

倍率情報下での選択におけるMax-Min戦略の実験による検証

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問題: ロダンの「考える人」が肘をついている場所はどこ?

A: 右脚

B: 左脚

ヒント: 人数

A: 3人

B: 7人



ヒント: 倍率

A: 10/3 倍

B: 10/7 倍

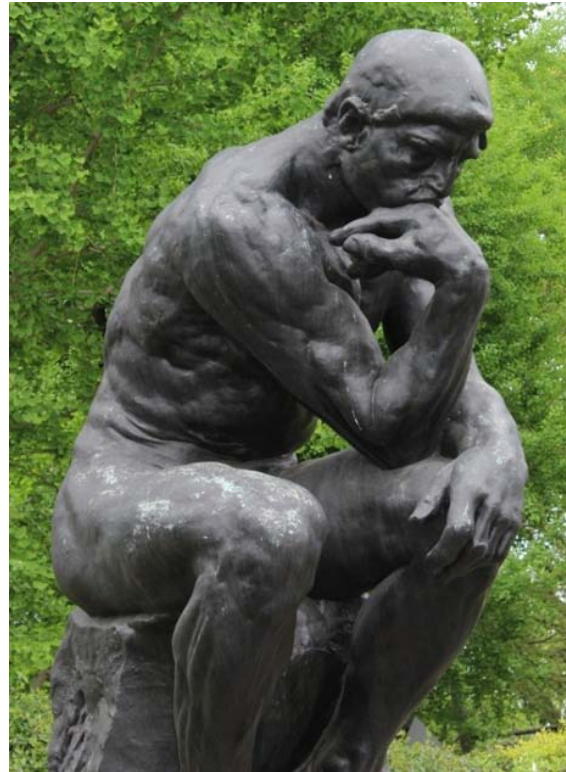
A: 11/4 倍

B: 11/8 倍

正解:B:左脚

ノーヒントでの正答率

グループA $T = 57$	53%
グループB $T = 63$	46%



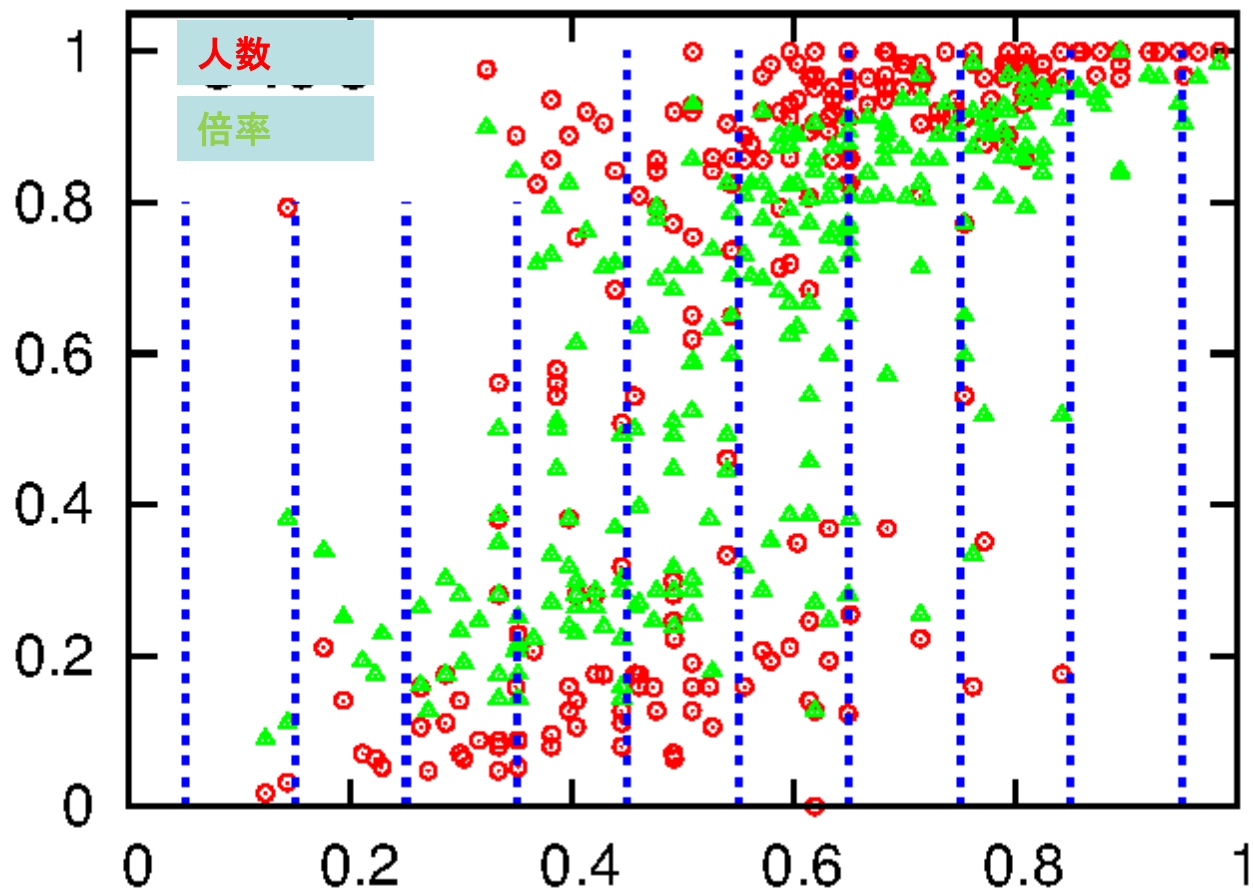
