應用類別資料分析報告

美國居民在blackfriday的消費紀錄之研究探討

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1. 研究背景

事實上，從黑色購物節的英語名稱「Black Friday」就可以發現，它確實與黑色星期五有所關聯。對於西方國家來說，在他們的文化中，阿拉伯數字「13」就象徵著不幸、不吉利，任何月份的13日若剛好是星期五，就會被視為是充滿厄運、災難的日子。

直到1960年代，「黑色星期五」開始與購物產生連結。在1960年代中期，美國感恩節（每年11月的第4個星期四）後開業的第一天，店家都會舉辦促銷活動、祭出各項優惠吸引民眾上門搶購，使得店家生意獲得大額進帳，從那之後就被商人炒作，讓黑色星期五不再只是代表厄運，也成了令全球瘋狂的購物日。

1. 研究目的

每逢遇到美國的blackfriday(黑色星期五)時，各大百貨都會在這一天推出促銷活動，很多人都會選擇在這一天大採購，不同背景的人採買的商品項也會有所不同，我們想知道年齡(age)、性別(Gender)、婚姻狀態(Marital\_Status)與不同商品購買次數的關聯。

1. 資料說明與來源

第一節 原始變數

User\_ID、Product\_ID、Gender、Age、Occupation、City\_Category、Stay\_In\_Current\_City\_Years、Marital\_Status、

Product\_Category\_1、Product\_Category\_2、Product\_Category\_3、Purchase。

第二節 使用變數及說明

**獨立變數**:

X1:年齡

X2:性別(Gender)

X3:婚姻狀態(Marital\_Status)

**反映變數**:

Y1:

Product\_Category\_1

Product\_Category\_2

Product\_Category\_3

(種產品之購買次數)

**變數說明**：

X1:年齡：0-17(1),18-25(2),26-35(3),36-45(4),46-50(5),

51-55(6),55+(7)

X2:性別(Gender)：M(1),F(2)

X3:婚姻狀態(Marital\_Status)：未婚(0),已婚(1)

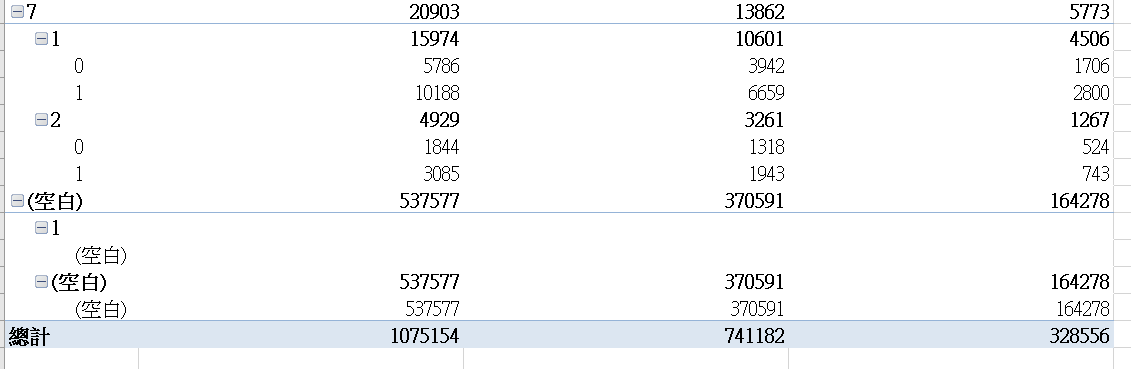
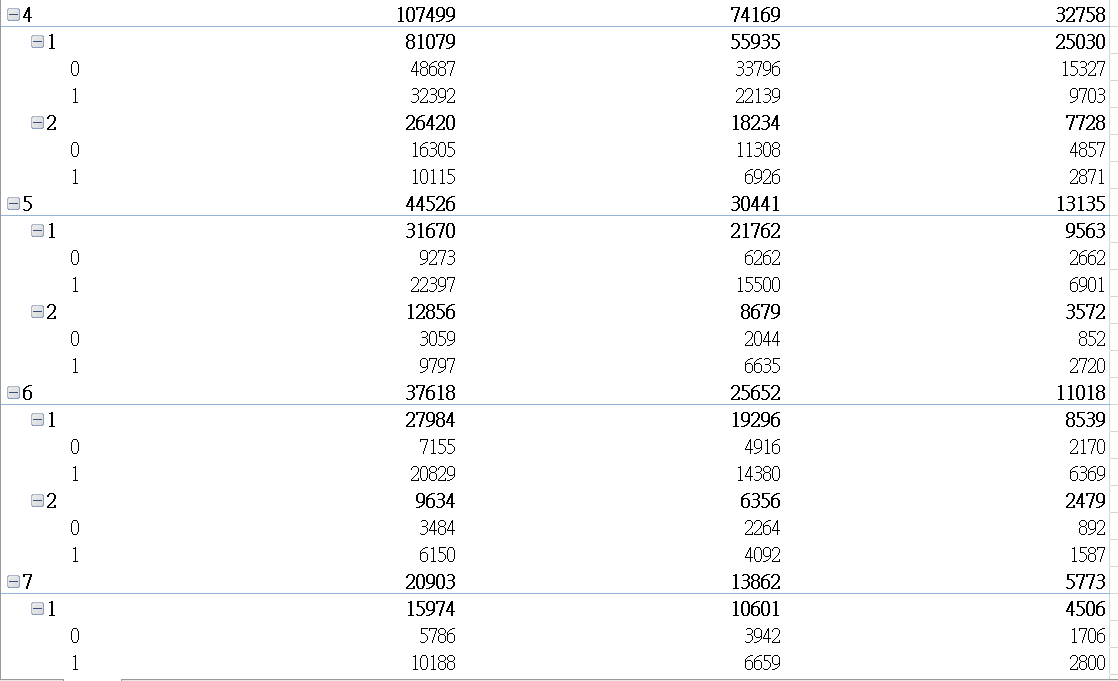
Y1:3種產品之購買次數

第三節 資料來源及資料更新時間

網址: https://www.kaggle.com/mehdidag/black-friday

資料更新時間:2018/07/25

1. 分析討論
2. 四維列聯表



第二節 二變數獨立性檢定

1. 二維總表

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 變數 | 自由度 | Cramer V | X2 | X2  P-value | G2 | G2 P-value | M2 | M2 p-value | 結論 |
| X1 \* Y | 12 | 0.0139 | 411.0697 | <.0001 | 410.6037 | <.0001 | 38.4228 | <.0001 | Reject H0 |
| X2 \* Y | 2 | 0.0434 | 2009.0211 | <.0001 | 2088.4748 | <.0001 | 1362.5934 | <.0001 | Reject H0 |
| X3 \* Y | 2 | 0.0090 | 85.8129 | <.0001 | 85.6665 | <.0001 | 26.3524 | <.0001 | Reject H0 |
| X1 \* X2 | 6 | 0.0650 | 4508.7989 | <.0001 | 4369.5044 | <.0001 | 74.5129 | <.0001 | Reject H0 |
| X1 \* X3 | 6 | 0.34601 | 127571 | <.0001 | 140409 | <.0001 | 103146 | <.0001 | Reject H0 |
| X2 \* X3 | 1 | 0.0187 | 370.9639 | <.0001 | 369.9660 | <.0001 | 370.9636 | <.0001 | Reject H0 |

