Midterm Exam R12522615 王邑安 ID:2

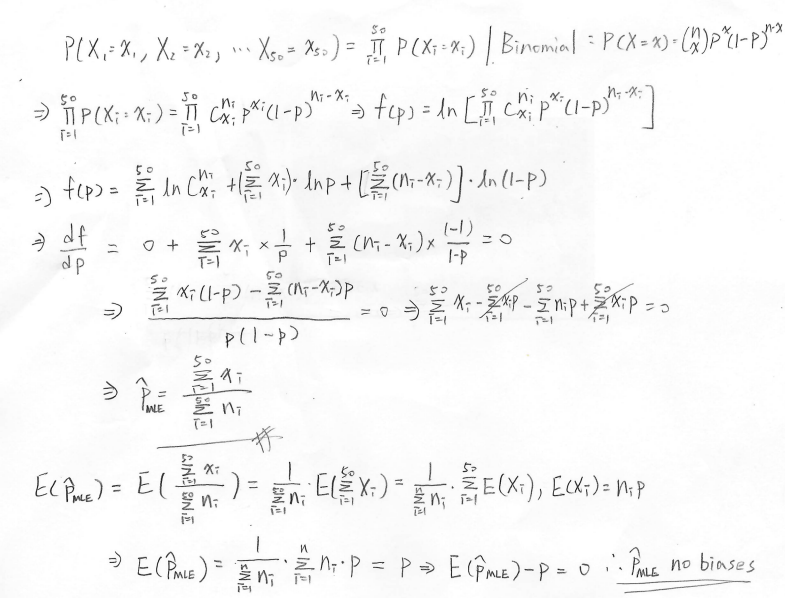


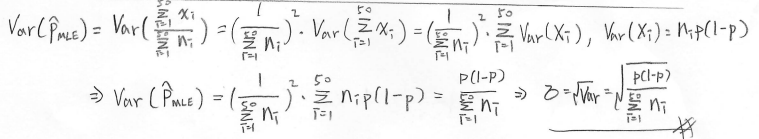
Assumption:

* IDD assumption in each term: Every winning set has identical probability to be chosen independently each term.
* IDD assumption in choosing a number each time: Every number has the identical probability to be chosen independently each time.

There are totally outcomes in Big Lotto. To win the fifth prize, four of six numbers should be the winning numbers in the first set, and the rest should not be the winning numbers. Also, the rest numbers should not be the special number. The probability of fifth prize will be:







|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 開獎日 | 金額 | 注數 | 5獎中獎數 | 開獎日 | 金額 | 注數 | 5獎中獎數 |
| 2024/4/23 | 94533100.00 | 1890662 | 1659 | 2024/2/16 | 188302250.00 | 3766045 | 2846 |
| 2024/4/19 | 91260750.00 | 1825215 | 1736 | 2024/2/15 | 197336000.00 | 3946720 | 3977 |
| 2024/4/16 | 93796550.00 | 1875931 | 1750 | 2024/2/14 | 272001450.00 | 5440029 | 5332 |
| 2024/4/12 | 94919950.00 | 1898399 | 2037 | 2024/2/13 | 190351800.00 | 3807036 | 3120 |
| 2024/4/9 | 110857850.00 | 2217157 | 2101 | 2024/2/12 | 248903050.00 | 4978061 | 3965 |
| 2024/4/9 | 101158800.00 | 2023176 | 1686 | 2024/2/11 | 271083500.00 | 5421670 | 4520 |
| 2024/4/2 | 102237750.00 | 2044755 | 1676 | 2024/2/10 | 311420200.00 | 6228404 | 6475 |
| 2024/3/29 | 98140150.00 | 1962803 | 1608 | 2024/2/9 | 289130550.00 | 5782611 | 5955 |
| 2024/3/26 | 98682250.00 | 1973645 | 1758 | 2024/2/8 | 183653950.00 | 3673079 | 3322 |
| 2024/3/22 | 100908850.00 | 2018177 | 1537 | 2024/2/7 | 147109300.00 | 2942186 | 2488 |
| 2024/3/19 | 102852250.00 | 2057045 | 1907 | 2024/2/6 | 215438650.00 | 4308773 | 3845 |
| 2024/3/15 | 102625750.00 | 2052515 | 1607 | 2024/2/2 | 108994850.00 | 2179897 | 2302 |
| 2024/3/12 | 147291700.00 | 2945834 | 2391 | 2024/1/30 | 106791850.00 | 2135837 | 1842 |
| 2024/3/8 | 132588250.00 | 2651765 | 2237 | 2024/1/26 | 102419000.00 | 2048380 | 1604 |
| 2024/3/5 | 134655600.00 | 2693112 | 2565 | 2024/1/23 | 92997300.00 | 1859946 | 1712 |
| 2024/3/1 | 119882400.00 | 2397648 | 1873 | 2024/1/19 | 102906750.00 | 2058135 | 2054 |
| 2024/2/27 | 114267850.00 | 2285357 | 1923 | 2024/1/16 | 104587000.00 | 2091740 | 1969 |
| 2024/2/24 | 140742000.00 | 2814840 | 2466 | 2024/1/12 | 104749750.00 | 2094995 | 1719 |
| 2024/2/23 | 154793450.00 | 3095869 | 2878 | 2024/1/9 | 104402400.00 | 2088048 | 1759 |
| 2024/2/22 | 136989650.00 | 2739793 | 2445 | 2024/1/5 | 101273350.00 | 2025467 | 1686 |
| 2024/2/21 | 138635750.00 | 2772715 | 2418 | 2024/1/2 | 94153750.00 | 1883075 | 1708 |
| 2024/2/20 | 156102700.00 | 3122054 | 3003 | 2023/12/29 | 157827150.00 | 3156543 | 2843 |
| 2024/2/19 | 148157600.00 | 2963152 | 2844 | 2023/12/26 | 97816250.00 | 1956325 | 1782 |
| 2024/2/18 | 151708250.00 | 3034165 | 2970 | 2023/12/22 | 92432900.00 | 1848658 | 1366 |
| 2024/2/17 | 164832950.00 | 3296659 | 2931 | 2023/12/19 | 96200900.00 | 1924018 | 1501 |