ヒント:人数での正答率

グループA	86%
グループB	16%

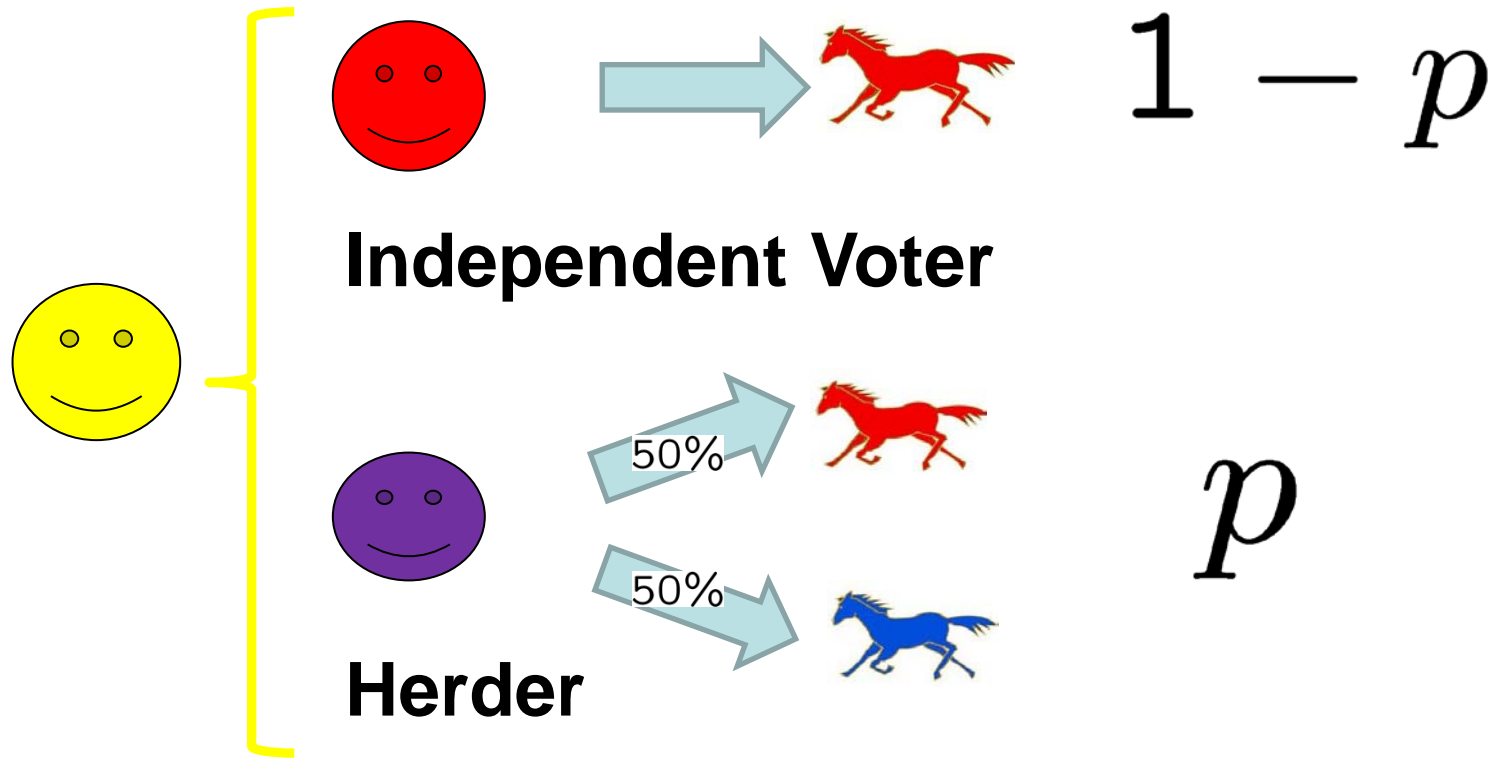
ヒント:倍率での正答率

グループA	74%
グループB	40%

ヒントありでの正答率



ノーヒントでの正答率



平均正答率

$$q = (1 - p) \cdot 1 + p \cdot \frac{1}{2} = 1 - \frac{1}{2}p$$

ヒント:人数

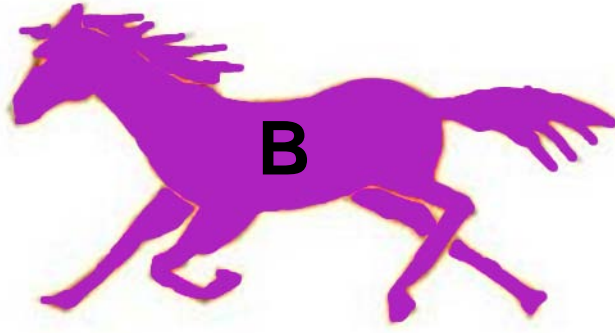
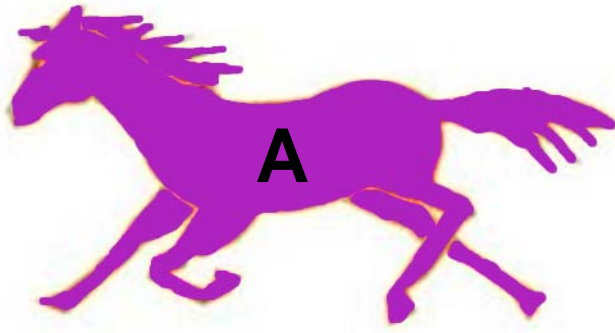
どう選択するのか？



