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1. Population : binomial distribution
Sample : normal distribution (By CLT)

$1000 \times 0.55 = 550 = \mu$

$\sigma = \sqrt{npq} = 15.72$

$Z_1 = \frac{529.5 - 550}{15.72} = -1.3$

$Z_2 = \frac{560.5 - 550}{15.72} = 0.67$

$P(530 \le \bar{x} \le 560) = P(-1.3 \le 0.67) = 0.6518$

2.

$\begin{cases} H_0 : \sigma^2 = 1 \\ H_1 : \sigma^2 \neq 1 \end{cases}$

$\frac{(n-1)s^2}{\sigma_0^2} = \frac{9 \times 1.65}{1} = 47.85$ (雙尾卡方檢定 $\alpha = 0.05$)

$\chi^2_{9, 0.025} = 45.722$

$\frac{(n-1)s^2}{\sigma_0^2} > \chi^2_{9, 0.025} = 45.722$ (不在95%內)

By chi-square ⇒ Reject H_0，有證據可說明 $\sigma^2 \neq 1$ (H_1 accept)

3. $x = \pm\sqrt{y}$

$x_1 = \sqrt{y}$, $x_2 = -\sqrt{y} \Rightarrow J_1 = \frac{1}{2\sqrt{y}}$, $J_2 = \frac{-1}{2\sqrt{y}}$

$$\begin{cases} f(y_1) = \frac{2(\sqrt{y}+1)}{9} \cdot \frac{1}{2\sqrt{y}} \\ f(y_2) = \frac{2(-\sqrt{y}+1)}{9} \cdot \frac{1}{2\sqrt{y}} \end{cases}$$

$$\begin{cases} f(y) = \frac{2}{9\sqrt{y}}, & 0 < y < 1 \\ f(y) = \frac{2(\sqrt{y}+1)}{9} \cdot \frac{1}{2\sqrt{y}} = \frac{\sqrt{y}+1}{9\sqrt{y}}, & 1 < y < 4 \end{cases}$$

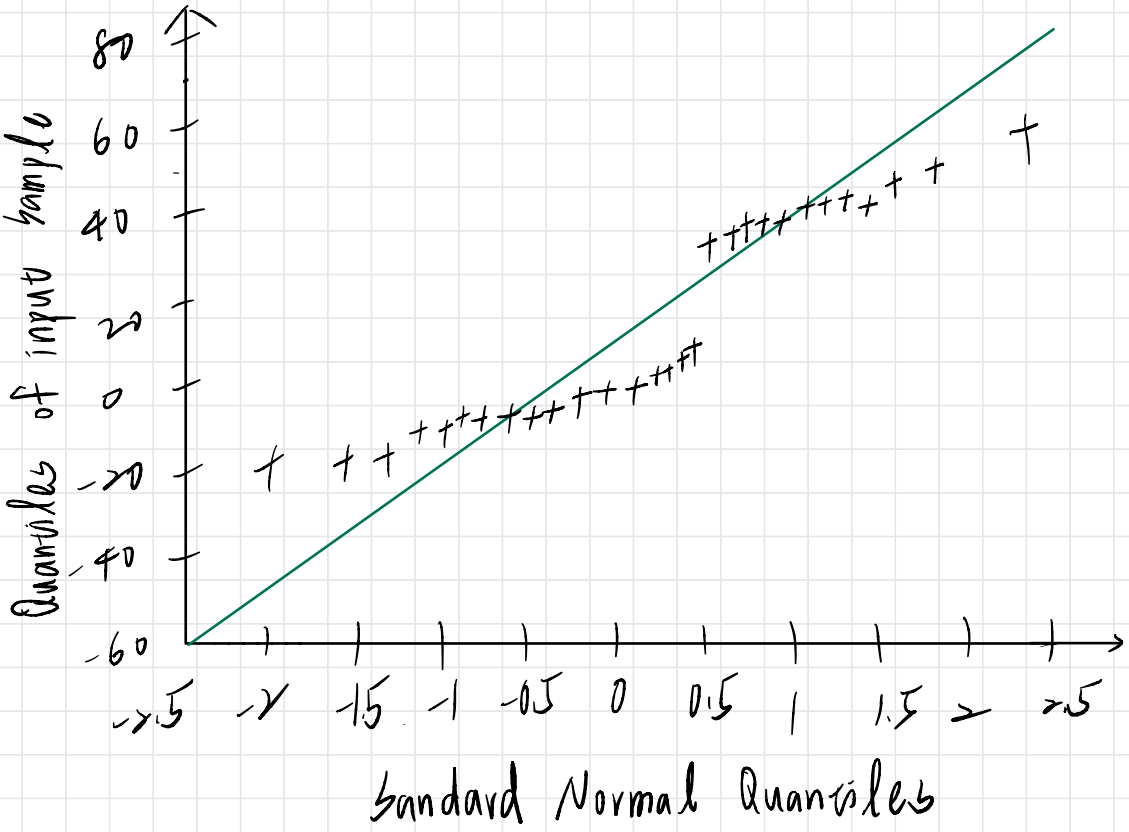
$$f(y) = \begin{cases} \frac{2}{9\sqrt{y}}, & 0 < y < 1 \\ \frac{\sqrt{y}+1}{9\sqrt{y}}, & 1 < y < 4 \end{cases} \#$$