The estimated is slightly smaller than . If the sample size is bigger, the difference between and may become smaller.



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 開獎日 | 注數 | 5獎中獎數 | p\_0 | Binom\_0.05(lb) | Binom\_0.95(ub) | H\_0 | p value |
| 4月23日 | 1890662 | 1659 | 0.000924 | 1678 | 1815 | reject | 0.036783212 |
| 4月19日 | 1825215 | 1736 | 0.000924 | 1618 | 1753 | accept | 0.216631994 |
| 4月16日 | 1875931 | 1750 | 0.000924 | 1664 | 1801 | accept | 0.663771119 |
| 4月12日 | 1898399 | 2037 | 0.000924 | 1685 | 1822 | reject | 3.53433E-11 |
| 4月9日 | 2217157 | 2101 | 0.000924 | 1974 | 2122 | accept | 0.234795063 |
| 4月9日 | 2023176 | 1686 | 0.000924 | 1798 | 1940 | reject | 1.86386E-05 |
| 4月2日 | 2044755 | 1676 | 0.000924 | 1817 | 1960 | reject | 6.63184E-07 |
| 3月29日 | 1962803 | 1608 | 0.000924 | 1743 | 1883 | reject | 1.00443E-06 |
| 3月26日 | 1973645 | 1758 | 0.000924 | 1753 | 1893 | accept | 0.130612747 |
| 3月22日 | 2018177 | 1537 | 0.000924 | 1793 | 1935 | reject | 6.25301E-15 |
| 3月19日 | 2057045 | 1907 | 0.000924 | 1828 | 1972 | accept | 0.857172953 |
| 3月15日 | 2052515 | 1607 | 0.000924 | 1824 | 1967 | reject | 1.07401E-11 |
| 3月12日 | 2945834 | 2391 | 0.000924 | 2635 | 2807 | reject | 1.15881E-10 |
| 3月8日 | 2651765 | 2237 | 0.000924 | 2368 | 2531 | reject | 1.43869E-05 |
| 3月5日 | 2693112 | 2565 | 0.000924 | 2406 | 2570 | accept | 0.117698208 |
| 3月1日 | 2397648 | 1873 | 0.000924 | 2137 | 2292 | reject | 9.86589E-14 |
| 2月27日 | 2285357 | 1923 | 0.000924 | 2035 | 2186 | reject | 3.5491E-05 |
| 2月24日 | 2814840 | 2466 | 0.000924 | 2516 | 2684 | reject | 0.008462791 |
| 2月23日 | 3095869 | 2878 | 0.000924 | 2772 | 2947 | accept | 0.716620647 |
| 2月22日 | 2739793 | 2445 | 0.000924 | 2448 | 2613 | reject | 0.090174759 |
| 2月21日 | 2772715 | 2418 | 0.000924 | 2478 | 2644 | reject | 0.004561883 |
| 2月20日 | 3122054 | 3003 | 0.000924 | 2795 | 2972 | reject | 0.026085194 |
| 2月19日 | 2963152 | 2844 | 0.000924 | 2651 | 2823 | reject | 0.040168196 |
| 2月18日 | 3034165 | 2970 | 0.000924 | 2716 | 2890 | reject | 0.001622759 |
| 2月17日 | 3296659 | 2931 | 0.000924 | 2954 | 3136 | reject | 0.039197372 |
| 2月16日 | 3766045 | 2846 | 0.000924 | 3382 | 3575 | reject | 1.86567E-28 |
| 2月15日 | 3946720 | 3977 | 0.000924 | 3546 | 3745 | reject | 5.60725E-08 |
