資訊 113 張庭菀 F74094075

**5.14** The percentage of wins for the Chicago Bulls basketball team going into the playoffs for the 1996–97 season was 87.7. Round the 87.7 to 90 in order to use Table A.1.

(a) What is the probability that the Bulls sweep (4-0) the initial best-of-7 playoff series?

(b) What is the probability that the Bulls win the initial best-of-7 playoff series?

(c) What very important assumption is made in answering parts (a) and (b)?

(a)

$b(X;4,0.9)$ for $X=0,1,2,3,4$

$P(X\geq 4) = 1 - P(X\leq 3)$

$= 1 - \sum_{X=0}^{3} b(X;4,0.9)$

$= 1 - 0.3439$

$= 0.6561$ #

(b)

(4-0) : $0.6561$

(4-1) : $\binom{4}{3} 0.9^4 0.1 = 0.2624$

(4-2) $\binom{5}{3} 0.9^4 0.1^2 = 0.0656$

(4-3) $\binom{6}{3} 0.9^4 0.1^3 = 0.0131$

$0.6561 + 0.2624 + 0.0656 + 0.0131 = 0.9972$ #

(c)

All trials are independent.

**5.26** Assuming that 6 in 10 automobile accidents are due mainly to a speed violation, find the probability that among 8 automobile accidents, 6 will be due mainly to a speed violation

(a) by using the formula for the binomial distribution;

(b) by using Table A.1.

$p = 0.6$

(a)

$$b(6; 8, 0.6) = \binom{8}{6} 0.6^6 0.4^2 = 0.209 \#$$

(b)

$$\sum_{x=0}^{6} (x; 8, 0.6) - \sum_{x=0}^{5} (x; 8, 0.6) = 0.8936 - 0.6846 = 0.209 \#$$

**5.50** Find the probability that a person flipping a coin gets

(a) the third head on the seventh flip;

(b) the first head on the fourth flip.

(a)

$$b^*(7; 3, 0.5) = \binom{6}{2} 0.5^3 0.5^4 = 0.1172 \#$$

(b)

$$b^*(4; 1, 0.5) = \binom{3}{0} 0.5 \times 0.5^3 = 0.0625 \#$$

**5.56** On average, 3 traffic accidents per month occur at a certain intersection. What is the probability that in any given month at this intersection

(a) exactly 5 accidents will occur?

(b) fewer than 3 accidents will occur?

(c) at least 2 accidents will occur?

(a)

$$P(5; 3) = \sum_{x=0}^{5} P(x; 3) - \sum_{x=0}^{4} P(x; 3) = 0.9161 - 0.8153 = 0.1008 \#$$

(b)

$$P(X < 3; 3) = \sum_{x=0}^{2} P(x; 3) = 0.4232 \#$$

(c)

$$P(X \geq 2; 3) = 1 - \sum_{x=0}^{1} P(x; 3) = 1 - 0.1991 = 0.8009 \#$$

**5.80** Service calls come to a maintenance center according to a Poisson process, and on average, 2.7 calls are received per minute. Find the probability that
(a) no more than 4 calls come in any minute;
(b) fewer than 2 calls come in any minute;
(c) more than 10 calls come in a 5-minute period.

(a) $\sum_{x=0}^{4} (x; 2.7) = 0.8629$ #

(b) $\sum_{x=0}^{1} (x; 2.7) = 0.2486$ #

(c) $1 - \sum_{x=0}^{10} (x; 13.5) = 1 - 0.2111 = 0.7888$ #

Matlab

1a

可分別輸入 x, n, p
程式記算後會輸出答案.

1b.

可分別輸入 x, t, λ
程式記算後會輸出答案.