* 勝算比總表

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 變數（X1\*X2) | 勝算比 | 95%信賴區間 | 結論 | 變數（X1\*X2) | 勝算比 | 95%信賴區間 | 結論 |
| X1(1,2)\*Y(1,2) | 0.9817 | (0.9557, 1.0085) | （包含1，無關聯） | X1(4,5)\*Y(1,3) | 0.9681 | (0.9461, 0.9907) | （不包含1，有關聯） |
| X1(1,3)\*Y(1,2) | 0.9686 | (0.9438, 0.9941) | （不包含1，有關聯） | X1(4,6)\*Y(1,3) | 0.9624 | (0.9390, 0.9863) | （不包含1，有關聯） |
| X1(1,4)\*Y(1,2) | 0.9695 | (0.9439 ,0.9958) | （不包含1，有關聯） | X1(4,7)\*Y(1,3) | 0.9065 | (0.8783, 0.9357) | （不包含1，有關聯） |
| X1(1,5)\*Y(1,2) | 0.9607 | (0.9332, 0.9889) | （不包含1，有關聯） | X1(5,6)\*Y(1,3) | 0.9941 | (0.9659, 1.0231) | （包含1，無關聯） |
| X1(1,6)\*Y(1,2) | 0.9593 | (0.9313 ,0.9882) | （不包含1，有關聯） | X1(5,7)\*Y(1,3) | 0.9364 | (0.9041, 0.9697) | （不包含1，有關聯） |
| X1(1,7)\*Y(1,2) | 0.9319 | (0.9016, 0.9631) | （不包含1，有關聯） | X1(6,7)\*Y(1,3) | 0.9419 | (0.9086, 0.9765) | （不包含1，有關聯） |
| X1(2,3)\*Y(1,2) | 0.9866 | (0.9750 ,0.9984) | （不包含1，有關聯） | X1(1,2)\*Y(2,3) | 0.9888 | (0.9532, 1.0258) | （包含1，無關聯） |
| X1(2,4)\*Y(1,2) | 0.9875 | (0.9742 ,1.0010) | （不包含1，有關聯） | X1(1,3)\*Y(2,3) | 0.8772 | (0.8466, 0.9089) | （不包含1，有關聯） |
| X1(2,5)\*Y(1,2) | 0.9785 | (0.9615, 0.9959) | （不包含1，有關聯） | X1(1,4)\*Y(2,3) | 0.965 | (0.9304, 1.0010) | （包含1，無關聯） |
| X1(2,6)\*Y(1,2) | 0.9772 | (0.9591 ,0.9956) | （不包含1，有關聯） | X1(1,5)\*Y(2,3) | 0.9429 | (0.9060, 0.9812) | （不包含1，有關聯） |
| X1(2,7)\*Y(1,2) | 0.9492 | (0.9271, 0.9719) | （不包含1，有關聯） | X1(1,6)\*Y(2,3) | 0.9386 | (0.9010, 0.9777) | （不包含1，有關聯） |
| X1(3,4)\*Y(1,2) | 1.0009 | (0.9895, 1.0124) | （包含1，無關聯） | X1(1,7)\*Y(2,3) | 0.9101 | (0.8693, 0.9529) | （不包含1，有關聯） |
| X1(3,5)\*Y(1,2) | 0.9918 | (0.9760, 1.0078) | （包含1，無關聯） | X1(2,3)\*Y(2,3) | 0.8871 | (0.8726, 0.9019) | （不包含1，有關聯） |
| X1(3,6)\*Y(1,2) | 0.9904 | (0.9735, 1.0076) | （包含1，無關聯） | X1(2,4)\*Y(2,3) | 0.976 | (0.9579, 0.9944) | （不包含1，有關聯） |
| X1(3,7)\*Y(1,2) | 0.9621 | (0.9407, 0.9839) | （不包含1，有關聯） | X1(2,5)\*Y(2,3) | 0.9535 | (0.9305, 0.9772) | （不包含1，有關聯） |
| X1(4,5)\*Y(1,2) | 0.9909 | (0.9739, 1.0082) | （包含1，無關聯） | X1(2,6)\*Y(2,3) | 0.9492 | (0.9248, 0.9742) | （不包含1，有關聯） |
| X1(4,6)\*Y(1,2) | 0.9895 | (0.9715, 1.0079) | （包含1，無關聯） | X1(2,7)\*Y(2,3) | 0.9204 | (0.8901, 0.9518) | （不包含1，有關聯） |
| X1(4,7)\*Y(1,2) | 0.9612 | (0.9390, 0.9840) | （不包含1，有關聯） | X1(3,4)\*Y(2,3) | 1.1001 | (1.0825, 1.1180) | （不包含1，有關聯） |
| X1(5,6)\*Y(1,2) | 0.9986 | (0.9773, 1.0204) | （包含1，無關聯） | X1(3,5)\*Y(2,3) | 1.0748 | (1.0508, 1.0994) | （不包含1，有關聯） |
| X1(5,7)\*Y(1,2) | 0.97 | (0.9452 ,0.9955) | （不包含1，有關聯） | X1(3,6)\*Y(2,3) | 1.0699 | (1.0443, 1.0962) | （不包含1，有關聯） |
| X1(6,7)\*Y(1,2) | 0.9714 | (0.9458, 0.9976) | （不包含1，有關聯） | X1(3,7)\*Y(2,3) | 1.0375 | (1.0047, 1.0714) | （不包含1，有關聯） |
| X1(1,2)\*Y(1,3) | 0.9708 | (0.9373 ,1.0054) | （包含1，無關聯） | X1(4,5)\*Y(2,3) | 0.977 | (0.9536, 1.0010) | （包含1，無關聯） |
| X1(1,3)\*Y(1,3) | 0.8497 | (0.8214, 0.8789) | （不包含1，有關聯） | X1(4,6)\*Y(2,3) | 0.9726 | (0.9478, 0.9980) | （不包含1，有關聯） |
| X1(1,4)\*Y(1,3) | 0.9356 | (0.9035, 0.9688) | （不包含1，有關聯） | X1(4,7)\*Y(2,3) | 0.9431 | (0.9122, 0.9751) | （不包含1，有關聯） |
| X1(1,5)\*Y(1,3) | 0.9058 | (0.8720, 0.9408) | （不包含1，有關聯） | X1(5,6)\*Y(2,3) | 0.9954 | (0.9658, 1.0261) | （包含1，無關聯） |
| X1(1,6)\*Y(1,3) | 0.9004 | (0.8660, 0.9361) | （不包含1，有關聯） | X1(5,7)\*Y(2,3) | 0.9653 | (0.9303, 1.0016) | （包含1，無關聯） |
| X1(1,7)\*Y(1,3) | 0.8481 | (0.8118, 0.8860) | （不包含1，有關聯） | X1(6,7)\*Y(2,3) | 0.9697 | (0.9336, 1.0072) | （包含1，無關聯） |
| X1(2,3)\*Y(1,3) | 0.8753 | (0.8616, 0.8891) | （不包含1，有關聯） | 變數（X2\*Y) | 勝算比 | 95%信賴區間 | 結論 |
| X1(2,4)\*Y(1,3) | 0.9638 | (0.9468, 0.9811) | （不包含1，有關聯） | X2(1,2)\*Y(1,2) | 0.984 | (0.9745, 0.9936) | （不包含1，有關聯） |
| X1(2,5)\*Y(1,3) | 0.9331 | (0.9116, 0.9550) | （不包含1，有關聯） | X2(1,2)\*Y(1,3) | 0.7324 | (0.7222, 0.7427) | （不包含1，有關聯） |
| X1(2,6)\*Y(1,3) | 0.9275 | (0.9048, 0.9508) | （不包含1，有關聯） | X2(1,2)\*Y(2,3) | 0.7443 | (0.7335, 0.7553) | （不包含1，有關聯） |
| X1(2,7)\*Y(1,3) | 0.8737 | (0.8463, 0.9019) | （不包含1，有關聯） | 變數（X2\*Y) | 勝算比 | 95%信賴區間 | 結論 |
| X1(3,4)\*Y(1,3) | 1.1011 | (1.0843, 1.1181) | （不包含1，有關聯） | X3(1,2)\*Y(1,2) | 0.9879 | (0.9795, 0.9963) | （不包含1，有關聯） |
| X1(3,5)\*Y(1,3) | 1.066 | (1.0434, 1.0892) | （不包含1，有關聯） | X3(1,2)\*Y(1,3) | 1.0449 | (1.0330, 1.0568) | （不包含1，有關聯） |
| X1(3,6)\*Y(1,3) | 1.0597 | (1.0355, 1.0845) | （不包含1，有關聯） | X3(1,2)\*Y(2,3) | 1.0577 | (1.0451, 1.0704) | （不包含1，有關聯） |
| X1(3,7)\*Y(1,3) | 0.9982 | (0.9682, 1.0291) | （包含1，無關聯） | 變數（X2\*X3) | 勝算比 | 95%信賴區間 | 結論 |
|  |  |  |  | X2(1,2)\*X3(1,2) | 1.093 | (1.0832 ,1.1030) | （不包含1，有關聯） |
| 變數（X1\*X2) | 勝算比 | 95%信賴區間 | 結論 | 變數（X1\*X3) | 勝算比 | 95%信賴區間 | 結論 |
| X1(1,2)\*X2(1,2) | 0.6302 | (0.6140 ,0.6468) | （不包含1，有關聯） | X1(1,2)\*X3(1,2) | 2650.5386 | (854.7626 ,8219.0717) | （不包含1，有關聯） |
| X1(1,3)\*X2(1,2) | 0.5266 | (0.5135, 0.5399) | （不包含1，有關聯） | X1(1,3)\*X3(1,2) | 6596.3907 | (2127.3210, 20454.0689) | （不包含1，有關聯） |
| X1(1,4)\*X2(1,2) | 0.6369 | (0.6206 ,0.6536) | （不包含1，有關聯） | X1(1,4)\*X3(1,2) | 6451.404 | (2080.5290, 20004.8221) | （不包含1，有關聯） |
| X1(1,5)\*X2(1,2) | 0.7852 | (0.7635, 0.8076) | （不包含1，有關聯） | X1(1,5)\*X3(1,2) | 26445.2031 | (8527.8357, 82007.7673) | （不包含1，有關聯） |
| X1(1,6)\*X2(1,2) | 0.6503 | (0.6316 ,0.6696) | （不包含1，有關聯） | X1(1,6)\*X3(1,2) | 25523.2431 | (8230.3956, 79150.0153) | （不包含1，有關聯） |
| X1(1,7)\*X2(1,2) | 0.5996 | (0.5800 ,0.6198) | （不包含1，有關聯） | X1(1,7)\*X3(1,2) | 16789.8844 | (5413.8215 ,52070.4677) | （不包含1，有關聯） |
| X1(2,3)\*X2(1,2) | 0.8356 | (0.8250 ,0.8463) | （不包含1，有關聯） | X1(2,3)\*X3(1,2) | 2.4887 | (2.4578 ,2.5200) | （不包含1，有關聯） |
| X1(2,4)\*X2(1,2) | 1.0106 | (0.9963 ,1.0251) | （不包含1，有關聯） | X1(2,4)\*X3(1,2) | 2.434 | (2.4004 2.4680) | （不包含1，有關聯） |
| X1(2,5)\*X2(1,2) | 1.2461 | (1.2240, 1.2686) | （不包含1，有關聯） | X1(2,5)\*X3(1,2) | 9.9773 | (9.7958 ,10.1621) | （不包含1，有關聯） |
| X1(2,6)\*X2(1,2) | 1.032 | (1.0120 ,1.0524) | （不包含1，有關聯） | X1(2,6)\*X3(1,2) | 9.6295 | (9.4451 ,9.8174) | （不包含1，有關聯） |
| X1(2,7)\*X2(1,2) | 0.9514 | (0.9277, 0.9757) | （不包含1，有關聯） | X1(2,7)\*X3(1,2) | 6.3345 | (6.1913, 6.4810) | （不包含1，有關聯） |
| X1(3,4)\*X2(1,2) | 1.2095 | (1.1947 ,1.2245) | （不包含1，有關聯） | X1(3,4)\*X3(1,2) | 0.978 | (0.9677 ,0.9885) | （不包含1，有關聯） |
| X1(3,5)\*X2(1,2) | 1.4912 | (1.4670 ,1.5159) | （不包含1，有關聯） | X1(3,5)\*X3(1,2) | 4.009 | (3.9453, 4.0738) | （不包含1，有關聯） |
| X1(3,6)\*X2(1,2) | 1.235 | (1.2127, 1.2577) | （不包含1，有關聯） | X1(3,6)\*X3(1,2) | 3.8693 | (3.8035 3.9362) | （不包含1，有關聯） |
| X1(3,7)\*X2(1,2) | 1.1386 | (1.1114 ,1.1665) | （不包含1，有關聯） | X1(3,7)\*X3(1,2) | 2.5453 | (2.4923, 2.5995) | （不包含1，有關聯） |
| X1(4,5)\*X2(1,2) | 1.233 | (1.2114 ,1.2549) | （不包含1，有關聯） | X1(4,5)\*X3(1,2) | 2.6025 | (2.5461 2.6602) | （不包含1，有關聯） |
| X1(4,6)\*X2(1,2) | 1.0211 | (1.0016 ,1.0411) | （不包含1，有關聯） | X1(4,6)\*X3(1,2) | 3.9562 | (3.8849 ,4.0289) | （不包含1，有關聯） |
| X1(4,7)\*X2(1,2) | 0.9414 | (0.9182, 0.9653) | （不包含1，有關聯） | X1(4,7)\*X3(1,2) | 4.0991 | (4.0294, 4.1701) | （不包含1，有關聯） |
| X1(5,6)\*X2(1,2) | 0.8282 | (0.8100 0.8467) | （不包含1，有關聯） | X1(5,6)\*X3(1,2) | 0.6349 | (0.6192, 0.6510) | （不包含1，有關聯） |
| X1(5,7)\*X2(1,2) | 0.7635 | (0.7430 0.7847) | （不包含1，有關聯） | X1(5,7)\*X3(1,2) | 0.9651 | (0.9443 ,0.9864) | （不包含1，有關聯） |
| X1(6,7)\*X2(1,2) | 0.9219 | (0.8961, 0.9485) | （不包含1，有關聯） | X1(6,7)\*X3(1,2) | 0.6578 | (0.6411 0.6750) | （不包含1，有關聯） |