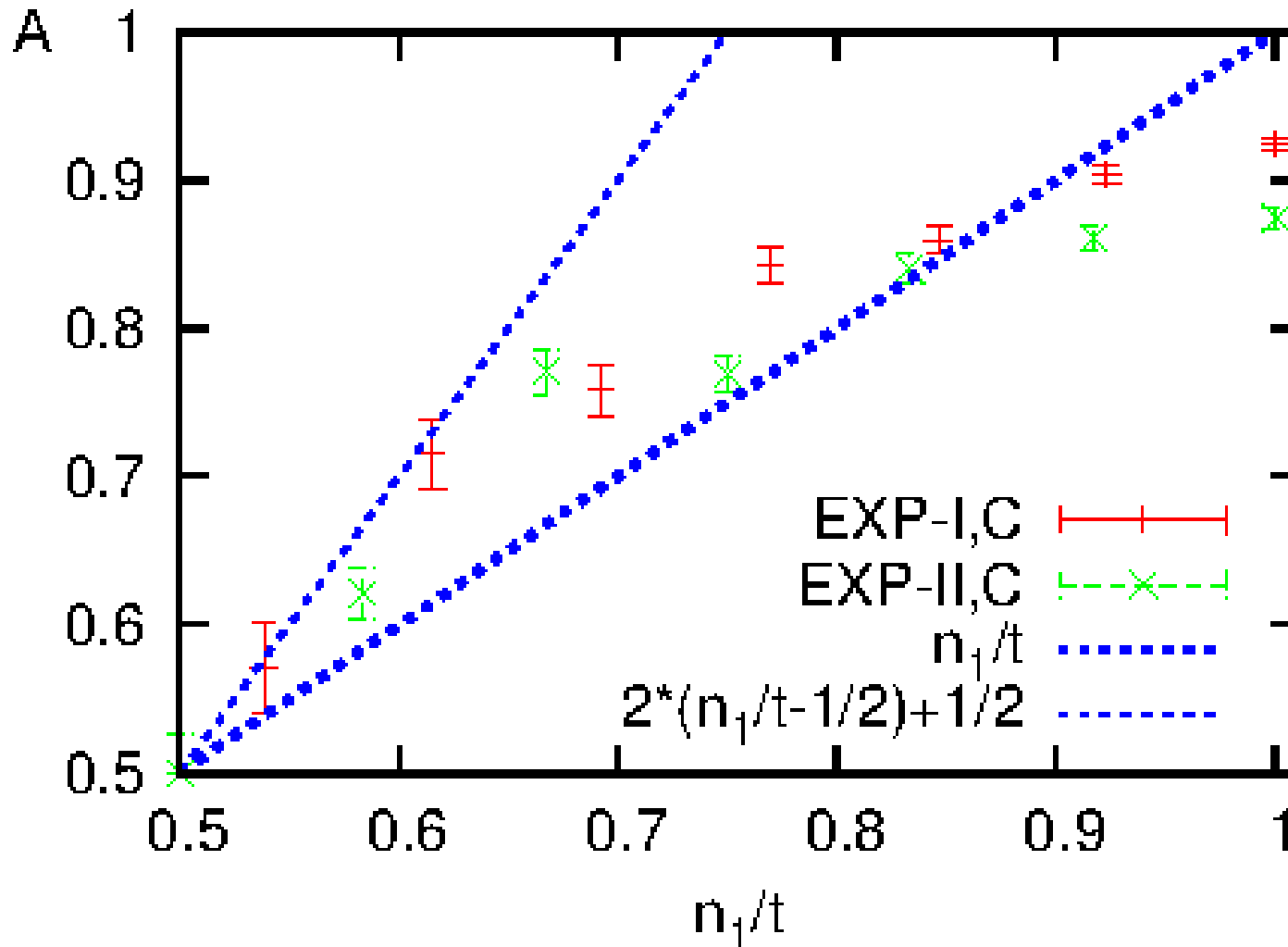
$$\{C_A(t), C_B(t)\}$$



?