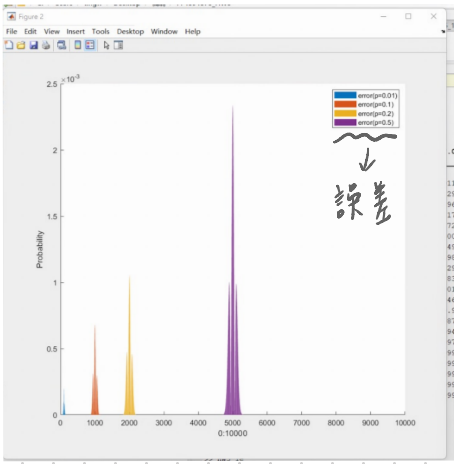
1c

| n | r | p = 0.1 | p = 0.2 | p = 0.25 | p = 0.3 | p = 0.4 | p = 0.5 | p = 0.6 | p = 0.7 | p = 0.8 | p = 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0.9 | 0.8 | 0.75 | 0.7 | 0.6 | 0.5 | 0.4 | 0.3 | 0.2 | 0.1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 0 | 0.81 | 0.64 | 0.5625 | 0.49 | 0.36 | 0.25 | 0.16 | 0.09 | 0.04 | 0.01 |
| | 1 | 0.99 | 0.96 | 0.9375 | 0.91 | 0.84 | 0.75 | 0.64 | 0.51 | 0.36 | 0.19 |
| | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 0 | 0.729 | 0.512 | 0.4219 | 0.343 | 0.216 | 0.125 | 0.064 | 0.027 | 0.008 | 0.001 |
| | 1 | 0.972 | 0.896 | 0.8438 | 0.784 | 0.648 | 0.5 | 0.352 | 0.216 | 0.104 | 0.028 |
| | 2 | 0.999 | 0.992 | 0.9844 | 0.973 | 0.936 | 0.875 | 0.784 | 0.657 | 0.488 | 0.271 |
| | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | 0 | 0.6561 | 0.4096 | 0.3164 | 0.2401 | 0.1296 | 0.0625 | 0.0256 | 0.0081 | 0.0016 | 0.0001 |
| | 1 | 0.9477 | 0.8192 | 0.7383 | 0.6517 | 0.4752 | 0.3125 | 0.1792 | 0.0837 | 0.0272 | 0.0037 |
| | 2 | 0.9963 | 0.9728 | 0.9492 | 0.9163 | 0.8208 | 0.6875 | 0.5248 | 0.3483 | 0.1808 | 0.0523 |
| | 3 | 0.9999 | 0.9984 | 0.9961 | 0.9919 | 0.9744 | 0.9375 | 0.8704 | 0.7599 | 0.5904 | 0.3439 |
| | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 5 | 0 | 0.5905 | 0.3277 | 0.2373 | 0.1681 | 0.0778 | 0.0313 | 0.0102 | 0.0024 | 0.0003 | 0 |
| | 1 | 0.9185 | 0.7373 | 0.6328 | 0.5282 | 0.337 | 0.1875 | 0.087 | 0.0308 | 0.0067 | 0.0005 |
| | 2 | 0.9914 | 0.9421 | 0.8965 | 0.8369 | 0.6826 | 0.5 | 0.3174 | 0.1631 | 0.0579 | 0.0086 |
| | 3 | 0.9995 | 0.9933 | 0.9844 | 0.9692 | 0.913 | 0.8125 | 0.663 | 0.4718 | 0.2627 | 0.0815 |
| | 4 | 1 | 0.9997 | 0.999 | 0.9976 | 0.9898 | 0.9688 | 0.9222 | 0.8319 | 0.6723 | 0.4095 |
| | 5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6 | 0 | 0.5314 | 0.2621 | 0.178 | 0.1176 | 0.0467 | 0.0156 | 0.0041 | 0.0007 | 0.0001 | 0 |
| | 1 | 0.8857 | 0.6554 | 0.5339 | 0.4202 | 0.2333 | 0.1094 | 0.041 | 0.0109 | 0.0016 | 0.0001 |
| | 2 | 0.9842 | 0.9011 | 0.8306 | 0.7443 | 0.5443 | 0.3438 | 0.1792 | 0.0705 | 0.017 | 0.0013 |
| | 3 | 0.9987 | 0.983 | 0.9624 | 0.9295 | 0.8208 | 0.6563 | 0.4557 | 0.2557 | 0.0989 | 0.0158 |
| | 4 | 0.9999 | 0.9984 | 0.9954 | 0.9891 | 0.959 | 0.8906 | 0.7667 | 0.5798 | 0.3446 | 0.1143 |
| | 5 | 1 | 0.9999 | 0.9998 | 0.9993 | 0.9959 | 0.9844 | 0.9533 | 0.8824 | 0.7379 | 0.4686 |
| | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 7 | 0 | 0.4783 | 0.2097 | 0.1335 | 0.0824 | 0.028 | 0.0078 | 0.0016 | 0.0002 | 0 | 0 |
| | 1 | 0.8503 | 0.5767 | 0.4449 | 0.3294 | 0.1586 | 0.0625 | 0.0188 | 0.0038 | 0.0004 | 0 |
| | 2 | 0.9743 | 0.852 | 0.7564 | 0.6471 | 0.4199 | 0.2266 | 0.0963 | 0.0288 | 0.0047 | 0.0002 |
| | 3 | 0.9973 | 0.9667 | 0.9294 | 0.874 | 0.7102 | 0.5 | 0.2898 | 0.126 | 0.0333 | 0.0027 |
| | 4 | 0.9998 | 0.9953 | 0.9871 | 0.9712 | 0.9037 | 0.7734 | 0.5801 | 0.3529 | 0.148 | 0.0257 |
| | 5 | 1 | 0.9996 | 0.9987 | 0.9962 | 0.9812 | 0.9375 | 0.8414 | 0.6706 | 0.4233 | 0.1497 |
| | 6 | 1 | 1 | 0.9999 | 0.9998 | 0.9984 | 0.9922 | 0.972 | 0.9176 | 0.7903 | 0.5217 |
| | 7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