1. 卡方獨立性檢定

X3\*Y

H0：有無結婚與購買不同商品的次數無關聯

H1：有無結婚與買不同商品的次數有關聯

α=0.05

從報表得P-value<0.0001，所以拒絕H0，說明有無結婚與購買不同商品的次數有顯著關聯。Cramer V=0.0090表示有無結婚與購買不同商品的相關程度為弱。

* 勝算比

1.X3（無結婚，有結婚）\* Y（商品1，商品2）

： ：

0.05 *=*0.9879

*，*表示沒有結婚購買商品1的次數對購買商品2的勝算是有結婚購買商品1的次數對購買商品2勝算的倍。

的信賴區間為(0.9795，0.9963)不包含1，所以婚姻狀態(無結婚，有結婚)與購買商品次數（商品1，商品2）之間有顯著關聯。

X2\*Y

H0：性別與購買不同商品的次數無關聯

H1：性別與買不同商品的次數有關聯

： ：

0.05 *=*0.9840

*，*表示男性購買商品1的次數對購買商品2的勝算是女性購買商品1的次數對購買商品2勝算的倍。

的信賴區間為(0.9745，0.9936)不包含1，所以性別(男，女)與購買商品次數（商品1，商品2）之間有顯著關聯。

**第三節 三維列聯表**

* X1\*Y | X2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| X2=1 | X1\*Y | 12 | 0.0079 | 101.2569 | <.0001 | 101.7619 | <.0001 | Reject H0 |
| X2=2 | X1\*Y | 12 | 0.0718 | 2597.3549 | <.0001 | 2761.2121 | <.0001 | Reject H0 |

* X1\*Y | X3

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| X3=1 | X1\*Y | 12 | 0.0247 | 770.3405 | <.0001 | 775.3039 | <.0001 | Reject H0 |
| X3=2 | X1\*Y | 12 | 0.0092 | 74.0736 | <.0001 | 74.3476 | <.0001 | Reject H0 |

* X2\*Y | X1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| X1=1 | X2\*Y | 2 | 0.0127 | 4.8399 | 0.0889 | 4.8572 | 0.0889 | No reject H0 |
| X1=2 | X2\*Y | 2 | 0.0172 | 58.1427 | <.0001 | 58.8586 | <.0001 | reject H0 |
| X1=3 | X2\*Y | 2 | 0.0962 | 3902.0999 | <.0001 | 4398.8049 | <.0001 | reject H0 |
| X1=4 | X2\*Y | 2 | 0.0083 | 14.6698 | 0.0007 | 14.7646 | 0.0006 | reject H0 |
| X1=5 | X2\*Y | 2 | 0.0126 | 13.9873 | 0.0009 | 14.0821 | 0.0009 | reject H0 |
| X1=6 | X2\*Y | 2 | 0.0237 | 41.6193 | <.0001 | 42.2526 | <.0001 | reject H0 |
| X1=7 | X2\*Y | 2 | 0.0133 | 7.1411 | 0.0281 | 7.2252 | 0.027 | reject H0 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | X2(1,2)&Y(1,2) | | X2(1,2)&Y(1,3) | | X2(1,2)&Y(2,3) | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |
| X1=1 | 1.0247 | (0.9719,1.0804) | 0.9444 | (0.8810,1.0124) | 0.9216 | (0.8570,0.9911) |
| X1=2 | 0.9817 | (0.9596,1.0042) | 0.8891 | (0.825,0.9165) | 0.9057 | (0.8773,0.9350) |
| X1=3 | 0.9753 | (0.9600,.9909) | 0.4345 | (0.4228,0.4465) | 0.4455 | (0.4331,0.4582) |
| X1=4 | 1.0004 | (0.9789,1.0224) | 0.9476 | (0.9204,0.9755) | 0.9472 | (0.9187,0.9765) |
| X1=5 | 0.9825 | (0.9513,1.0147) | 0.9203 | (0.8811,0.9612) | 0.9367 | (0.8948,0.9806) |
| X1=6 | 0.9613 | (0.9268,0.9972) | 0.8474 | (0.8058,0.8912) | 0.8815 | (0.8361,0.9294) |
| X1=7 | 0.997 | (0.9478,1.0487) | 0.9116 | (0.8500,0.9778) | 0.9144 | (0.8495,0.9843) |
| CMH | 11.0148 | | 2011.5723 | | 1671.2351 | |
| P-value | 0.0009 | | <.0001 | | <.0001 | |
| B-D | 7.5491 | | 2130.2816 | | 1892.1104 | |
| P-value | 0.273 | | <.0001 | | <.0001 | |
| 共同勝算比 | 0.9836 | (0.9740,0.9933) | 0.725 | (0.71153,0.7357) | 0.7365 | (0.7258,0.7474) |
| 邊際勝算比 | 0.984 | (0.9745,0.9936) | 0.7324 | (0.7222, 0.7427) | 0.7443 | (0.7335,0.7553) |
| 辛普森詭論 |  |  |  |  |  |  |