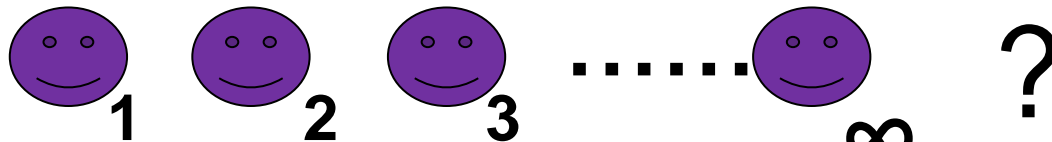


$q_h(t, n_1)$: Herder's Response Function

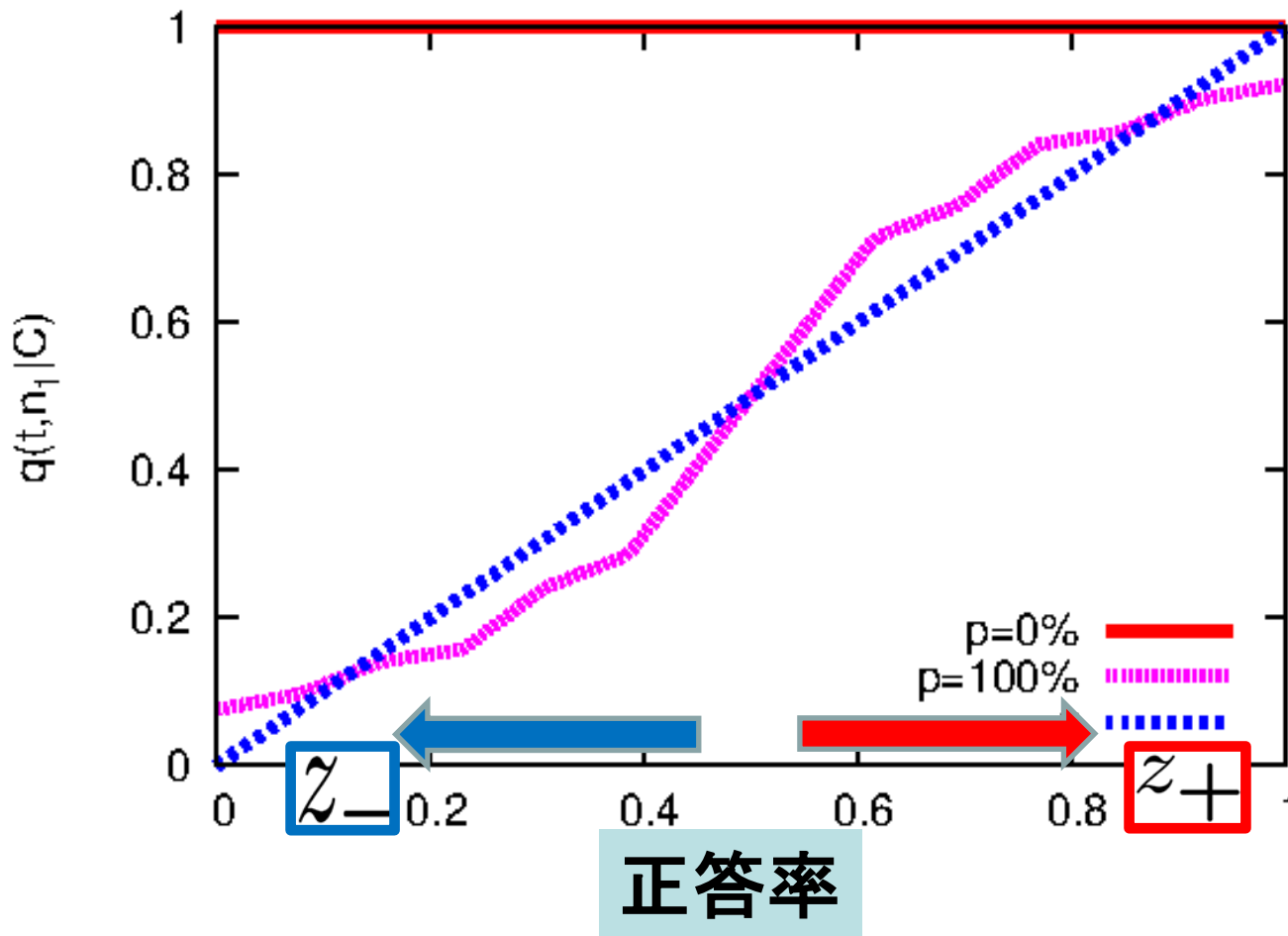
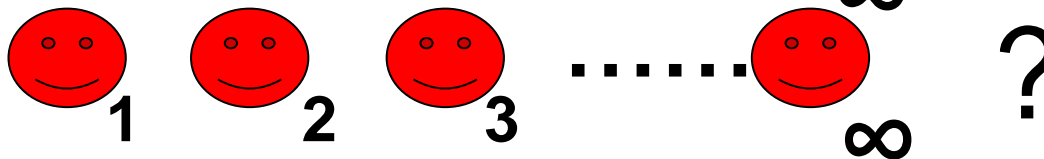