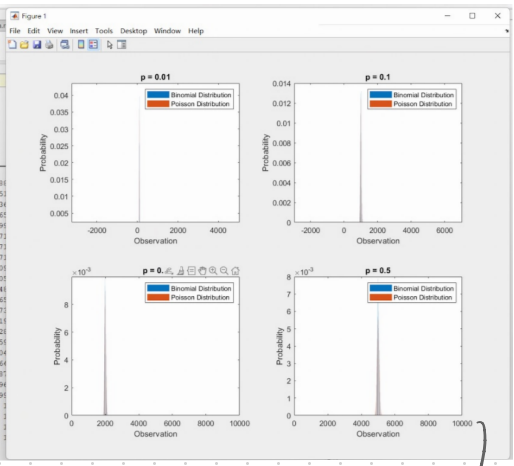
1d

| r | μ = 5.5 | μ = 6.0 | μ = 6.5 | μ = 7.0 | μ = 7.5 | μ = 8.0 | μ = 8.5 | μ = 9.0 | μ = 9.5 |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.0040868 | 0.0024788 | 0.0015034 | 0.00091188 | 0.00055308 | 0.00033546 | 0.00020347 | 0.00012341 | 7.4852e-05 |
| 1 | 0.026564 | 0.017351 | 0.011276 | 0.0072951 | 0.0047012 | 0.0030192 | 0.0019329 | 0.0012341 | 0.00078594 |
| 2 | 0.088376 | 0.061969 | 0.043036 | 0.029636 | 0.020257 | 0.013754 | 0.0092832 | 0.0062322 | 0.0041636 |
| 3 | 0.2017 | 0.1512 | 0.11185 | 0.081765 | 0.059145 | 0.04238 | 0.030109 | 0.021226 | 0.01486 |
| 4 | 0.35752 | 0.28506 | 0.22367 | 0.17299 | 0.13206 | 0.099632 | 0.074364 | 0.054964 | 0.040263 |
| 5 | 0.52892 | 0.44568 | 0.36904 | 0.30071 | 0.24144 | 0.19124 | 0.1496 | 0.11569 | 0.088528 |
| 6 | 0.68604 | 0.6063 | 0.52652 | 0.44971 | 0.37815 | 0.31337 | 0.25618 | 0.20678 | 0.16495 |
| 7 | 0.80949 | 0.74398 | 0.67276 | 0.59871 | 0.52464 | 0.45296 | 0.3856 | 0.3239 | 0.26866 |
| 8 | 0.89436 | 0.84724 | 0.79157 | 0.72909 | 0.66197 | 0.59255 | 0.52311 | 0.45565 | 0.39182 |
| 9 | 0.94622 | 0.91608 | 0.87738 | 0.8305 | 0.77641 | 0.71662 | 0.65297 | 0.58741 | 0.52183 |
| 10 | 0.97475 | 0.95738 | 0.93316 | 0.90148 | 0.86224 | 0.81589 | 0.76336 | 0.70599 | 0.64533 |
| 11 | 0.98901 | 0.97991 | 0.96612 | 0.94665 | 0.92076 | 0.88808 | 0.84866 | 0.80301 | 0.75199 |
| 12 | 0.99555 | 0.99117 | 0.98397 | 0.973 | 0.95733 | 0.9362 | 0.90908 | 0.87577 | 0.83643 |
| 13 | 0.99831 | 0.99637 | 0.9929 | 0.98719 | 0.97844 | 0.96582 | 0.94859 | 0.92615 | 0.89814 |
| 14 | 0.9994 | 0.9986 | 0.99704 | 0.99428 | 0.98974 | 0.98274 | 0.97257 | 0.95853 | 0.94001 |
| 15 | 0.9998 | 0.99949 | 0.99884 | 0.99759 | 0.99539 | 0.99177 | 0.98617 | 0.97796 | 0.96653 |
| 16 | 0.99994 | 0.99983 | 0.99957 | 0.99904 | 0.99804 | 0.99628 | 0.99339 | 0.98889 | 0.98227 |
| 17 | 0.99998 | 0.99994 | 0.99985 | 0.99964 | 0.99921 | 0.99841 | 0.997 | 0.99468 | 0.99107 |
| 18 | 0.99999 | 0.99998 | 0.99995 | 0.99987 | 0.9997 | 0.99935 | 0.9987 | 0.99757 | 0.99572 |
| 19 | 1 | 0.99999 | 0.99998 | 0.99996 | 0.99989 | 0.99975 | 0.99947 | 0.99894 | 0.99804 |
| 20 | 1 | 1 | 1 | 0.99999 | 0.99996 | 0.99991 | 0.99979 | 0.99956 | 0.99914 |
| 21 | 1 | 1 | 1 | 1 | 0.99999 | 0.99997 | 0.99992 | 0.99983 | 0.99964 |
| 22 | 1 | 1 | 1 | 1 | 1 | 0.99999 | 0.99997 | 0.99993 | 0.99985 |
| 23 | 1 | 1 | 1 | 1 | 1 | 1 | 0.99999 | 0.99998 | 0.99994 |
| 24 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0.99999 | 0.99998 |