* X2\*Y | X3

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| X3=1 | X2\*Y | 2 | 0.0633 | 2527.0706 | <.0001 | 2527.0706 | <.0001 | Reject H0 |
| X3=2 | X2\*Y | 2 | 0.0163 | 115.4514 | <.0001 | 116.8483 | <.0001 | Reject H0 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | X2(1,2)&Y(1,2) | | X2(1,2)&Y(1,3) | | X2(1,2)&Y(2,3) | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |
| X3=1 | 0.9832 | (0.9708,0.9958) | 0.6202 | (0.6084,0.6323) | 0.6308 | (0.6183,0.6435) |
| X3=2 | 0.9854 | (0.9705,1.0005) | 0.8943 | (0.8762,0.9129) | 0.9076 | (0.8882,0.9274) |
| CMH | 10.3488 | | 1933.1413 | | 1599.6976 | |
| P-value | 0.0013 | | <.0001 | | <.0001 | |
| B-D | 0.0460 | | 652.3061 | | 589.1100 | |
| P-value | 0.8301 | | <.0001 | | <.0001 | |
| 共同勝算比 | 0.9841 | (0.9746,0.9938) | 0.7312 | (0.7211,0.7415) | 0.74226 | (0.7318,0.7535) |
| 邊際勝算比 | 0.9840 | (0.9745,0.9936) | 0.7324 | (0.7222,0.7427) | 0.7443 | (0.7335,0.7553) |
| 辛普森詭論 |  |  |  |  |  |  |

* X3\*Y | X1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| X1=1 | X3\*Y | 2 | 0.0049 | 0.7185 | 0.6982 | 0.6021 | 0.7400 | No reject H0 |
| X1=2 | X3\*Y | 2 | 0.0058 | 6.7204 | 0.0347 | 6.7303 | 0.0346 | Reject H0 |
| X1=3 | X3\*Y | 2 | 0.0340 | 488.4079 | <.0001 | 484.1864 | <.0001 | Reject H0 |
| X1=4 | X3\*Y | 2 | 0.0081 | 14.2340 | 0.0008 | 14.2571 | 0.0008 | Reject H0 |
| X1=5 | X3\*Y | 2 | 0.0075 | 4.8949 | 0.0865 | 4.9059 | 0.0860 | No reject H0 |
| X1=6 | X3\*Y | 2 | 0.0045 | 1.5022 | 0.4718 | 1.5030 | 0.4717 | Reject H0 |
| X1=7 | X3\*Y | 2 | 0.0176 | 12.5391 | 0.0019 | 12.5296 | 0.0019 | Reject H0 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | X3(1,2)&Y(1,2) | | X3(1,2)&Y(1,3) | | X3(1,2)&Y(2,3) | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |
| X1=1 | 1.4052 | (0.0879,22.4678) | 3.0706 | (0.1920,49.1001) | 2.1852 | (0.1367,34.9429) |
| X1=2 | 0.9796 | (0.9563,1.0034) | 0.9621 | (0.9322,0.9930) | 0.9822 | (0.9501,1.0154) |
| X1=3 | 0.9998 | (0.9863,1.0135) | 1.2183 | (1.1961,1.2409) | 1.2185 | (1.1953,1.2423) |
| X1=4 | 0.9853 | (0.9666,1.0043) | 0.9525 | (0.9286,0.9770) | 0.9668 | (0.9413,0.9929) |
| X1=5 | 1.0208 | (0.9880,1.0547) | 1.0486 | (1.0036,1.0956) | 1.0273 | (0.9810,1.0758) |
| X1=6 | 1.0162 | (0.9809,1.0527) | 1.0262 | (0.9787,1.0759) | 1.0098 | (0.9608,1.0614) |
| X1=7 | 0.9401 | (0.8993,0.9827) | 0.9132 | (0.8600,0.9697) | 0.9714 | (0.9120,1.0347) |
| CMH | 1.8540 | | 129.4067 | | 141.4558 | |
| P-value | 0.1733 | | <.0001 | | <.0001 | |
| B-D | 13.1201 | | 346.4572 | | 270.5160 | |
| P-value | 0.0412 | | <.0001 | | <.0001 | |
| 共同勝算比 | 0.9937 | (0.9847,1.0028) | 1.0731 | (1.06011.0862) | 1.0805 | (1.0668,1.0944) |
| 邊際勝算比 | 0.9879 | (0.9795, 0.9963) | 1.0449 | (1.0330, 1.0568) | 1.0577 | (1.0451, 1.0704) |
| 辛普森詭論 |  |  |  |  |  |  |

* X3\*Y | X2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| X2=1 | X3\*Y | 2 | 0.0046 | 17.3594 | 0.0002 | 17.3666 | 0.0002 | Reject H0 |
| X2=2 | X3\*Y | 2 | 0.0562 | 795.2604 | <.0001 | 787.6256 | <.0001 | Reject H0 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | X3(1,2)&Y(1,2) | | X3(1,2)&Y(1,3) | | X3(1,2)&Y(2,3) | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |
| X2=1 | 0.9875 | (0.9779,0.9972) | 0.9745 | (0.9621,0.9871) | 0.9868 | (0.9736,1.0003) |
| X2=2 | 0.9896 | (0.9728,1.0068) | 1.4052 | (1.3705,1.4408) | 1.4199 | (1.3833,1.4575) |
| CMH | 7.6859 | | 74.1036 | | 107.1589 | |
| P-value | 0.0056 | | <.0001 | | <.0001 | |
| B-D | 0.0460 | | 652.2652 | | 589.0856 | |
| P-value | 0.8301 | | <.0001 | | <.0001 | |
| 共同勝算比 | 0.9880 | (0.9796,0.9965) | 1.0513 | (1.0394,1.0634) | 1.0653 | (1.0526,1.0781) |
| 邊際勝算比 | 0.9879 | (0.9795,0.9963) | 1.0449 | (1.0330,1.0568) | 1.0577 | (1.0451,1.0704) |
| 辛普森詭論 |  |  |  |  |  |  |

