

$$C = \sum_i v_i \alpha_i$$

$$\alpha_i = \frac{\exp(k_i^T q)}{\sum_j \exp(k_j^T q)}$$

(a)

when $k_i^T q$ gets particularly big.

eg. $k_i = q = e_i^{\times q}$ then $\exp(1) = 1$ others

$\exp(c)$ is large $k_i^T q \gg k_j^T q \quad j \neq i$

$\{k_i - k_n\} \quad \forall i \neq j \quad k_i^T k_j = 0$

$$\forall i \quad \|k_i\| = 1$$

$$q = \sum_{i=1}^N (k_a + k_b) \quad N \rightarrow \infty$$

(b)

$$\alpha_i \approx \begin{cases} \frac{1}{2} & i = a, b \\ 0 & \text{others} \end{cases}$$

$$q = \frac{1}{\sqrt{2}} (\mu_a + \mu_b)$$

①

$$k_i^T q = \mu_i^T (\mu_a + \mu_b) \frac{1}{\sqrt{2}}$$

$$+ \varepsilon_i^T q$$

$$\|\varepsilon_i^T q\| \leq \|q\|_2 \|\varepsilon_i\|_2 \leq \frac{d}{\sqrt{2}} \sqrt{2} = d \sqrt{2} \rightarrow 0$$

$$k_i^T q \Rightarrow \mu_i^T (\mu_a + \mu_b) \frac{1}{\sqrt{2}}$$

$$k_i^T q = \mu_i^T (\mu_a + \mu_b) \frac{1}{\sqrt{2}}$$

②

$$+ \varepsilon_i^T q$$

$$\text{Var}(\varepsilon_i^T q) = \left(E(\varepsilon_i^T q) \right)^2 + E\left[q^T \varepsilon \varepsilon^T q \right]$$

$$= q^T E(\varepsilon \varepsilon^T) q = q^T \Sigma_i q$$

$$= \frac{1}{\sqrt{2}} (\mu_a^T + \mu_b^T) \left(2I + \frac{1}{2} \mu_a \mu_a^T \right)$$

$$= \sqrt{2} \mu_a^T \mu_a + \frac{1}{2\sqrt{2}} (\mu_a^T \mu_a)^2$$

$$\text{Var}(\varepsilon_i^T q) \rightarrow \frac{1}{2\sqrt{2}} \sigma^2$$

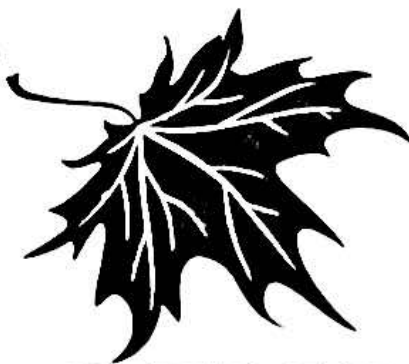
$$\text{Var}(k_i^T q) = \frac{1}{2\sqrt{2}} \sigma^2$$

$$E(k_i^T q) = \mu_i^T (\mu_a + \mu_b) \frac{1}{4\sqrt{2}}$$

$$E(\alpha_i) = \begin{cases} \frac{1}{2} & i = a, b \\ 0 & \text{others} \end{cases} \quad \alpha \rightarrow 0$$

α_a could swing between 0 and 1

Suddenly $C = V_a$, Suddenly $C = V_b$

q_1, q_2 

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$$q_1 = \mu_a \frac{1}{\sqrt{2}} \text{ and } q_2 = \mu_b \frac{1}{\sqrt{2}}$$

$$\textcircled{1} k_1^T q_1 = \frac{1}{\sqrt{2}} \delta_{ia} + \Sigma_i^T q_1$$

$$k_1^T q_2 = \frac{1}{\sqrt{2}} \delta_{ib} + \Sigma_i^T q_2 \Rightarrow \frac{1}{\sqrt{2}} \delta_{ib}$$

$$\text{var}(\Sigma_i^T q_1) = \frac{1}{\sqrt{2}} \mu_a^T \Sigma_a \mu_a$$

$$= \sqrt{2} + \frac{1}{2\sqrt{2}} \Rightarrow \infty$$

C always has $\frac{1}{2} V_b$, $\frac{1}{2} V_a$ might stay
 or swings to average of all V s

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$$x_1 = u_d + u_b, \quad x_2 = u_a, \quad x_3 = u_c + u_b$$

$$K = \frac{1}{\beta} (u_c u_a^T + u_a u_c^T + u_b u_d^T)$$

$$k_1 = u_b, \quad k_2 = u_c, \quad k_3 = u_a$$

$$Q = \frac{1}{\beta} (u_b u_a^T + u_a u_b^T + u_c u_c^T)$$

$$q_1 = u_a, \quad q_2 = u_b, \quad q_3 = u_c$$

$$c_1 = v_1, \quad c_2 = v_1, \quad c_3 = v_2$$

$$V = \frac{1}{\beta} (u_b u_b^T - u_c u_c^T)$$

$$v_1 = u_b, \quad v_2 = 0, \quad v_3 = u_b - u_c$$