| 2月14日 | 5440029 | 5332 | 0.000924 | 4908 | 5141 | reject | 1.63267E-05 |
| 2月13日 | 3807036 | 3120 | 0.000924 | 3419 | 3614 | reject | 1.0295E-11 |
| 2月12日 | 4978061 | 3965 | 0.000924 | 4486 | 4709 | reject | 1.2913E-21 |
| 2月11日 | 5421670 | 4520 | 0.000924 | 4891 | 5124 | reject | 2.63272E-12 |
| 2月10日 | 6228404 | 6475 | 0.000924 | 5628 | 5877 | reject | 0 |
| 2月9日 | 5782611 | 5955 | 0.000924 | 5221 | 5461 | reject | 0 |
| 2月8日 | 3673079 | 3322 | 0.000924 | 3297 | 3488 | accept | 0.229797903 |
| 2月7日 | 2942186 | 2488 | 0.000924 | 2632 | 2803 | reject | 8.50784E-06 |
| 2月6日 | 4308773 | 3845 | 0.000924 | 3876 | 4083 | reject | 0.032867625 |
| 2月2日 | 2179897 | 2302 | 0.000924 | 1940 | 2087 | reject | 2.85147E-10 |
| 1月30日 | 2135837 | 1842 | 0.000924 | 1900 | 2046 | reject | 0.003079375 |
| 1月26日 | 2048380 | 1604 | 0.000924 | 1821 | 1964 | reject | 1.17243E-11 |
| 1月23日 | 1859946 | 1712 | 0.000924 | 1650 | 1786 | accept | 0.901597212 |
| 1月19日 | 2058135 | 2054 | 0.000924 | 1829 | 1973 | reject | 0.000493624 |
| 1月16日 | 2091740 | 1969 | 0.000924 | 1860 | 2004 | accept | 0.391054525 |
| 1月12日 | 2094995 | 1719 | 0.000924 | 1863 | 2007 | reject | 6.04172E-07 |
| 1月9日 | 2088048 | 1759 | 0.000924 | 1857 | 2001 | reject | 9.47733E-05 |
| 1月5日 | 2025467 | 1686 | 0.000924 | 1800 | 1942 | reject | 1.49963E-05 |
| 1月2日 | 1883075 | 1708 | 0.000924 | 1671 | 1808 | accept | 0.463315118 |
| 12月29日 | 3156543 | 2843 | 0.000924 | 2827 | 3004 | accept | 0.18270576 |
| 12月26日 | 1956325 | 1782 | 0.000924 | 1737 | 1877 | accept | 0.569173341 |
| 12月22日 | 1848658 | 1366 | 0.000924 | 1640 | 1776 | reject | 1.24202E-17 |
| 12月19日 | 1924018 | 1501 | 0.000924 | 1708 | 1847 | reject | 1.88994E-11 |



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | CL | UCL | LCL |
| 0.000895935 | 2805962.42 | 1.78609E-05 | 0.000896 | 0.00095 | 0.000842 |

|  |  |  |
| --- | --- | --- |
|  | 1-B(n\*UCL;n\_bar,p\_hat) | B(n\*LCL;n\_bar,p\_hat) |
| binomial dist | 0.001451429 | 0.001224758 |



One of the chosen numbers should be the special number, and the other four number should be the winning numbers. The rest of it should not be either special or winning numbers. The probability in this situation is:



|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 開獎日 | 注數 | 5獎中獎數 | p\_0 | Binom\_0.05(lb) | Binom\_0.95(ub) | P\_new(lb) | P\_new(ub) | β |
| 4月23日 | 1890662 | 1659 | 0.000924 | 1678 | 1815 | 1 | 1 | 0 |
| 4月19日 | 1825215 | 1736 | 0.000924 | 1618 | 1753 | 1 | 1 | 0 |
| 4月16日 | 1875931 | 1750 | 0.000924 | 1664 | 1801 | 1 | 1 | 0 |
| 4月12日 | 1898399 | 2037 | 0.000924 | 1685 | 1822 | 1 | 1 | 0 |
| 4月9日 | 2217157 | 2101 | 0.000924 | 1974 | 2122 | 1 | 1 | 0 |
| 4月9日 | 2023176 | 1686 | 0.000924 | 1798 | 1940 | 1 | 1 | 0 |
| 4月2日 | 2044755 | 1676 | 0.000924 | 1817 | 1960 | 1 | 1 | 0 |
| 3月29日 | 1962803 | 1608 | 0.000924 | 1743 | 1883 | 1 | 1 | 0 |
| 3月26日 | 1973645 | 1758 | 0.000924 | 1753 | 1893 | 1 | 1 | 0 |
| 3月22日 | 2018177 | 1537 | 0.000924 | 1793 | 1935 | 1 | 1 | 0 |
| 3月19日 | 2057045 | 1907 | 0.000924 | 1828 | 1972 | 1 | 1 | 0 |
| 3月15日 | 2052515 | 1607 | 0.000924 | 1824 | 1967 | 1 | 1 | 0 |
| 3月12日 | 2945834 | 2391 | 0.000924 | 2635 | 2807 | 1 | 1 | 0 |
| 3月8日 | 2651765 | 2237 | 0.000924 | 2368 | 2531 | 1 | 1 | 0 |
| 3月5日 | 2693112 | 2565 | 0.000924 | 2406 | 2570 | 1 | 1 | 0 |
| 3月1日 | 2397648 | 1873 | 0.000924 | 2137 | 2292 | 1 | 1 | 0 |
| 2月27日 | 2285357 | 1923 | 0.000924 | 2035 | 2186 | 1 | 1 | 0 |
| 2月24日 | 2814840 | 2466 | 0.000924 | 2516 | 2684 | 1 | 1 | 0 |
| 2月23日 | 3095869 | 2878 | 0.000924 | 2772 | 2947 | 1 | 1 | 0 |
| 2月22日 | 2739793 | 2445 | 0.000924 | 2448 | 2613 | 1 | 1 | 0 |
| 2月21日 | 2772715 | 2418 | 0.000924 | 2478 | 2644 | 1 | 1 | 0 |
| 2月20日 | 3122054 | 3003 | 0.000924 | 2795 | 2972 | 1 | 1 | 0 |
| 2月19日 | 2963152 | 2844 | 0.000924 | 2651 | 2823 | 1 | 1 | 0 |
| 2月18日 | 3034165 | 2970 | 0.000924 | 2716 | 2890 | 1 | 1 | 0 |
| 2月17日 | 3296659 | 2931 | 0.000924 | 2954 | 3136 | 1 | 1 | 0 |
| 2月16日 | 3766045 | 2846 | 0.000924 | 3382 | 3575 | 1 | 1 | 0 |
| 2月15日 | 3946720 | 3977 | 0.000924 | 3546 | 3745 | 1 | 1 | 0 |
| 2月14日 | 5440029 | 5332 | 0.000924 | 4908 | 5141 | 1 | 1 | 0 |
| 2月13日 | 3807036 | 3120 | 0.000924 | 3419 | 3614 | 1 | 1 | 0 |
| 2月12日 | 4978061 | 3965 | 0.000924 | 4486 | 4709 | 1 | 1 | 0 |
| 2月11日 | 5421670 | 4520 | 0.000924 | 4891 | 5124 | 1 | 1 | 0 |
| 2月10日 | 6228404 | 6475 | 0.000924 | 5628 | 5877 | 1 | 1 | 0 |
| 2月9日 | 5782611 | 5955 | 0.000924 | 5221 | 5461 | 1 | 1 | 0 |
| 2月8日 | 3673079 | 3322 | 0.000924 | 3297 | 3488 | 1 | 1 | 0 |
| 2月7日 | 2942186 | 2488 | 0.000924 | 2632 | 2803 | 1 | 1 | 0 |
| 2月6日 | 4308773 | 3845 | 0.000924 | 3876 | 4083 | 1 | 1 | 0 |
| 2月2日 | 2179897 | 2302 | 0.000924 | 1940 | 2087 | 1 | 1 | 0 |
| 1月30日 | 2135837 | 1842 | 0.000924 | 1900 | 2046 | 1 | 1 | 0 |
| 1月26日 | 2048380 | 1604 | 0.000924 | 1821 | 1964 | 1 | 1 | 0 |
| 1月23日 | 1859946 | 1712 | 0.000924 | 1650 | 1786 | 1 | 1 | 0 |
| 1月19日 | 2058135 | 2054 | 0.000924 | 1829 | 1973 | 1 | 1 | 0 |
| 1月16日 | 2091740 | 1969 | 0.000924 | 1860 | 2004 | 1 | 1 | 0 |
| 1月12日 | 2094995 | 1719 | 0.000924 | 1863 | 2007 | 1 | 1 | 0 |
| 1月9日 | 2088048 | 1759 | 0.000924 | 1857 | 2001 | 1 | 1 | 0 |
| 1月5日 | 2025467 | 1686 | 0.000924 | 1800 | 1942 | 1 | 1 | 0 |
| 1月2日 | 1883075 | 1708 | 0.000924 | 1671 | 1808 | 1 | 1 | 0 |
| 12月29日 | 3156543 | 2843 | 0.000924 | 2827 | 3004 | 1 | 1 | 0 |
| 12月26日 | 1956325 | 1782 | 0.000924 | 1737 | 1877 | 1 | 1 | 0 |
| 12月22日 | 1848658 | 1366 | 0.000924 | 1640 | 1776 | 1 | 1 | 0 |
| 12月19日 | 1924018 | 1501 | 0.000924 | 1708 | 1847 | 1 | 1 | 0 |



