13.   Egypt : n=139   Europe: m=1000.

Длина:

$l_{Eg} = 5.722$ мм

$l_{Eu} = \,$ 6.161 ~~6.162~~ мм

$$H_0 : \mathcal{b}_{Eg} = \mathcal{b}_{Eu} \quad H_1 : \mathcal{b}_{Eg} \neq \mathcal{b}_{Eu} \quad \alpha = 0.05$$

$$S^2_{Eg} = \frac{n}{n-1} \hat{\mathcal{b}}^2_{Eg} = 32.9785$$

$$S^2_{Eu} = \frac{m}{m-1} \hat{\mathcal{b}}^2_{Eu} = 37.9959$$

$$\tilde{\Delta} = \frac{S^2_{Eg}}{S^2_{Eu}} = 0.86795 \quad \Delta \sim F(138, 999)$$

$$p\text{-value} = P(\Delta \geq \tilde{\Delta} | H_0) = \int_{\tilde{\Delta}}^{\infty} q(t)\,dt \approx 0.874661$$

$$p\text{-value} \in (0.025, 0.975)$$

Нет оснований отвергнуть H_0

Ширина:

$$\tilde{\mathcal{b}}_{Eg} = 4.612$$

$$\mathcal{b}_{Eu} = 5.055$$

$$H_0 : \mathcal{b}_{Eg} = \mathcal{b}_{Eu} \quad H_1 : \mathcal{b}_{Eg} \neq \mathcal{b}_{Eu} \quad \alpha = 0.05$$

$$S^2_{Eg} = 21.42468$$

$$S^2_{Eu} = 25.57886$$

$$\tilde{\Delta} = 0.837602 \quad \Delta \sim F(138, 999)$$

p-value $\simeq 0.919691$

p-value $\in (0.025, 0.975)$

Нет оснований отвергнуть H_0.

$$W = P\left(\frac{S_{Eg}^2}{S_{Eu}^2} > U_{1-\alpha/2} \mid H_1\right) + P\left(\frac{S_{Eg}^2}{S_{Eu}^2} < U_{\alpha/2} \mid H_1\right) =$$

$$= P\left(\frac{S_{Eg}^2 \cdot \sigma_{Eu}^2}{S_{Eu}^2 \cdot \sigma_{Eg}^2} > \underbrace{U_{1-\alpha/2} \frac{\sigma_{Eu}^2}{\sigma_{Eg}^2}}_{a_2(\theta)}\right) + P\left(\frac{S_{Eg}^2}{S_{Eu}^2} \cdot \frac{\sigma_{Eu}^2}{\sigma_{Eg}^2} < \underbrace{U_{\alpha/2} \frac{\sigma_{Eu}^2}{\sigma_{Eg}^2}}_{a_1(\theta)}\right)$$

$$\underbrace{\frac{S_{Eg}^2}{S_{Eu}^2} \cdot \frac{\sigma_{Eu}^2}{\sigma_{Eg}^2}}_{\theta} \sim F(138, 999)$$

$$W = \int_{a_2(\theta)}^{+\infty} q(t)\,dt + \int_{0}^{a_1(\theta)} q(t)\,dt = W(\theta) =$$

$$= 1 - F(a_2(\theta)) + F(a_1(\theta))$$

График $W(\theta)$ — см. файл $W.png$