* X1\*X2 |Y

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| Y=1 | X1\*X2 | 1 | 0.0693 | 539.2492 | <0.0001 | 513.9514 | <0.0001 | Reject H0 |
| Y=2 | X1\*X2 | 1 | 0.0768 | 464.8111 | <0.0001 | 441.0441 | <0.0001 | Reject H0 |
| Y=3 | X1\*X2 | 1 | 0.0787 | 221.2618 | <0.0001 | 208.6749 | <0.0001 | Reject H0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | X1(1,2)&X2(1,2) | | X1(1,3)&X2(1,2) | | X1(1,4)&X2(1,2) | |  | X1(3,5)&X2(1,2) | | X1(3,6)&X2(1,2) | | X1(3,7)&X2(1,2) | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |
| Y=1 | 0.6455 | (0.6219,0.6699) | 0.5834 | (0.5630,0.6046) | 0.6417 | (0.6184,0.6658) | Y=1 | 1.3701 | (1.3392,1.4018) | 1.1566 | (1.1277,1.1862) | 1.0416 | (1.0073,1.0771) |
| Y=2 | 0.6183 | (0.8569,0.8820) | 0.5553 | (0.5323,0.5792) | 0.6264 | (0.5996,0.6544) | Y=2 | 1.3802 | (1.3425,1.4190) | 1.14 | (1.1054,1.1757) | 1.0647 | (1.0219,1.1094) |
| Y=3 | 0.6076 | (0.5688,0.6492) | 0.2684 | (0.2514,0.2866) | 0.6438 | (0.6029,0.6875) | Y=3 | 2.9022 | (2.7716,3.0388) | 2.2559 | (2.1429,2.3749) | 2.1856 | (2.0434,2.3376) |
| CMH | 1221.1097 | | 2708.3052 | | 1181.5847 | | CMH | 2370.8786 |  | 542.8168 |  | 113.267 |  |
| P-value | <0.0001 | | <0.0001 | | <0.0001 | | P-value | <0.0001 |  | <.0001 |  | <.0001 |  |
| B-D | 3.4769 | | 450.6781 | | 0.8116 | | B-D | 903.5468 | | 589.7495 | | 408.958 | |
| P-value | 0.1758 | | <0.0001 | | 0.6664 | | P-value | <0.0001 |  | <.0001 |  | <.0001 |  |
| 共同勝算比 | 0.6299 | (0.6137,0.6466) | 0.5197 | (0.50680.5330) | 0.6366 | (0.6203,0.6533) | 共同勝算比 | 1.499 | (1.4746,1.5238) | 1.2412 | (1.2188,1.2641) | 1.1398 | (1.1125,1.1677) |
| 邊際勝算比 | 0.6302 | (0.6140,0.6468) | 0.5266 | (0.5135,0.5399) | 0.6369 | (0.6206,0.6536) | 邊際勝算比 | 1.4912 | (1.4670,1.5159) | 1.235 | (1.2127,1.2577) | 1.1386 | (1.1114,1.1665) |
| 辛普森詭論 | 無 | | 無 | | 無 | | 辛普森詭論 | 無 |  | 無 |  | 無 |  |
|  | X1(1,5)&X2(1,2) | | X1(1,6)&X2(1,2) | | X1(1,7)&X2(1,2) | |  | X1(4,5)&X2(1,2) | | X1(4,6)&X2(1,2) | | X1(4,7)&X2(1,2) | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |
| Y=1 | 0.7994 | (0.7681,0.8319) | 0.6748 | (0.6475,0.7032) | 0.6077 | (0.57799,0.6368) | Y=1 | 1.2458 | (1.2153,1.2770) | 1.0516 | (1.0236,1.0804) | 0.947 | (0.9146,0.9806) |
| Y=2 | 0.7664 | (0.7309,0.8036) | 0.633 | (0.6026,0.6650) | 0.5912 | (0.5589,0.6255) | Y=2 | 1.2235 | (1.1873,1.2607) | 1.0105 | (0.9778,1.0443) | 0.9438 | (0.9044,0.9849) |
| Y=3 | 0.7789 | (0.7251,0.8368) | 0.6055 | (0.5616,0.6528) | 0.5866 | (0.538,0.6398) | Y=3 | 1.2099 | (1.1554,1.2670) | 0.9405 | (0.8933,0.9902) | 0.9111 | (0.8518,0.9746) |
| CMH | 287.6094 | | 847.5761 | | 922.4109 | | CMH | 541.6075 |  | 4.3378 |  | 22.7849 |  |
| P-value | <0.0001 | | <0.0001 | | <0.0001 | | P-value | <0.0001 |  | 0.0373 |  | <.0001 |  |
| B-D | 1.8206 | | 7.6678 | | 0.793 | | B-D | 1.5707 | | 14.7566 | | 1.0297 | |
| P-value | 0.4024 | | 0.0216 | | 0.6727 | | P-value | 0.456 |  | 0.0006 |  | 0.5976 |  |
| 共同勝算比 | 0.7846 | (0.7628,0.8069) | 0.6492 | (0.6306,0.6685) | 0.5988 | (0.5792,0.6190) | 共同勝算比 | 1.2327 | (1.2112,1.2547) | 1.0208 | (1.0012,1.0407) | 0.9408 | (0.9176,0.9647) |
| 邊際勝算比 | 0.7852 | (0.7635,0.8076) | 0.6503 | (0.6316,0.6696) | 0.5996 | (0.5800,0.6198) | 邊際勝算比 | 1.233 | (1.2114,1.2549) | 1.2011 | (1.0016,1.0411) | 0.9414 | (0.9182,0.9653) |
| 辛普森詭論 | 無 | | 無 | | 無 | | 辛普森詭論 | 無 |  | 無 |  | 無 |  |
|  | X1(2,3)&X2(1,2) | | X1(2,4)&X2(1,2) | | X1(2,5)&X2(1,2) | |  | X1(5,6)&X2(1,2) | | X1(5,7)&X2(1,2) | | X1(6,7)&X2(1,2) | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |
| Y=1 | 0.9039 | (0.8880,0.9200) | 0.9941 | (0.9743,1.0143) | 1.2385 | (1.2077,1.2700) | Y=1 | 0.8441 | (0.8184,0.8707) | 0.7602 | (0.7319,0.7896) | 0.9006 | (0.8657,0.9368) |
| Y=2 | 0.898 | (0.8791 ,0.9174) | 1.0131 | (0.9889, 1.0379) | 1.2395 | (1.2024,1.2778) | Y=2 | 0.826 | (0.7954,0.8577) | 0.7714 | (0.7364,0.8081) | 0.934 | (0.8898,0.9803) |
| Y=3 | 0.4417 | (0.4258,0.4583) | 1.055 | (1.0211,1.0994) | 1.2819 | (1.2233,1.3433) | Y=3 | 0.7773 | (0.7328,0.8245) | 0.7531 | (0.6999,0.8103) | 0.9688 | (0.8973,1.0460) |
| CMH | 841.9636 | | 1.9667 | | 577.2772 | | CMH | 278.5585 |  | 378.8863 |  | 32.1756 |  |
| P-value | <0.0001 | | 0.1608 | | <0.0001 | | P-value | <0.0001 |  | <.0001 |  | <.0001 |  |
| B-D | 1293.6319 | | 8.9083 | | 1.7488 | | B-D | 5.921 | | 0.3736 | | 3.2361 | |
| P-value | <0.0001 | | 0.0116 | | 0.4171 | | P-value | 0.0518 |  | 0.8296 |  | 0.1983 |  |
| 共同勝算比 | 0.8287 | (0.8183,0.8393) | 1.0103 | (0.9960,1.0248) | 1.2451 | (1.2230,1.2675) | 共同勝算比 | 0.8281 | (0.8099,0.8466) | 0.763 | (0.7425,0.7841) | 0.9211 | (0.8953,0.9476) |
| 邊際勝算比 | 0.8356 | (0.8250,0.8463) | 1.0106 | (0.9963,1.0251) | 1.2461 | (1.2240,1.2686) | 邊際勝算比 | 0.8282 | (0.8100,0.8467) | 0.7635 | (0.7430,0.7847) | 0.9219 | (0.8961,0.9485) |
| 辛普森詭論 | 無 | | 無 | |  | | 辛普森詭論 | 無 |  | 無 |  | 無 |  |
|  | X1(2,6)&X2(1,2) | | X1(2,7)&X2(1,2) | | X1(3,4)&X2(1,2) | |  |  |  |  |  |  |  |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  |  |  |  |  |  |  |
| Y=1 | 1.0454 | (1.0172,1.0745) | 0.9415 | (0.9090,0.9751) | 1.0998 | (1.0811,1.1189) |  |  |  |  |  |  |  |
| Y=2 | 1.0238 | (0.9902,1.0584) | 0.9562 | (0.9160,0.9981) | 1.1281 | (1.1050,1.1517) |  |  |  |  |  |  |  |
| Y=3 | 0.9965 | (0.9459,1.0497) | 0.9654 | (0.9021,1.0331) | 2.3987 | (2.3140,2.4865) |  |  |  |  |  |  |  |
| CMH | 9.2279 |  | 16.0178 |  | 972.5276 |  |  |  |  |  |  |  |  |
| P-value | 0.0024 |  | <.0001 |  | <.0001 |  |  |  |  |  |  |  |  |
| B-D | 2.8089 | | 0.5559 | | 1585.6992 | |  |  |  |  |  |  |  |
| P-value | 0.2455 | | 0.7573 | | <.0001 | |  |  |  |  |  |  |  |
| 共同勝算比 | 1.0308 | (1.0108,1.0512) | 0.9498 | (0.9261,0.9741) | 1.2163 | (1.20141.2314) |  |  |  |  |  |  |  |
| 邊際勝算比 | 1.032 | (1.0212,1.0524) | 0.9514 | (0.9277,0.9757) | 1.2095 | (1.1947,1.2245) |  |  |  |  |  |  |  |
| 辛普森詭論 | 無 |  | 無 |  | 無 |  |  |  |  |  |  |  |  |