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | ) | β |  |
| 4.51E-05 | 1 | 1 | 0 | 1 |



Death in a month = sum of number of death from New Taipei, Taipei, …, Keelung

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **n** | | **max death number** | | **min death number** | | | **k** |
| 84 | | 139 | | 64 | | | 78 |
| **death number** | **x\_i** | | **frequence** | | **p\_i(poisson, λ=10)** | | **np\_i** | **(X\_i-np\_i)^2/np\_i** | | |
| ~63 | 0 | | 0 | | 1 | | 84 | 84 | | |
| 64 | 2 | | 0.02381 | | 3.578E-30 | | 3.01E-28 | 1.33089E+28 | | |
| 65 | 0 | | 0 | | 5.505E-31 | | 4.62E-29 | 4.62386E-29 | | |
| 66 | 0 | | 0 | | 8.34E-32 | | 7.01E-30 | 7.00584E-30 | | |
| 67 | 0 | | 0 | | 1.245E-32 | | 1.05E-30 | 1.04565E-30 | | |
| 68 | 1 | | 0.011905 | | 1.831E-33 | | 1.54E-31 | 6.50315E+30 | | |
| 69 | 0 | | 0 | | 2.653E-34 | | 2.23E-32 | 2.22858E-32 | | |
| 70 | 2 | | 0.02381 | | 3.79E-35 | | 3.18E-33 | 1.25641E+33 | | |
| 71 | 0 | | 0 | | 5.338E-36 | | 4.48E-34 | 4.48406E-34 | | |
| 72 | 1 | | 0.011905 | | 7.414E-37 | | 6.23E-35 | 1.60569E+34 | | |
| 73 | 0 | | 0 | | 1.016E-37 | | 8.53E-36 | 8.53131E-36 | | |
| 74 | 4 | | 0.047619 | | 1.372E-38 | | 1.15E-36 | 1.38783E+37 | | |
| 75 | 1 | | 0.011905 | | 1.83E-39 | | 1.54E-37 | 6.50545E+36 | | |
| 76 | 1 | | 0.011905 | | 2.408E-40 | | 2.02E-38 | 4.94414E+37 | | |
| 77 | 2 | | 0.02381 | | 3.127E-41 | | 2.63E-39 | 1.5228E+39 | | |
| 78 | 0 | | 0 | | 4.009E-42 | | 3.37E-40 | 3.36763E-40 | | |
| 79 | 7 | | 0.083333 | | 5.075E-43 | | 4.26E-41 | 1.14947E+42 | | |
| 80 | 3 | | 0.035714 | | 6.343E-44 | | 5.33E-42 | 1.68902E+42 | | |
| 81 | 2 | | 0.02381 | | 7.831E-45 | | 6.58E-43 | 6.08049E+42 | | |
| 82 | 1 | | 0.011905 | | 9.551E-46 | | 8.02E-44 | 1.2465E+43 | | |
| 83 | 1 | | 0.011905 | | 1.151E-46 | | 9.67E-45 | 1.03459E+44 | | |
| 84 | 2 | | 0.02381 | | 1.37E-47 | | 1.15E-45 | 3.47624E+45 | | |
| 85 | 1 | | 0.011905 | | 1.612E-48 | | 1.35E-46 | 7.38701E+45 | | |
| 86 | 0 | | 0 | | 1.874E-49 | | 1.57E-47 | 1.5741E-47 | | |
| 87 | 3 | | 0.035714 | | 2.154E-50 | | 1.81E-48 | 4.97426E+48 | | |
| 88 | 0 | | 0 | | 2.448E-51 | | 2.06E-49 | 2.05604E-49 | | |
| 89 | 0 | | 0 | | 2.75E-52 | | 2.31E-50 | 2.31016E-50 | | |
| 90 | 0 | | 0 | | 3.056E-53 | | 2.57E-51 | 2.56684E-51 | | |
| 91 | 1 | | 0.011905 | | 3.358E-54 | | 2.82E-52 | 3.54522E+51 | | |
| 92 | 4 | | 0.047619 | | 3.65E-55 | | 3.07E-53 | 5.21856E+53 | | |
| 93 | 3 | | 0.035714 | | 3.925E-56 | | 3.3E-54 | 2.72996E+54 | | |
| 94 | 5 | | 0.059524 | | 4.175E-57 | | 3.51E-55 | 7.12822E+55 | | |
| 95 | 0 | | 0 | | 4.395E-58 | | 3.69E-56 | 3.69177E-56 | | |
| 96 | 2 | | 0.02381 | | 4.578E-59 | | 3.85E-57 | 1.04015E+57 | | |
| 97 | 1 | | 0.011905 | | 4.72E-60 | | 3.96E-58 | 2.52236E+57 | | |
| 98 | 0 | | 0 | | 4.816E-61 | | 4.05E-59 | 4.04544E-59 | | |
