f : \mathbb{R} \to \mathbb{R}$$

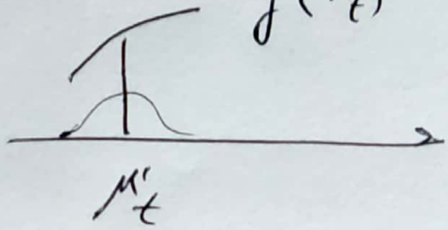
$$X_t = \underbrace{f(X_{t-1})} + \varepsilon_x$$




$$f(X_{t-1}) \simeq \mu_{t-1} + f'(\mu_{t-1})(X_{t-1} - \mu_{t-1})$$

$$f(X_{t-1}) = f'(\mu_{t-1}) X_{t-1} + (\mu_{t-1} - f'(\mu_{t-1})\mu_{t-1})$$

$$\cancel{g(O_t)=} \quad O_t = g(x_t) + \varepsilon_o$$




$$g(x_t) = \mu'_t + g'(\mu'_t)(x_t - \mu')$$

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$$X_t = f(X_{t-1}) + \varepsilon_x \qquad f : \mathbb{R}^n \to \mathbb{R}^n$$

$$f(X_{t-1}) \simeq \mu_{t-1} + J_f\Big|_{\mu_{t-1}} (X_{t-1} - \mu_{t-1})$$

$$f(X) = f\left(\begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}\right) = \begin{bmatrix} f_1(x) \\ f_2(x) \\ \vdots \\ f_n(x) \end{bmatrix}$$

$$J = \begin{bmatrix} \frac{\partial f_1}{\partial x_1} & \frac{\partial f_1}{\partial x_2} & \cdots & \frac{\partial f_1}{\partial x_n} \\ \frac{\partial f_2}{\partial x_1} & \frac{\partial f_2}{\partial x_2} & & \frac{\partial f_2}{\partial x_n} \\ \vdots & \vdots & & \vdots \\ \frac{\partial f_n}{\partial x_1} & & & \frac{\partial f_n}{\partial x_n} \end{bmatrix}$$