* X1\*X2 |X3

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| X3=1 | X1\*X2 | 6 | 0.0858 | 4631.2733 | <.0001 | 4443.7842 | <.0001 | Reject H0 |
| X3=2 | X1\*X2 | 6 | 0.0663 | 1917.1827 | <.0001 | 1867.4457 | <.0001 | Reject H0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | X1(1,2)&X2(1,2) | | X1(1,3)&X2(1,2) | | X1(1,4)&X2(1,2) | |  | X1(2,6)&X2(1,2) | | | X1(2,7)&X2(1,2) | | X1(3,4)&X2(1,2) | | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | 勝算比 | | 信賴區間 |
| X3=1 | 0.5871 | (0.5717,0.6030) | 0.4856 | (0.4741,0.4992) | 0.6541 | (0.6366,0.6720) | X3=1 | 1.5648 | (1.5164,1.6147) | | 1.0821 | (1.0407,1.1250) | 13445 | | (1.3233,1.3660) |
| X3=2 | 0.4094 | (0.0426,3.9358) | 0.2994 | (0.0311,2.8785) | 0.31 | (0.0322,2.9804) | X3=2 | 0.6924 | (0.6723,0.7131) | | 0.7177 | (0.6921,0.7441) | 1.0354 | | (1.0153,1.0558) |
| CMH | 1550.2081 | | 3078.1084 | | 955.4993 | | CMH | 0.0081 | | | 116.1599 | | 922.1308 | | |
| P-value | <.0001 | | <.0001 | | <.0001 | | P-value | 0.9284 | | | <.0001 | | <.0001 | | |
| B-D | 0.0986 | | 0.1801 | | 0.4378 | | B-D | 1388.6456 | | | 229.5532 | | 413.3872 | | |
| P-value | 0.7535 | | 0.6712 | | 0.5082 | | P-value | <.0001 | | | <.0001 | | <.0001 | | |
| 共同勝算比 | 0.5871 | (0.5716,0.6030) | 0.4865 | (0.4740,0.4992) | 0.654 | (0.6366,0.6719) | 共同勝算比 | 1.001 | (0.9795,1.0229) | | 0.8648 | (0.8421,0.8882) | 1.21 | | (1.1952,1.2250) |
| 邊際勝算比 | 0.6302 | (0.6140,0.6468) | 0.5266 | (0.5135,0.5399) | 0.6369 | (0.6206,0.6536) | 邊際勝算比 | 1.032 | (1.0212,1.0524) | | 0.9514 | (0.9277,0.9757) | 1.2095 | | (1.1947,1.2245) |
| 辛普森詭論 |  | |  | |  | | 辛普森詭論 |  | | |  | |  | | |
|  | X1(1,5)&X2(1,2) | | X1(1,6)&X2(1,2) | | X1(1,7)&X2(1,2) | |  | X1(3,5)&X2(1,2) | | | X1(3,6)&X2(1,2) | | X1(3,7)&X2(1,2) | | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | 勝算比 | | 信賴區間 |
| X3=1 | 0.6449 | (0.6209,0.6697) | 0.9187 | (0.8847,0.9541) | 0.6353 | (0.6079,0.6640) | X3=1 | 1.3256 | (1.853,1.3671) | | 1.8885 | (1.8314,1.9474) | 1.3059 | | (1.2568,1.3570) |
| X3=2 | 0.4275 | (0.0445,4.1104) | 0.2834 | (0.0295,2.7252) | 0.2938 | (0.0306,2.8249) | X3=2 | 1.4279 | (1.3991,1.4573) | | 0.9467 | (0.9248,0.9691) | 0.9812 | | (0.9508,1.0126) |
| CMH | 520.7095 | | 19.5433 | | 408.8982 | | CMH | 1490.2309 | | | 360.942 | | 54.2645 | | |
| P-value | <.0001 | | <.0001 | | <.0001 | | P-value | <.0001 | | | <.0001 | | <.0001 | | |
| B-D | 0.1284 | | 1.1619 | | 0.4684 | | B-D | 15.547 | | | 1246.5063 | | 127.8345 | | |
| P-value | 0.7201 | | 0.2811 | | 0.4937 | | P-value | <.0001 | | | <.0001 | | <.0001 | | |
| 共同勝算比 | 0.6448 | (0.6209,0.6696) | 0.9185 | (0.8845,0.9538) | 0.6352 | (0.6077,0.6638) | 共同勝算比 | 1.3966 | (1.3731,1.4205) | | 1.1953 | (1.1732,1.2177) | 1.0956 | | (1.0692,1.1226) |
| 邊際勝算比 | 0.7852 | (0.7635,0.8076) | 0.6503 | (0.6316,0.6696) | 0.5996 | (0.5800,0.6198) | 邊際勝算比 | 1.4912 | (1.4670,1.5159) | | 1.235 | (1.2127,1.2577) | 1.1386 | | (1.1114,1.1665) |
| 辛普森詭論 |  | |  | |  | | 辛普森詭論 |  | | |  | |  | | |
|  | X1(2,3)&X2(1,2) | | X1(2,4)&X2(1,2) | | X1(2,5)&X2(1,2) | |  | X1(4,5)&X2(1,2) | | | X1(4,6)&X2(1,2) | | X1(4,7)&X2(1,2) | | |
|  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | 勝算比 | | 信賴區間 |
| X3=1 | 0.8286 | (0.8160,0.8414) | 1.114 | (1.0950,1.1334) | 1.0983 | (1.0642,1.1335) | X3=1 | 0.9859 | (0.9550,1.0178) | | 1.4046 | (1.3608,1.4499) | 0.9713 | | (0.9340,1.0101) |
| X3=2 | 0.7314 | (0.7140,0.7493) | 0.7573 | (0.7375,0.7777) | 1.0444 | (1.0164,1.0732) | X3=2 | 1.3791 | (1.3475,1.4115) | | 0.9143 | (0.8909,0.9383) | 0.9477 | | (0.9166,0.9798) |
| CMH | 1147.0269 | | 0.5198 | | 37.8688 | | CMH | 457.61 | | | 56.3962 | | 11.2054 | | |
| P-value | <.0001 | | 0.4709 | | <.0001 | | P-value | <.0001 | | | <.0001 | | 0.0008 | | |
| B-D | 73.2883 | | 572.7779 | | 5.6189 | | B-D | 279.2481 | | | 423.9085 | | 0.8807 | | |
| P-value | <.0001 | | <.0001 | | 0.0178 | | P-value | <.0001 | | | <.0001 | | 0.348 | | |
| 共同勝算比 | 0.8 | (0.7897,0.8104) | 0.9947 | (0.9804,1.0092) | 1.0668 | (1.0450,1.0890) | 共同勝算比 | 1.2264 | (1.2309,1.2494) | | 1.0795 | (1.0580,1.1014) | 0.9575 | | (0.9335,0.9822) |
| 邊際勝算比 | 0.8356 | (0.8250,0.8463) | 1.0106 | (0.9963,1.0251) | 1.2461 | (1.2240,1.2686) | 邊際勝算比 | 1.233 | (1.2114,1.2549) | | 1.2011 | (1.0016,1.0411) | 0.9414 | | (0.9182,0.9653) |
| 辛普森詭論 |  | |  | |  | | 辛普森詭論 |  | | |  | | 無 | | |
|  | | | | | | |  | X1(5,6)&X2(1,2) | | | X1(5,7)&X2(1,2) | | X1(6,7)&X2(1,2) | | |
|  | 勝算比 | | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | |
| X3=1 | 1.4247 | | (1.3671,1.4847) | 0.9852 | (0.9397,1.0329) | 0.6915 | (0.6596,0.7249) | |
| X3=2 | 0.663 | | (0.6456,0.6808) | 0.6872 | (0.6643,0.7108) | 1.0365 | (1.0001,1.0742) | |
| CMH | 280.0481 | | | 335.1626 | | 61.8284 | | |
| P-value | <.0001 | | | <.0001 | | <.0001 | | |
| B-D | 940.2496 | | | 147.7894 | | 179.8658 | | |
| P-value | <.0001 | | | <.0001 | | <.0001 | | |
| 共同勝算比 | 0.8284 | | (0.8103,0.8469) | 0.7741 | (0.7532,0.7956) | 0.8924 | (0.8673,0.9182) | |
| 邊際勝算比 | 0.8282 | | (0.8100,0.8467) | 0.7635 | (0.7430,0.7847) | 0.9219 | (0.8961,0.9485) | |
| 辛普森詭論 |  | | | 有 | | 有 | | |