ある選択肢を選んだ人の比率

$p = 100\%$



$p = 0\%$



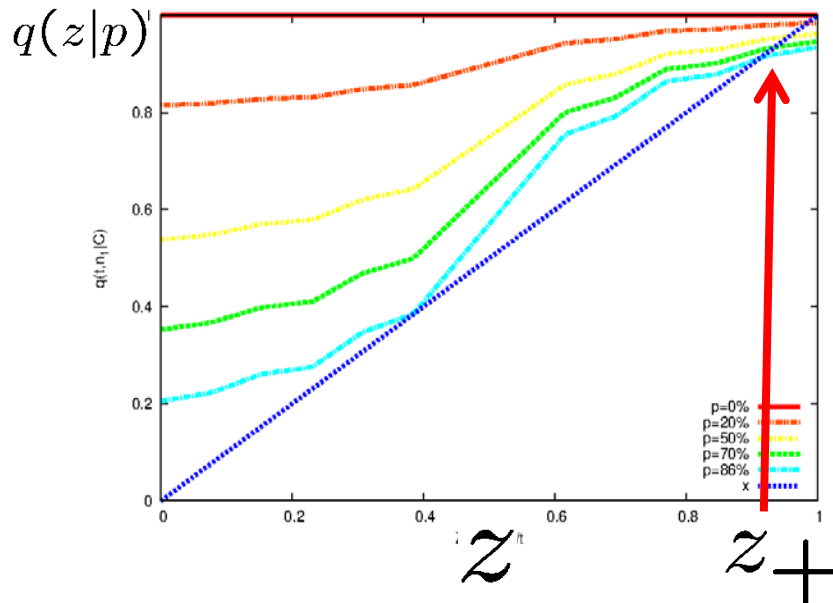
Self-Consistent equation

$$z = (1 - p) \cdot 1 + p \cdot q_h(t, t \cdot z) = q(z|p)$$

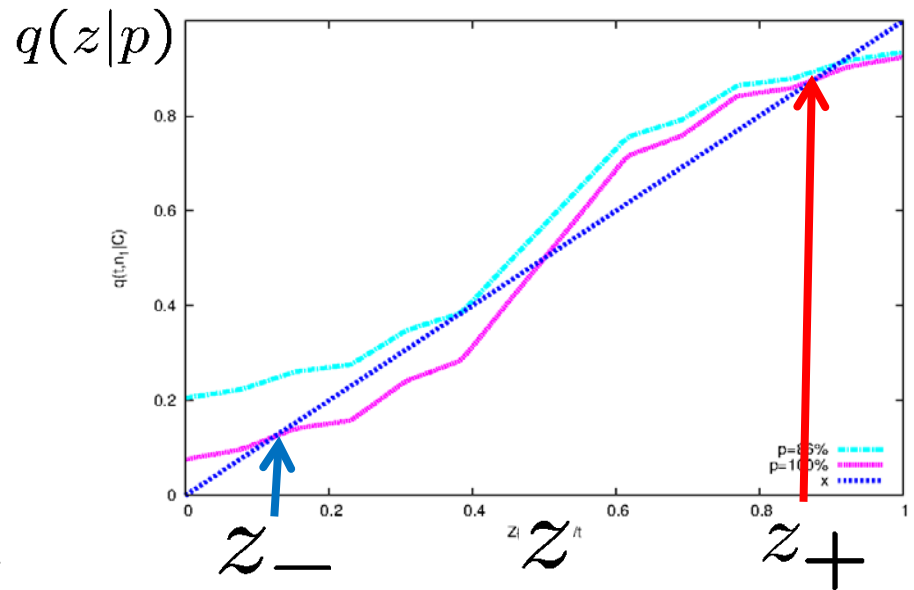


$p \leq p_c = 86\%$

$p \geq p_c = 86\%$



One-Peak Phase



Two-Peak Phase

Information Cascade Phase transition

ヒント:倍率

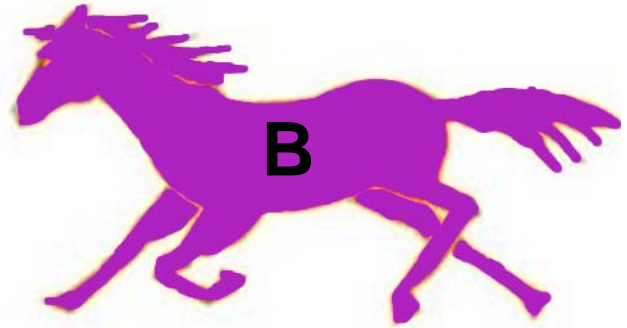
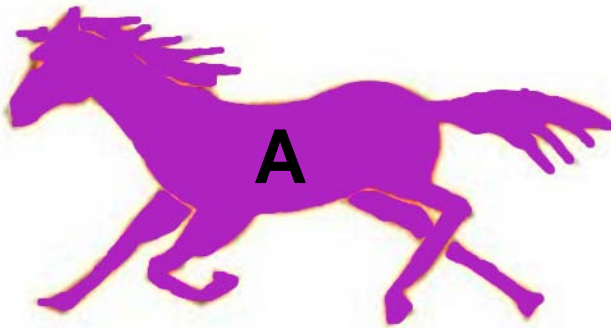
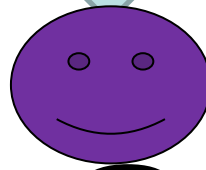


$$\{C_A(t), C_B(t)\}$$

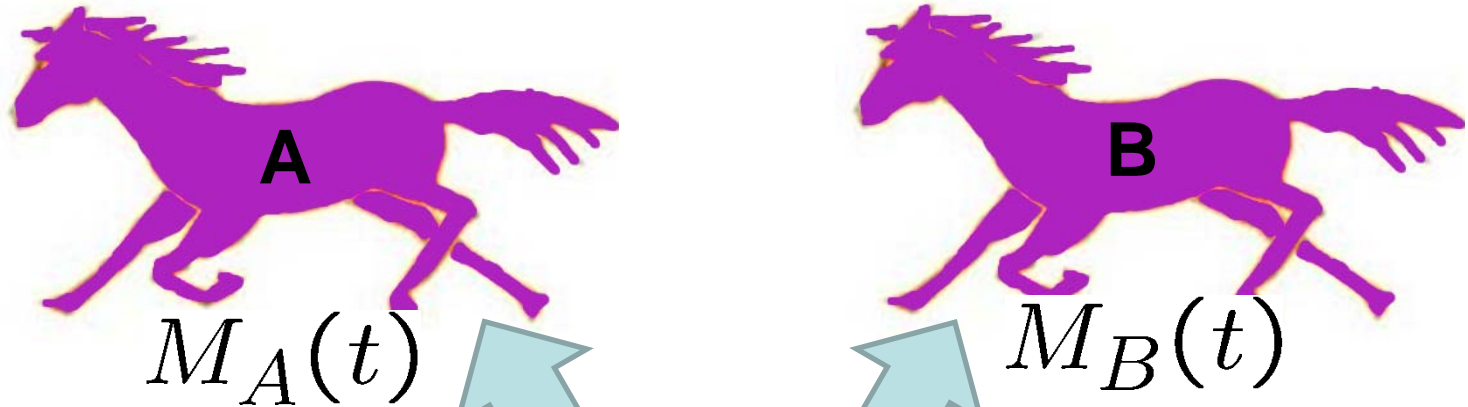
$$M_\alpha = \frac{t + 1}{C_\alpha(t) + 1}$$