| 99 | 3 | | 0.035714 | | 4.865E-62 | | 4.09E-60 | 2.20248E+60 | | |
| 100 | 1 | | 0.011905 | | 4.865E-63 | | 4.09E-61 | 2.4472E+60 | | |
| 101 | 1 | | 0.011905 | | 4.816E-64 | | 4.05E-62 | 2.47167E+61 | | |
| 102 | 1 | | 0.011905 | | 4.722E-65 | | 3.97E-63 | 2.5211E+62 | | |
| 103 | 1 | | 0.011905 | | 4.585E-66 | | 3.85E-64 | 2.59674E+63 | | |
| 104 | 2 | | 0.02381 | | 4.408E-67 | | 3.7E-65 | 1.08024E+65 | | |
| 105 | 1 | | 0.011905 | | 4.198E-68 | | 3.53E-66 | 2.83564E+65 | | |
| 106 | 2 | | 0.02381 | | 3.961E-69 | | 3.33E-67 | 1.20231E+67 | | |
| 107 | 2 | | 0.02381 | | 3.702E-70 | | 3.11E-68 | 1.28647E+68 | | |
| 108 | 2 | | 0.02381 | | 3.427E-71 | | 2.88E-69 | 1.38939E+69 | | |
| 109 | 1 | | 0.011905 | | 3.144E-72 | | 2.64E-70 | 3.78609E+69 | | |
| 110 | 0 | | 0 | | 2.858E-73 | | 2.4E-71 | 2.40114E-71 | | |
| 111 | 3 | | 0.035714 | | 2.575E-74 | | 2.16E-72 | 4.16053E+72 | | |
| 112 | 1 | | 0.011905 | | 2.299E-75 | | 1.93E-73 | 5.17755E+72 | | |
| 113 | 2 | | 0.02381 | | 2.035E-76 | | 1.71E-74 | 2.34025E+74 | | |
| 114 | 0 | | 0 | | 1.785E-77 | | 1.5E-75 | 1.49931E-75 | | |
| 115 | 2 | | 0.02381 | | 1.552E-78 | | 1.3E-76 | 3.06807E+76 | | |
| 116 | 0 | | 0 | | 1.338E-79 | | 1.12E-77 | 1.12392E-77 | | |
| 117 | 0 | | 0 | | 1.144E-80 | | 9.61E-79 | 9.60618E-79 | | |
| 118 | 0 | | 0 | | 9.691E-82 | | 8.14E-80 | 8.14083E-80 | | |
| 119 | 1 | | 0.011905 | | 8.144E-83 | | 6.84E-81 | 1.46177E+80 | | |
| 120 | 2 | | 0.02381 | | 6.787E-84 | | 5.7E-82 | 7.01648E+81 | | |
| 121 | 2 | | 0.02381 | | 5.609E-85 | | 4.71E-83 | 8.48994E+82 | | |
| 122 | 0 | | 0 | | 4.597E-86 | | 3.86E-84 | 3.86185E-84 | | |
| 123 | 1 | | 0.011905 | | 3.738E-87 | | 3.14E-85 | 3.185E+84 | | |
| 124 | 0 | | 0 | | 3.014E-88 | | 2.53E-86 | 2.53203E-86 | | |
| 125 | 0 | | 0 | | 2.411E-89 | | 2.03E-87 | 2.02562E-87 | | |
| 126 | 0 | | 0 | | 1.914E-90 | | 1.61E-88 | 1.60764E-88 | | |
| 127 | 0 | | 0 | | 1.507E-91 | | 1.27E-89 | 1.26586E-89 | | |
| 128 | 0 | | 0 | | 1.177E-92 | | 9.89E-91 | 9.8895E-91 | | |
| 129 | 0 | | 0 | | 9.127E-94 | | 7.67E-92 | 7.66628E-92 | | |
| 130 | 0 | | 0 | | 7.02E-95 | | 5.9E-93 | 5.89714E-93 | | |
| 131 | 0 | | 0 | | 5.359E-96 | | 4.5E-94 | 4.50163E-94 | | |
| 132 | 0 | | 0 | | 4.06E-97 | | 3.41E-95 | 3.41033E-95 | | |
| 133 | 1 | | 0.011905 | | 3.053E-98 | | 2.56E-96 | 3.89992E+95 | | |
| 134 | 0 | | 0 | | 2.28E-99 | | 1.91E-97 | 1.91355E-97 | | |
| 135 | 0 | | 0 | | 1.69E-100 | | 1.42E-98 | 1.41744E-98 | | |
| 136 | 0 | | 0 | | 1.24E-101 | | 1E-99 | 1.0422E-99 | | |
| 137 | 0 | | 0 | | 9.06E-103 | | 7.6E-101 | 7.6076E-101 | | |
| 138 | 1 | | 0.011905 | | 6.56E-104 | | 5.5E-102 | 1.814E+101 | | |
| 139 | 1 | | 0.011905 | | 4.72E-105 | | 4E-103 | 2.5214E+102 | | |
| 140~ | 0 | | 0 | | 0 | | 0 | infinity | | |



