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 $Y_2 - Y_1$)
 -
 $\delta = Y_1 - Y_2$
)
 []
 Y_1
 Y_2
 δ - (Cross-over)
 ([]
 $1 - \beta$ α) ...
 () : [] ()

$$n = \frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta} \right)^2 \sigma_{\delta}^2}{\delta^2} + \frac{z_{1-\frac{\alpha}{2}}^2}{2}$$
 $Y_1 - Y_2$ σ_{δ}^2)
 $z_{1-\beta}$ $z_{1-\frac{\alpha}{2}}$ ()
 () β $\frac{\alpha}{2}$
 t (Concordant)
 $Y_2 - Y_1$ [] (Discordant)
 α
 () []
 ρ $\sigma_{\delta}^2 = 2\sigma^2(1 - \rho)$ σ^2
 [] $Y_2 - Y_1$
 ρ ()
 (- / /)
 []



$$d_i \quad \cdot \quad (-$$

$$t \quad z$$

() : $\sigma^2 \quad \mu = Y_1 - Y_2$

$$\mu = \sum_{j=1}^{2(K-1)} d_j \pi_j \quad \sigma^2 = \sum_{j=1}^{2(K-1)} d_j^2 \pi_j - \mu^2$$

[]

$\sigma_\delta^2 \quad \delta \quad () \quad \sigma^2 \quad \mu$

$n_d \quad () \quad d_i + d_j > 0 \quad P_0$

$K \quad H_0$

$$\frac{K}{K^2} = \frac{1}{K}$$

$P_0 = 0.5$

$$1 - \frac{1}{K} = \frac{K-1}{K}$$

P_1

() :

$$n = \frac{n_d}{\frac{K-1}{K}} = \frac{Kn_d}{K-1}$$

$1 - \beta \quad \alpha$

() :

$$n = \frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta} \right)^2}{3(P_1 - 0.5)^2}$$

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$(K > 2)K$

$d_i = Y_{i1} - Y_{i2} \quad i \quad Y_{i2} \quad Y_{i1}$

$2(K-1)$

d_i

$\pi_{00} \quad \pi_{11} :$

π_i

$\pi_{01} \quad \pi_{10} :$

		/
π_{10}	π_{00}	
π_{11}	π_{01}	

$$\pi_{01} = \frac{\psi}{\psi + 1};$$

$$\psi = \frac{\pi_{10}}{\pi_{01}}$$

$$\pi_{10} = \frac{1}{\psi + 1}$$

$$1 - \beta \quad \alpha$$

() : []

$$\sigma^2 \quad \mu = \pi_{01} - \pi_{10}$$

() : []

$$\mu = \frac{\psi - 1}{\psi + 1} \quad \sigma^2 = \frac{4\psi}{(\psi + 1)^2}$$

$$n_d = \frac{\left(z_{1-\frac{\alpha}{2}}(\psi + 1) + z_{1-\beta} \sqrt{(\psi + 1)^2 - (\psi - 1)^2 \pi_d} \right)^2}{(\psi - 1)^2}$$

$$\sigma_\delta^2 \quad \sigma^2 \quad \delta \quad \mu$$

$$\pi_d = \pi_{01} + \pi_{10} \quad n_d \quad ($$

()

() :

$$n_d = \frac{4\psi \left(z_{1-\frac{\alpha}{2}} + z_{1-\beta} \right)^2}{(\psi - 1)^2} + \frac{z_{1-\frac{\alpha}{2}}^2}{2}$$

$$\pi \quad n = \frac{n_d}{\pi_d} \quad ($$

p

(-

\psi

\psi

K

k	...			
π_{1k}	...	π_{12}	π_{11}	
π_{2k}	...	π_{22}	π_{21}	
\vdots	\vdots	\vdots	\vdots	\vdots
π_{kk}	...	π_{k2}	π_{k1}	k

$$\pi_{22} \quad \pi_{11}$$

() K

$\pi_{KK} \dots$

$$n_K \dots n_2 \quad n_1$$

n) n n

n n

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$$\sigma_\delta = 2.48 \approx 2.5 \quad \delta = 3 \quad \beta = 0.1 \quad \alpha = 0.05$$

$$n = 11$$

[] (

c

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$$1 + c$$

/ /

) /

p_1

$$\frac{2c}{1+c}$$

n_E

$$d_i + d_j > 0$$

$$n_u = \frac{n_E(1+c)}{2c}$$

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$$\beta = 0.05 \quad \alpha = 0.05$$

n_u

$$n \approx 40 :$$

()

$$n_c = cn_u$$

[]

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$$n_T = n_c + n_u$$

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(VGB)

d_i

/ /

/ / :

π_i

()
 $n_d = 23.44 \approx 24$

()
 $n = 445$

() / / /
 $\sigma^2 = 2.12 \quad \mu \approx 3.09$
 $\sigma^2 \quad \mu$

$n_d = 7$ ()

:

$n = \frac{kn_d}{k-1} = \frac{5}{4} \times 7 = 8.79 \approx 9$

$n_c = 3270 \quad n_u = 327 \quad c = 10$

$n_t = 3270 + 327 = 3597$

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(Conservative)

		/

$\alpha = 0.05 \quad \psi = \frac{11}{3}$

$\delta =$
 $1 - \beta = / \quad \alpha = /$

() $1 - \beta = 0.9$

$\pi_d \quad n_d = 31.7 \approx 32$

$n \approx 593$

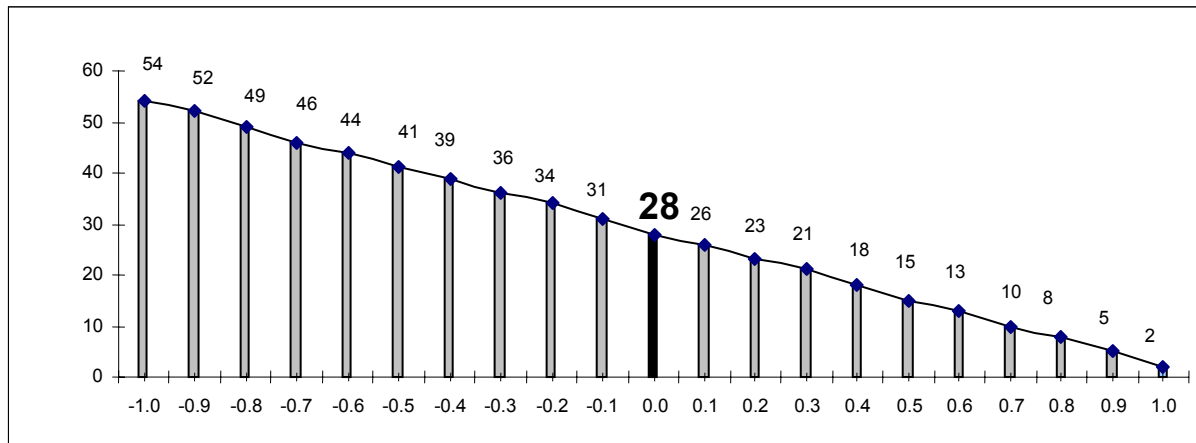
$\sigma^2 =$

ρ (-)

ρ

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ρ



$(\rho =)$

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$(- / /) \rho$

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