* X1\*X3 |Y

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| Y=1 | X1\*X3 | 6 | 0.3440 | 63585.5495 | <.0001 | 69798.2005 | <.0001 | Reject H0 |
| Y=2 | X1\*X3 | 6 | 0.3468 | 44569.3172 | <.0001 | 48961.7087 | <.0001 | Reject H0 |
| Y=3 | X1\*X3 | 6 | 0.3548 | 19854.2068 | <.0001 | 22088.4965 | <.0001 | Reject H0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | X1(1,2)&X3(1,2) | | | X1(1,3)&X3(1,2) | | X1(1,4)&X3(1,2) | |  | X1(3,5)&X3(1,2) | | X1(3,6)&X3(1,2) | | X1(3,7)&X3(1,2) | | | | | | | | | |
|  | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | | | 信賴區間 | | | | | | |
| Y=1 | 3954.659 | (556.9965,28077.9636) | | 9443.657 | (1330.1524,67046.9509) | 9619.615 | (1354.9107,68297.4908) | Y=1 | 4.0657 | (3.9752,4.1582) | 3.9427 | (3.8489,4.0387) | 2.7092 | | | (2.6305,2.7902) | | | | | | |
| Y=2 | 2756.819 | (388.2650,19574.3892) | | 6719.222 | (946.3782,47706.0343) | 6745.013 | (949.9845,47890.4686) | Y=2 | 4.1511 | (4.0393,4.2659) | 4.0073 | (3.8920,4.1260) | 2.5473 | | | (2.4576,2.6403) | | | | | | |
| Y=3 | 1239.17 | (174.4842,8800.4655) | | 3746.887 | (527.6563,26606.6473) | 2984.11 | (420.2130,21191.4204) | Y=3 | 3.4995 | (3.3559,3.6492) | 3.321 | (3.1575,3.4729) | 2.0308 | | | (1.9213,2.1464) | | | | | | |
| CMH | 7674.2393 | | | 19031.2078 | | 17920.9684 | | CMH | 31602.5427 | | 26295.5914 | | 7992.4047 | | | | | | | | | |
| P-value | <.0001 | | | <0.0001 | | <0.0001 | | P-value | <.0001 | | <.0001 | | <.0001 | | | | | | | | | |
| B-D | 0.7694 | | | 0.4682 | | 0.7863 | | B-D | 48.2192 | | 52.7873 | | 81.2842 | | | | | | | | | |
| P-value | 0.6807 | | | 0.7913 | | 0.6749 | | P-value | <.0001 | | <.0001 | | <.0001 | | | | | | | | | |
| 共同勝算比 | 2648.346 | (854.2236,8210.6543) | | 6724.932 | (2158.7600,20949.3911) | 6437.407 | (2077.0998,19950.9937) | 共同勝算比 | 4.0046 | (3.9409,4.0694) | 3.864 | (367991,3.9316) | 2.5435 | | | (2.4905,2.5976) | | | | | | |
| 邊際勝算比 | 2650.539 | (854.7626 ,8219.0717) | | 6596.391 | (2127.3210, 20454.0689) | 6451.404 | (2080.5290, 20004.8221) | 邊際勝算比 | 4.009 | (3.9453, 4.0738) | 3.8693 | (3.8035 3.9362) | 2.5453 | | | (2.4923, 2.5995) | | | | | | |
| 辛普森詭論 | 無 | | | 無 | | 無 | | 辛普森詭論 | 無 |  | 無 |  | 無 | | |  | | | | | | |
|  | X1(1,5)&X3(1,2) | | | X1(1,6)&X3(1,2) | | X1(1,7)&X3(1,2) | |  | X1(4,5)&X3(1,2) | | X1(4,6)&X3(1,2) | | X1(4,7)&X3(1,2) | | | | | | | | | |
|  | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | | | 信賴區間 | | | | | | |
| Y=1 | 38394.88 | (5407.4824,272616) | | 37233.08 | (5243.7587,264372) | 25584.33 | (3602.9287,181674) | Y=1 | 3.9913 | (3.8963,4.0886) | 3.8705 | (3.7729,3.9707) | 2.6593 | | | (2.5792,2.7425) | | | | | | |
| Y=2 | 27891.84 | (3927.9369,198057) | | 26926.18 | (3791.8419,191205) | 17116.06 | (2410.0791,121556) | Y=2 | 4.1352 | (4.0161,4.2578) | 3.992 | (3.8702,4.1177) | 2.5736 | | | (2.4446,2.6341) | | | | | | |
| Y=3 | 13112.2 | (1845.9497,93138.9220) | | 12443.37 | (1751.6813,88393.5671) | 7609.036 | (1070.8496,5466.8185) | Y=3 | 4.394 | (4.2024,4.5944) | 4.1699 | (3.9974,4.3716) | 2.5499 | | | (2.4075,2.7007) | | | | | | |
| CMH | 47441.9842 | | | 44125.433 | | 29348.9688 | | CMH | 27777.8847 | | 23536.8318 | | 7644.686 | | | | | | | | | |
| P-value | <.0001 | | | <.0001 | | <.0001 | | P-value | <.0001 | | <.0001 | | <.0001 | | | | | | | | | |
| B-D | 0.6629 | | | 0.6914 | | 0.8408 | | B-D | 14.3751 | | 7.9042 | | 4.1615 | | | | | | | | | |
| P-value | 0.7179 | | | 0.7077 | | 0.6568 | | P-value | 0.0008 | | 0.0192 | | 0.1248 | | | | | | | | | |
| 共同勝算比 | 26721.07 | (8590.7230,83114.7426) | | 25737.98 | (8279.1518,80013.4595) | 13512.41 | (5417.5622,52192.8756) | 共同勝算比 | 40984 | (4.0287,4.1694) | 3.9555 | ()3.8842,4.0281 | 2.6011 | | | (2.5447,2.6588) | | | | | | |
| 邊際勝算比 | 26445.2 | (8527.8357, 82007.7673) | | 25523.24 | (8230.3956, 79150.0153) | 16789.88 | (5413.8215 ,52070.4677) | 邊際勝算比 | 3.9562 | (3.8849 ,4.0289) | 3.9562 | (3.8849 ,4.0289) | 4.0991 | | | (4.0294, 4.1701) | | | | | | |
| 辛普森詭論 | 無 | | | 無 | | 無 | | 辛普森詭論 | 無 |  | 無 |  | 無 | | |  | | | | | | |
|  | X1(2,3)&X3(1,2) | | | X1(2,4)&X3(1,2) | | X1(2,5)&X3(1,2) | |  | X1(5,6)&X3(1,2) | | X1(5,7)&X3(1,2) | | X1(6,7)&X3(1,2) | | | | | | | | | |
|  | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | | | 信賴區間 | | | | | | |
| Y=1 | 2.388 | (2.3463,2.4304) | | 2.4325 | (2.3852,2.4807) | 9.7088 | (9.4614,9.9626) | Y=1 | 0.9697 | (0.9405,0.9998) | 0.6663 | (0.6434 ,0.6901) | 0.6871 | | | (0.628,0.7123) | | | | | | |
| Y=2 | 2.4373 | (2.3861,2.4896) | | 2.4467 | (2.3895,2.5052) | 10.1174 | (9.8060,10.4386) | Y=2 | 0.9654 | (0.9302,1.0019) | 0.6137 | (0.5881,0.6403) | 0.6357 | | | (0.6084,0.6641) | | | | | | |
| Y=3 | 3.0237 | (2.9285,3.1221) | | 2.4082 | (2.3243,2.4951) | 10.5814 | (10.0908,11.0959) | Y=3 | 0.949 | (0.8966,1.0045) | 0.5803 | (0.5435,0.6196) | 0.6115 | | | (0.5716,0.6541) | | | | | | |
| CMH | 21305.3235 | | | 16157.5061 | | 69600.6382 | | CMH | 10.1689 | | 1279.2421 | | 1025.7088 | | | | | | | | | |
| P-value | <0.0001 | | | <.0001 | | <.0001 | | P-value | 0.0014 | | <.0001 | | <.0001 | | | | | | | | | |
| B-D | 167.1463 | | | 0.537 | | 10.9475 | | B-D | 0.4318 | | 17.0206 | | 12.4935 | | | | | | | | | |
| P-value | <.0001 | | | 0.7645 | | 0.0042 | | P-value | 0.8058 | | 0.0002 | | 0.0019 | | | | | | | | | |
| 共同勝算比 | 2.4932 | (2.4623,2.5245) | | 2.4336 | (2.4001,2.4677) | 9.975 | (9.7936,10.1598) | 共同勝算比 | 0.9652 | (0.9444,0.9864) | 0.6349 | (0.6193,0.6510) | 0.6578 | | | (0.6411,0.6749) | | | | | | |
| 邊際勝算比 | 2.4887 | (2.4578 ,2.5200) | | 2.434 | (2.4004 2.4680) | 9.9773 | (9.7958 ,10.1621) | 邊際勝算比 | 0.6349 | (0.6192, 0.6510) | 0.9651 | (0.9443 ,0.9864) | 0.6578 | | | (0.6411 0.6750) | | | | | | |
| 辛普森詭論 | 無 | | | 無 | |  | | 辛普森詭論 | 無 |  | 無 |  | 無 | | |  | | | | | | |
|  | X1(2,6)&X3(1,2) | | | X1(2,7)&X3(1,2) | | X1(3,4)&X3(1,2) | |  | | | | | | | | | | | |  |  |  | | |  | | |  | |  |  | | | | | | |  |  | | |
|  | 勝算比 | | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 |  | | | | | | | | | | | |  |  | | | | | | | | | | |  |  |  | |  |  | | |  |  | |
| Y=1 | 9.415 | | (9.1625,9.6745) | 6.4694 | (6.2653,6.6802) | 1.0186 | (1.0035,1.0340) |  | | | | | | | | | | | |  |  | | | | | | | | | | |  |  |  | |  |  | | |  |  | |
| Y=2 | 9.7671 | | (9.4508,10.0940) | 6.2086 | (5.9714,6.4553) | 1.0038 | (0.9859,1.0221) |  | | | | | | | | | | | |  |  | | | | | | | | | | |  |  |  | |  |  | | |  |  | |
| Y=3 | 10.0417 | | (9.5521,10.5564) | 6.1404 | (5.7844,6.5184) | 0.7964 | (0.7748,0.8187) |  | | | | | | | | | | | |  |  | | | | | | | | | | |  |  |  | |  |  | | |  |  | |
| CMH | 61456.63 | | | 28938.7698 | | 18.9085 | |  | | | | | | | | | | | |  |  |  | | |  | | |  | |  |  | | | | | | |  |  | | |
| P-value | <.0001 | | | <.0001 | | <.0001 | |  | | | | | | | | | | | |  |  |  | | |  | | |  | |  |  | | | | | | |  |  | | |
| B-D | 6.0522 | | | 3.7175 | | 250.0834 | |  | | | | | | | | | | | |  |  |  | | |  | | |  | |  |  | | | | | | |  |  | | |
| P-value | 0.0485 | | | 0.1559 | | <.0001 | |  | | | | | | | | | | | |  |  |  | | |  | | |  | |  |  | | | | | | |  |  | | |
| 共同勝算比 | 9.6269 | | (9.4426,9.8148) | 6.3307 | (6.1876,6.4771) | 0.9767 | (0.9663,0.9871) |  | | | | | |  |  | |  |  |  | | | | |  | |  |  | |  | | | | | |
| 邊際勝算比 | 9.6295 | | (9.4451 ,9.8174) | 6.3345 | (6.1913, 6.4810) | 0.978 | (0.9677 ,0.9885) |  | | | | | |  |  | |  |  |  | | | | |  | |  |  | |  | | | | | |
| 辛普森詭論 |  | | | 無 | |  | |  | | | | | |  |  | |  |  |  | | | | |  | |  |  | |  | | | | | |