Since Poisson distribution is discrete model, and there isn’t Poisson inverse in Excel. I use the p-value to do the Hypothesis test. If the p-value is smaller than α=0.05, the death number in that month reject H0.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| month | death in Taoyuan | p-value | H\_0 | month | death in Taoyuan | p-value | H\_0 |
| 1-Jan | 7 | 0.4404413 | accept | 1-Mar | 18 | 0.01437301 | reject |
| 1-Feb | 7 | 0.4404413 | accept | 1-Apr | 16 | 0.05408322 | accept |
| 1-Mar | 5 | 0.1341719 | accept | 1-May | 18 | 0.01437301 | reject |
| 1-Apr | 4 | 0.0585054 | accept | 1-Jun | 7 | 0.44044129 | accept |
| 1-May | 9 | 0.9158594 | accept | 1-Jul | 15 | 0.09748081 | accept |
| 1-Jun | 7 | 0.4404413 | accept | 1-Aug | 14 | 0.16691695 | accept |
| 1-Jul | 10 | 0.8339205 | accept | 1-Sep | 15 | 0.09748081 | accept |
| 1-Aug | 6 | 0.2602828 | accept | 1-Oct | 13 | 0.27107115 | accept |
| 1-Sep | 14 | 0.1669169 | accept | 1-Nov | 18 | 0.01437301 | reject |
| 1-Oct | 6 | 0.2602828 | accept | 1-Dec | 22 | 0.00059147 | reject |
| 1-Nov | 13 | 0.2710712 | accept | 1-Jan | 18 | 0.01437301 | reject |
| 1-Dec | 5 | 0.1341719 | accept | 1-Feb | 10 | 0.8339205 | accept |
| 1-Jan | 21 | 0.0013993 | reject | 1-Mar | 24 | 9.3899E-05 | reject |
| 1-Feb | 13 | 0.2710712 | accept | 1-Apr | 13 | 0.27107115 | accept |
| 1-Mar | 13 | 0.2710712 | accept | 1-May | 12 | 0.41688705 | accept |
| 1-Apr | 11 | 0.6064477 | accept | 1-Jun | 13 | 0.27107115 | accept |
| 1-May | 22 | 0.0005915 | reject | 1-Jul | 19 | 0.00690868 | reject |
| 1-Jun | 17 | 0.0285552 | reject | 1-Aug | 9 | 0.91585943 | accept |
| 1-Jul | 9 | 0.9158594 | accept | 1-Sep | 15 | 0.09748081 | accept |
| 1-Aug | 16 | 0.0540832 | accept | 1-Oct | 24 | 9.3899E-05 | reject |
| 1-Sep | 22 | 0.0005915 | reject | 1-Nov | 14 | 0.16691695 | accept |
| 1-Oct | 16 | 0.0540832 | accept | 1-Dec | 12 | 0.41688705 | accept |
| 1-Nov | 11 | 0.6064477 | accept | 1-Jan | 18 | 0.01437301 | reject |
| 1-Dec | 17 | 0.0285552 | reject | 1-Feb | 15 | 0.09748081 | accept |
| 1-Jan | 21 | 0.0013993 | reject | 1-Mar | 23 | 0.00024024 | reject |
| 1-Feb | 24 | 9.39E-05 | reject |  |  |  |  |



The upper bound in the Hypothesis test is 17, and the lower bound is 4.