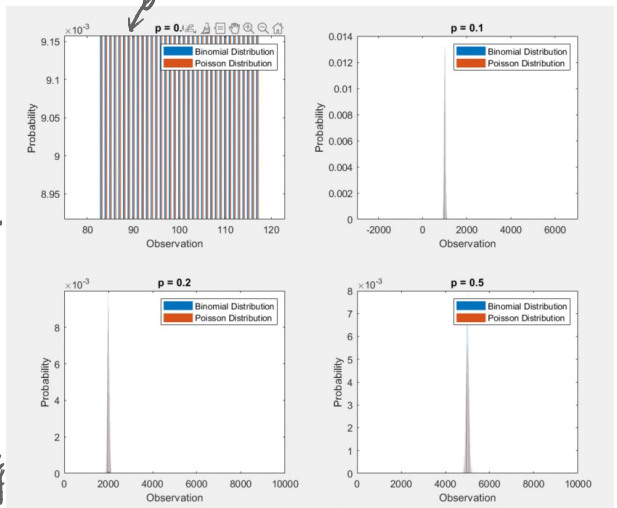
1e




誤差




放大後兩色比較明顯



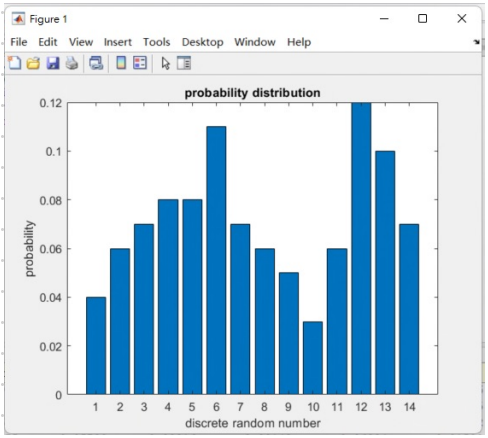

當 binomial distribution 的 p 越大，則與 poisson distribution 的誤差會越大

因為近似條件為

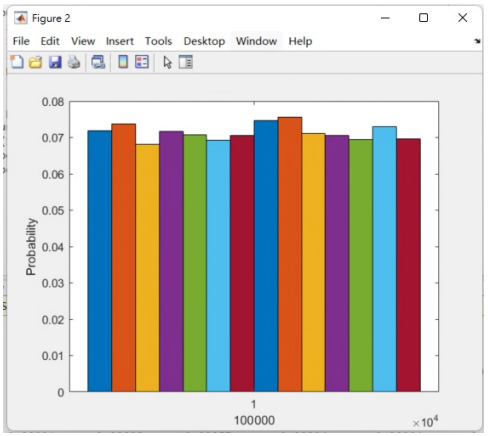
$n \to \infty$ , $p \to 0$,

所以 $p=0.1, 0.2, 0.5$ 時誤差較大

7a.




7b




個

用 randi，所以分布較平均

本次 HW5 與 F74096116 曾瑜華討論