$$\{M_A(t), M_B(t)\}$$

ゼロサムゲーム



Optimal Strategy = Max-Min Strategy



$$x_A M_A = x_B M_B$$

$$M_\alpha \propto \frac{1}{C_\alpha}$$



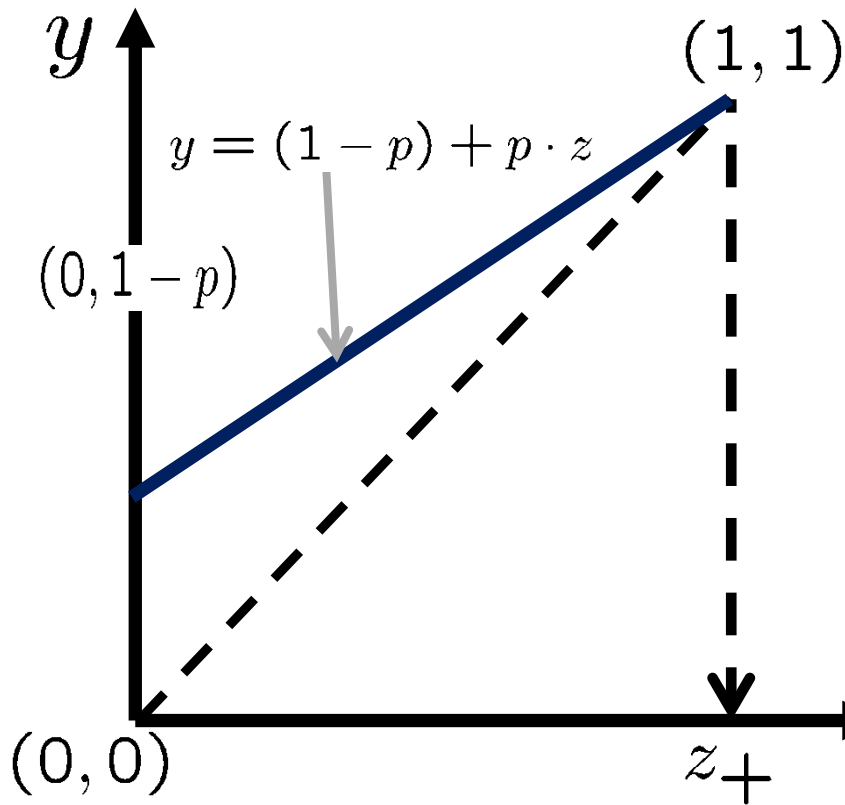
$$x_\alpha \propto C_\alpha$$

Analog Herder

$$z = (1 - p) \cdot 1 + p \cdot q_h(t, t \cdot z) = q(z|p)$$

$$q_h(t, t \cdot z) = z$$

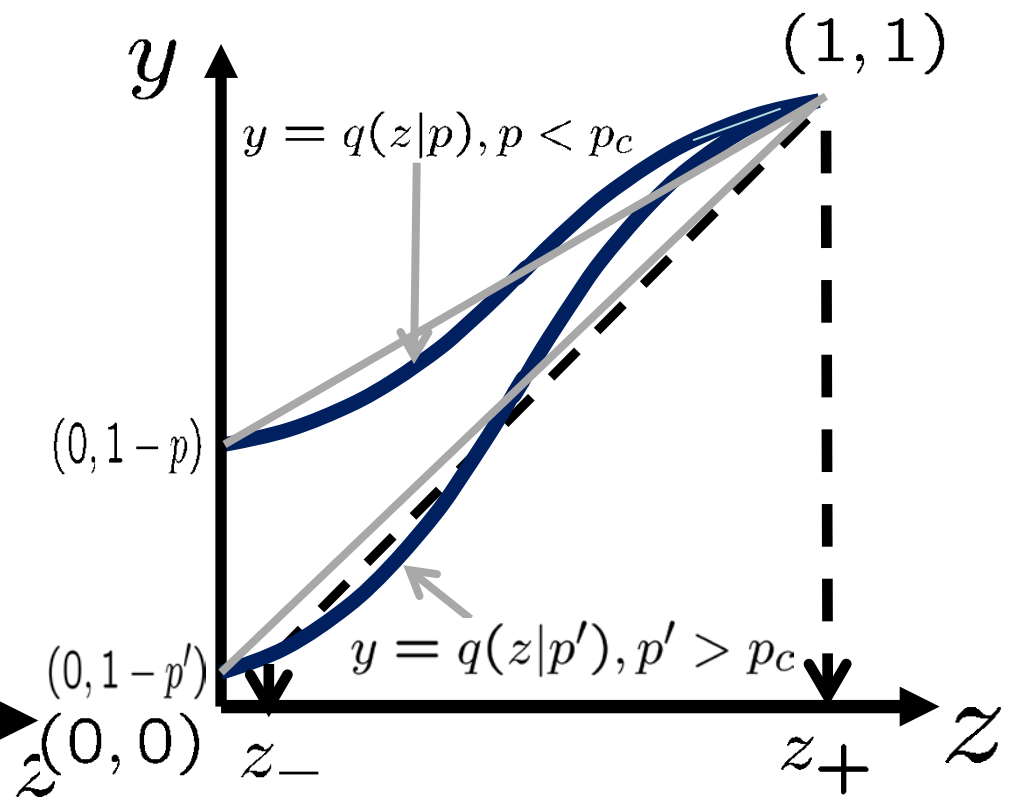
Analog Herder



$$z_+ = 1 \text{ for } p < 1$$

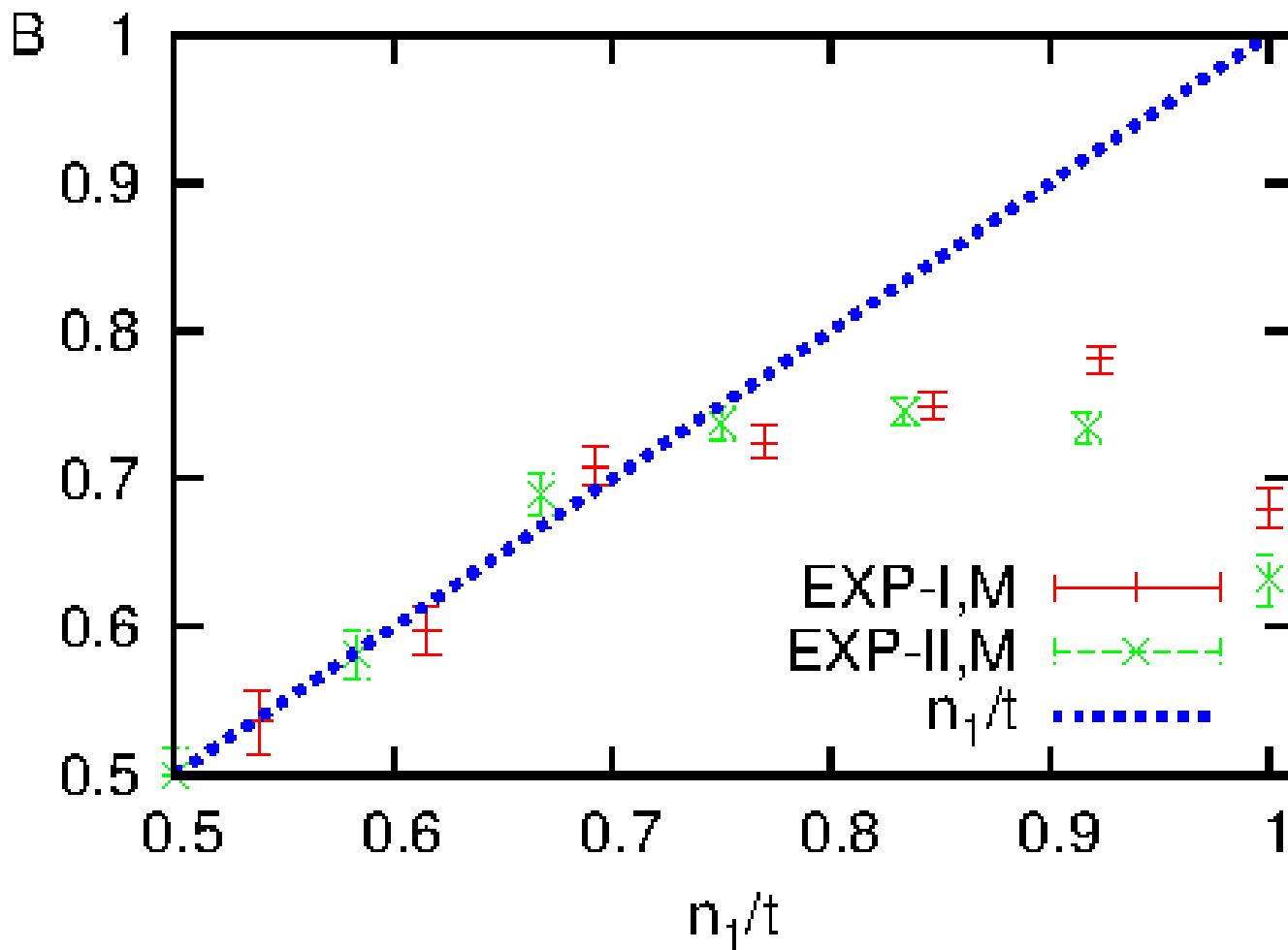