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **σ** | **CL** | **UCL** | **LCL** |
| 95 | 9.771908518 | 95 | 124.805922 | 66.17447053 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | α |  |
| 0.002178917 | 0.000899138 | 0.003078 | 324.880425 |







|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| average | sample variance | standard error | estimated α | estimated β |
| 348.7412 | 138.1941 | 11.7556 | 880.0694 | 0.396266 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| thickness | number x\_i | p\_i (gamma.dist) | np\_i | thickness | number x\_i | p\_i (gamma.dist) | np\_i |
| <334 | 1 | 0.087913 | 7.472574 | 347 | 5 | 0.03373 | 2.867063 |
| 334 | 1 | 0.015776 | 1.340944 | 348 | 2 | 0.033938 | 2.884713 |
| 335 | 1 | 0.017513 | 1.488584 | 349 | 10 | 0.0339 | 2.88148 |
| 336 | 0 | 0.019289 | 1.639587 | 350 | 6 | 0.033618 | 2.857553 |
| 337 | 0 | 0.021081 | 1.791899 | 351 | 12 | 0.033101 | 2.813561 |
| 338 | 0 | 0.022862 | 1.943262 | 352 | 9 | 0.032359 | 2.75055 |
| 339 | 0 | 0.024603 | 2.091256 | 353 | 5 | 0.031411 | 2.669941 |
| 340 | 1 | 0.026275 | 2.233372 | 354 | 4 | 0.030276 | 2.573474 |
| 341 | 1 | 0.027848 | 2.367076 | 355 | 2 | 0.028978 | 2.463154 |
| 342 | 0 | 0.029293 | 2.48989 | 356 | 4 | 0.027543 | 2.341175 |
| 343 | 2 | 0.030582 | 2.599466 | 357 | 4 | 0.025998 | 2.209855 |
| 344 | 5 | 0.03169 | 2.693662 | 358 | 1 | 0.024371 | 2.071564 |
| 345 | 4 | 0.032595 | 2.770613 | >358 | 1 | 0.214193 | 18.20639 |
| 346 | 4 | 0.03328 | 2.828792 | k=27 |  |  |  |



|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | sample variance | standard error σ | CL | UCL | LCL |
| 354.3911 | 26.34174 | 5.13242 | 354.3911 | 369.7884 | 338.9939 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | sample variance | standard error σ | CL | UCL | LCL |
| 9.822222 | 6.740404 | 2.596229 | 9.822222 | 17.61091 | 2.033536 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | sample variance | standard error σ | CL | UCL | LCL |
| 354.9707 | 6.561122 | 2.561469 | 354.9707 | 362.6551 | 347.2863 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | sample variance | standard error σ | CL | UCL | LCL |
| 9.902439 | 5.290244 | 2.300053 | 9.902439 | 16.8026 | 3.00228 |



|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| average | sample variance | standard error σ |  |  | Δ | α | β | accept (if lower) | accept (if higher) |
| 354.3911 | 26.34174 | 5.13242 | 350 | 341.7881 | -8.21187 | 0.003 | 0.2 | -17.9186 | 5.153057 |

Sequential likelihood ratio test shows that most of the are below the . It accepts and rejects .

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| average | sample variance | standard error σ |  | k | K | h | H |
| 354.3911 | 26.34174 | 5.13242 | 350 | 0.8 | 4.105936 | 6 | 30.79452 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| average | sample variance | standard error σ |  | k | K | h | H |
| 354.3911 | 26.34174 | 5.13242 | 350 | 0.5 | 2.56621 | 5 | 25.6621 |

There is an out -of-control signal in Tabular CUSUM chart with (k,h)=(0.5,5). The new process mean is :



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| shift | δ | k\* | h' |  |
| 0.5σ | 0.5 | 0.8 | 4.475606 | 60.87891 |
| 1.0σ | 1 | 0.8 | 4.475606 | 11.96443 |
| 1.5σ | 1.5 | 0.8 | 4.475606 | 5.375253 |
| 2.0σ | 2 | 0.8 | 4.475606 | 3.382457 |

There is an out -of-control signal in optimal Tabular CUSUM chart. The new process mean is :



|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| shift | δ | λ\* | L\* | g | w | φ(w) | Φ(w) |  |
| 0.5σ | 0.5 | 0.232431 | 3.12491 | 2.130589 | 2.055716 | 0.048223 | 0.980095 | 42.53612 |
| 1.0σ | 1 | 0.232431 | 3.12491 | 1.065295 | 0.753675 | 0.300306 | 0.774478 | 14.72196 |
| 1.5σ | 1.5 | 0.232431 | 3.12491 | 0.710196 | -0.58667 | 0.33587 | 0.278711 | 5.806391 |
| 2.0σ | 2 | 0.232431 | 3.12491 | 0.532647 | -1.94685 | 0.059961 | 0.025776 | 3.95144 |