4. $q_{0,1}(f_i)$ where $f_i = \frac{i - \frac{3}{8}}{n + \frac{1}{4}}$

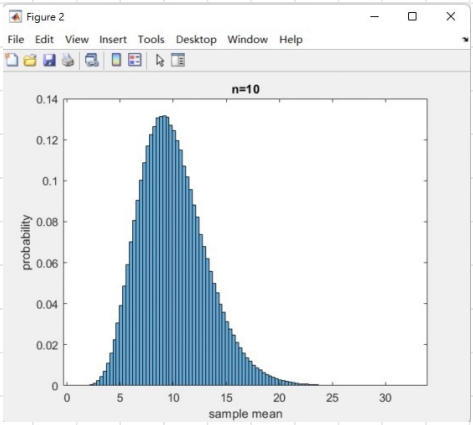
f_i	$q_{0,1}(f_i)$
-19.6	0.021
-19.6	0.054
-19.3	0.087
-14.8	0.120
-13.6	0.153
-12.4	0.186
-11.2	0.219
-10.4	0.252
-10.3	0.285
-10.1	0.31817
-8.5	0.351
-7.7	0.384
-7.6	0.417
-7.5	0.450
-6.1	0.483
-5.3	0.517
-2	0.550
-1.4	0.583
21.7	0.616
24.7	0.649
25.4	0.682
25.8	0.715
26	0.748

f_i	$q_{0,1}(f_i)$
28.2	0.780
28.7	0.814
30.4	0.847
30.4	0.880
33.2	0.913
35.6	0.946
43.2	0.979

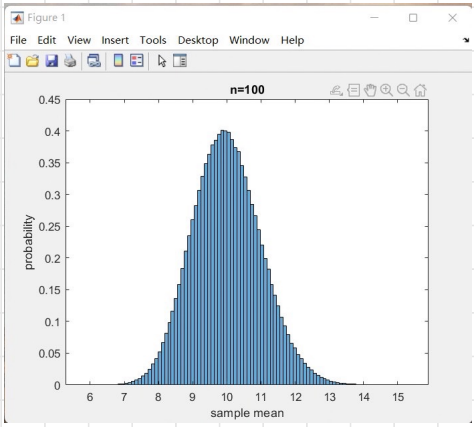
Quantile Quantile Plot



5.



$\bar{x}$ distribution 的最大值可用來預估 μ



$n=10$ ⇒ 最大的 probability 落在約 $\bar{x}=9$

$n=100$ ⇒ 則為 9.8 附近

可推估當 n 越大，$\bar{x}$ 越接近 μ，預估越精準

6.1

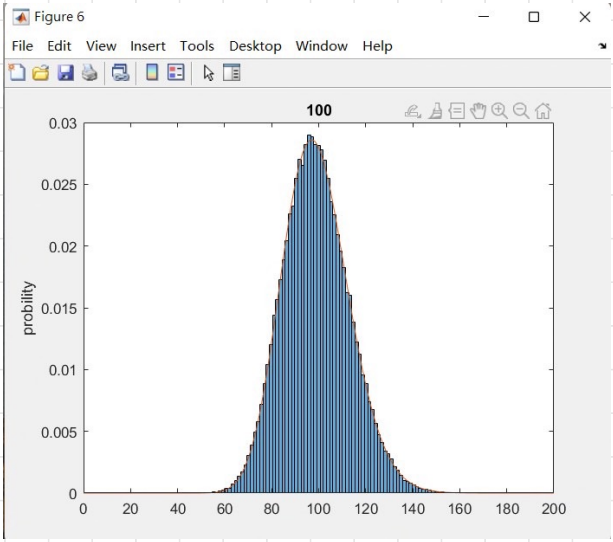


Figure 6
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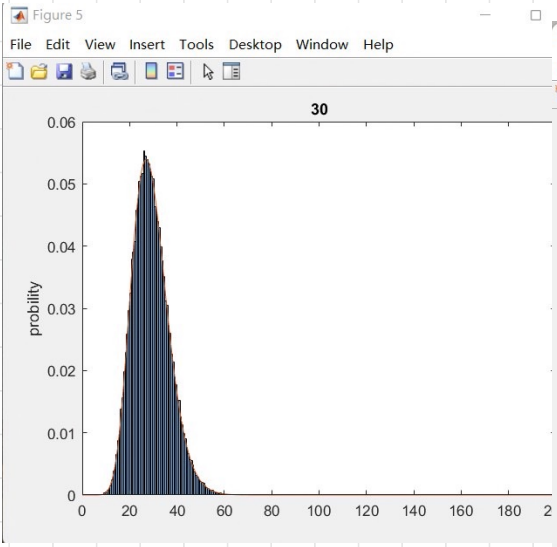
100
probility
0.03
0.025
0.02
0.015
0.01
0.005
0
0 20 40 60 80 100 120 140 160 180 200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probility
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0.05
0.04
0.03
0.02
0.01
0
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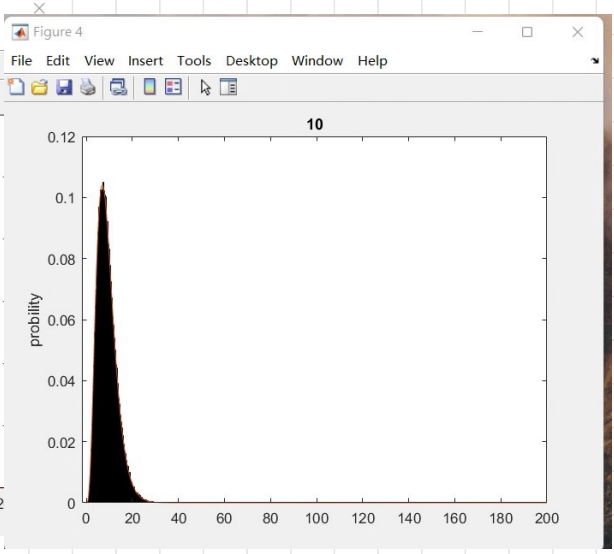
Figure 4
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10
probility
0.12
0.1
0.08
0.06
0.04
0.02
0
0 20 40 60 80 100 120 140 160 180 200

6.2