General Herder

$$z_+ = 1$$



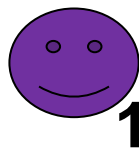
Information Cascade Phase transition

$q_h(t, n_1)$: Herder's Response Function



ある選択肢を選んだ比率

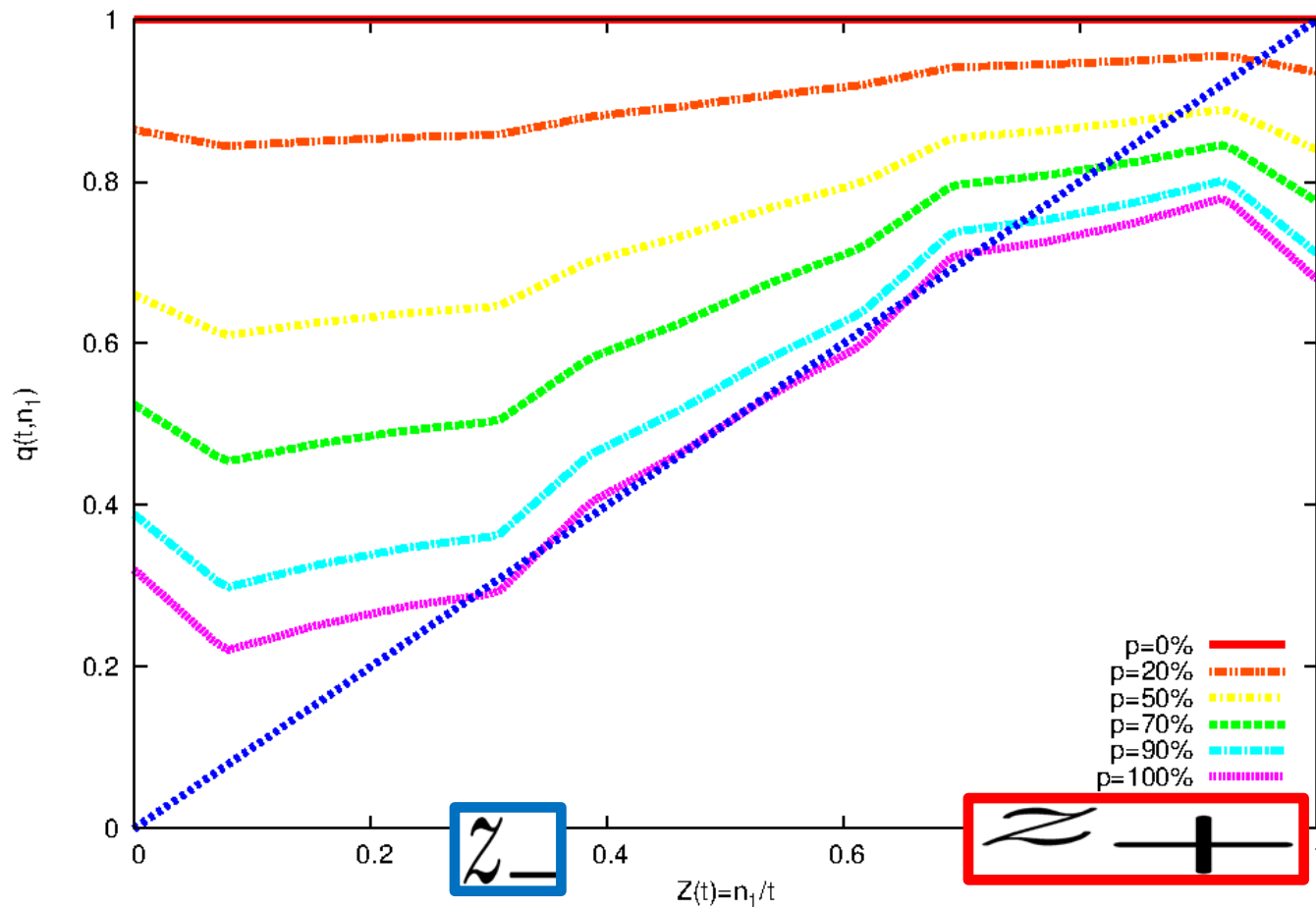
$p < 100\%$



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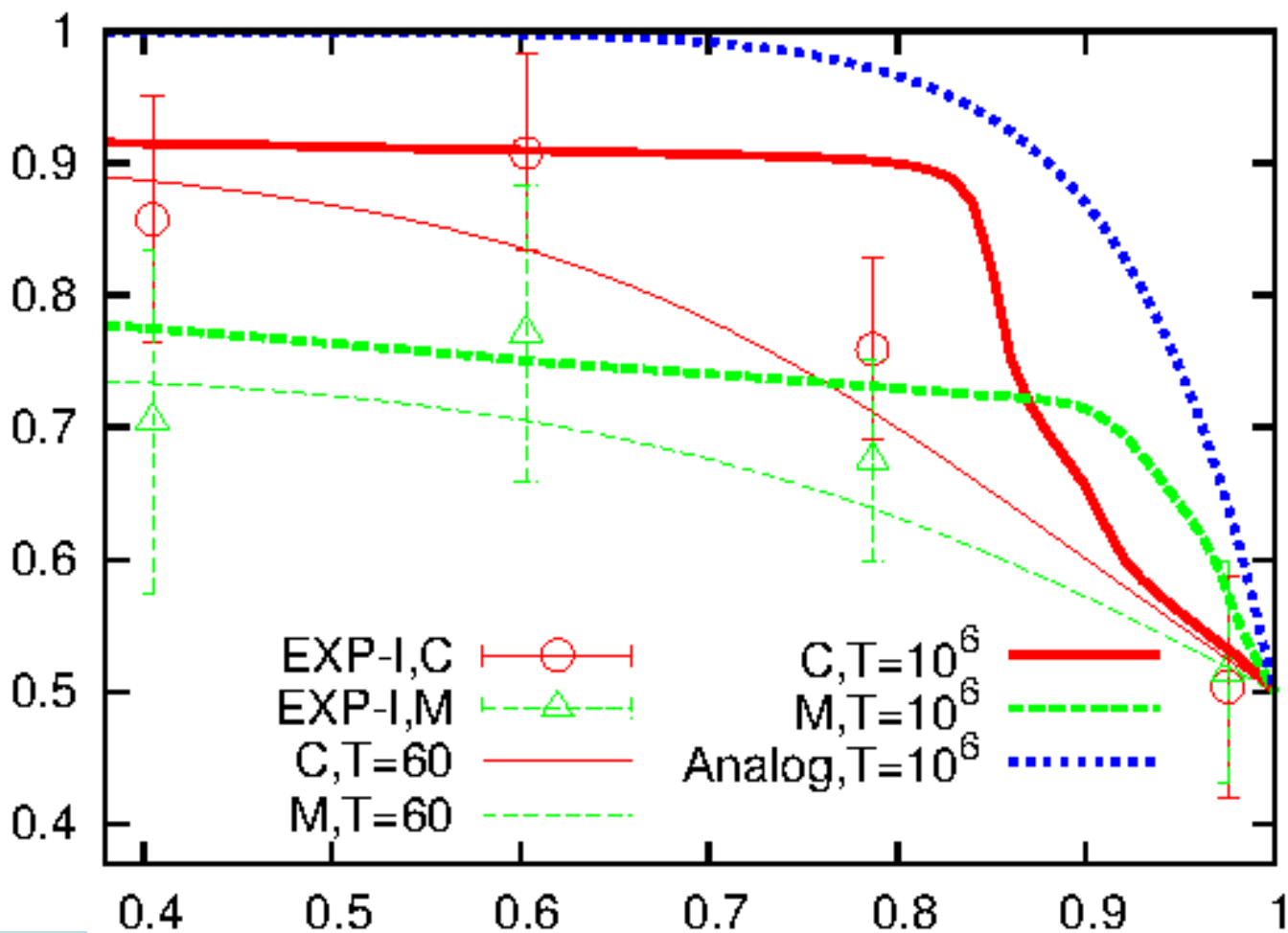


∞



$p_c = 96\%$

ハーダーの正答率



人数

倍率

ハーダーの比率

Summary of Experimental Results

Microscopic Level

Max-Min Strategy $4/3 < m < 4$ & Bias for $m < 4/3$ & $m > 4$

Macroscopic Level

Herder's % of Correct Choice is not so high by the bias.

References

Phase transition to two-peaks phase in an information cascade voting experiment
S.Mori, M. Hisakado and T. Takahashi, Phys.Rev.E86(2012)026109.

Collective Adoption of Max-Min Strategy in an information cascade voting experiment
S.Mori, M. Hisakado and T. Takahashi, arXiv:1211.3193