* X1\*X3 |X2

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| X2=1 | X1\*X3 | 6 | 0.34868 | 98904 | <.0001 | 107893 | <.0001 | Reject H0 |
| X2=2 | X1\*X3 | 6 | 0.3468 | 30319.1548 | <.0001 | 34458.4079 | <.0001 | Reject H0 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | X1(1,2)&X3(1,2) | | | X1(1,3)&X3(1,2) | | X1(1,4)&X3(1,2) | | |  | X1(3,5)&X3(1,2) | | | | X1(3,6)&X3(1,2) | | | X1(3,7)&X3(1,2) | | | | | |
|  | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | |  | 勝算比 | 信賴區間 | | | 勝算比 | 信賴區間 | | 勝算比 | | | 信賴區間 | | |
| X2=1 | 3238.492 | (653.5688,16047.0185) | | 8397.529 | (1694.7886,41609.0199) | 8702.2958 | (1756.2690,43119.7924) | | X2=1 | 3.8845 | (3.8130,3.9574) | | | 4.6067 | (4.5143,4.7010) | | 2.7113 | | | (2.6467,2.7774) | | |
| X2=2 | 2257.958 | (455.6203,11189.9662) | | 5168.458 | (1042.9952,25611.7748) | 4124.5881 | (832.3070,20439.8463) | | X2=2 | 4.1844 | (4.0528,4.3203) | | | 2.3092 | (2.2345,2.3863) | | 2.0371 | | | (1.9506,2.1274) | | |
| CMH | 7892.3457 | | | 19308.7504 | | 17800.7366 | | | CMH | 3090.6217 | | | | 26176.1242 | | | 7933.1652 | | | | | |
| P-value | <.0001 | | | <.0001 | | <.0001 | | | P-value | <.0001 | | | | <.0001 | | | <.0001 | | | | | |
| B-D | 0.1002 | | | 0.1836 | | 0.4405 | | | B-D | 15.5496 | | | | 1242.8186 | | | 127.7795 | | | | | |
| P-value | 0.7515 | | | 0.6683 | | 0.5069 | | | P-value | <.0001 | | | | <.0001 | | | <.0001 | | | | | |
| 共同勝算比 | 2781.894 | (891.6981,8678.8704) | | 6886.763 | (2206.4287,21495.1419) | 6452.1787 | (2076.9081,20044.5117) | | 共同勝算比 | 3.9606 | (3.8975,4.0247) | | | 3.8355 | (3.7703,3.9017) | | 2.5339 | | | (2.4811,2.5878) | | |
| 邊際勝算比 | 2650.539 | (854.7626 ,8219.0717) | | 6596.391 | (2127.3210, 20454.0689) | 6451.404 | (2080.5290, 20004.8221) | | 邊際勝算比 | 4.009 | (3.9453, 4.0738) | | | 3.8693 | (3.8035 3.9362) | | 2.5453 | | | (2.4923, 2.5995) | | |
| 辛普森詭論 | 無 | | | 無 | | 無 | | | 辛普森詭論 |  | |  | 無 | | |  | 無 | | | | | |  |
|  | X1(1,5)&X3(1,2) | | | X1(1,6)&X3(1,2) | | X1(1,7)&X3(1,2) | | |  | X1(4,5)&X3(1,2) | | | | X1(4,6)&X3(1,2) | | | X1(4,7)&X3(1,2) | | | | | |
|  | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | |  | 勝算比 | 信賴區間 | | | 勝算比 | 信賴區間 | | 勝算比 | | | 信賴區間 | | |
| X2=1 | 32620.17 | (6582.8897,161643) | | 38684.92 | (7806.6226,191699) | 22767.8959 | (4594.3219,112830) | | X2=1 | 3.7485 | (3.6746,3.8238) | | | 4.4454 | (4.3509,4.5419) | | 2.6163 | | | (2.5514,2.6828) | | |
| X2=2 | 21626.8 | (4363.3778,107192) | | 11934.86 | (2407.9068,59155.4391) | 10528.5182 | (2123.6397,52197.9765) | | X2=2 | 5.2434 | (5.0681,5.4248) | | | 2.8936 | (2.7944,2.9963) | | 2.5526 | | | (2.4405,2.6699) | | |
| CMH | 47583.0062 | | | 43683.6695 | | 29121.9835 | | | CMH | 27705.9247 | | | | 23588.8866 | | | 7644.1576 | | | | | |
| P-value | <.0001 | | | <.0001 | | <.0001 | | | P-value | <.0001 | | | | <.0001 | | | <.0001 | | | | | |
| B-D | 0.1338 | | | 1.1067 | | 0.4862 | | | B-D | 279.2256 | | | | 423.8407 | | | 0.8807 | | | | | |
| P-value | 0.7145 | | | 0.2928 | | 0.4856 | | | P-value | <.0001 | | | | <.0001 | | | 0.348 | | | | | |
| 共同勝算比 | 27835.56 | (8829.3074,87755.2986) | | 2388.261 | (7782.8375,73321.4596) | 17178.2751 | (5468.3265,53964.0666) | | 共同勝算比 | 4.0887 | (4.0192,4.1594) | | | 3.9677 | (3.8960,4.0406) | | 2.6012 | (2.5448,2.6588) | | | | |
| 邊際勝算比 | 26445.2 | (8527.8357, 82007.7673) | | 25523.24 | (8230.3956, 79150.0153) | 16789.8844 | (5413.8215 ,52070.4677) | | 邊際勝算比 | 2.6025 | (2.5461 2.6602) | | | 3.9562 | (3.8849 ,4.0289) | | 4.0991 | (4.0294, 4.1701) | | | | |
| 辛普森詭論 | 無 | | | 無 | | 無 | | | 辛普森詭論 | 無 | |  | 無 | | |  | 無 | | | | | |  |
|  | X1(2,3)&X3(1,2) | | | X1(2,4)&X3(1,2) | | X1(2,5)&X3(1,2) | | |  | X1(5,6)&X3(1,2) | | | | X1(5,7)&X3(1,2) | | | X1(6,7)&X3(1,2) | | | | | |
|  | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | 勝算比 | 信賴區間 | |  | 勝算比 | 信賴區間 | | | 勝算比 | 信賴區間 | | 勝算比 | 信賴區間 | | | | |
| X2=1 | 2.593 | (2.5556,2.6311) | | 2.6871 | (2.6440,2.7310) | 10.0726 | (9.8589,10.2910) | | X2=1 | 1.1859 | (1.1559,1.2168) | | | 0.698 | (0.6782,0.7183) | | 0.5885 | (0.5712,0.6064) | | | | |
| X2=2 | 2.289 | (2.2334,2.3459) | | 1.8267 | (1.777,1.8770) | 9.578 | (9.2423,9.9260) | | X2=2 | 0.5519 | (0.5292,0.5754) | | | 0.4868 | (0.4628,0.5121) | | 0.8822 | (0.8382,0.9284) | | | | |
| CMH | 21544.3735 | | | 16162.7832 | | 69121.4103 | | | CMH | 12.0022 | | | | 1234.8773 | | | 1055.9456 | | | | | |
| P-value | <.0001 | | | <.0001 | | <.0001 | | | P-value | 0.0005 | | | | <.0001 | | | <.0001 | | | | | |
| B-D | 73.3009 | | | 572.6868 | | 5.6214 | | | B-D | 940.3225 | | | | 147.8048 | | | 179.8959 | | | | | |
| P-value | <.0001 | | | <.0001 | | 0.0177 | | | P-value | <.0001 | | | | <.0001 | | | <.0001 | | | | | |
| 共同勝算比 | 2.5131 | (2.4819,2.5448) | | 2.4316 | (2.3980,2.4656) | 9.9338 | (9.7528,10.1182) | | 共同勝算比 | 0.9625 | (0.9418,0.9836) | | | 0.6404 | (0.6246,0.6566) | | 0.6536 | (0.6370,0.6707) | | | | |
| 邊際勝算比 | 2.4887 | (2.4578 ,2.5200) | | 2.434 | (2.4004 2.4680) | 9.9773 | (9.7958 ,10.1621) | | 邊際勝算比 | 0.6349 | (0.6192, 0.6510) | | | 0.9651 | (0.9443 ,0.9864) | | 0.6578 | (0.6411 0.6750) | | | | |
| 辛普森詭論 | 無 | | | 無 | |  | | | 辛普森詭論 | 無 | |  | 無 | | |  | 無 | | | | | |  |
|  | X1(2,6)&X3(1,2) | | | X1(2,7)&X3(1,2) | | X1(3,4)&X3(1,2) | | |  |  | | | | |  | |  | | | | | |  | | | | | |  | |  | |  | |  | |  |
|  | 勝算比 | | 信賴區間 | 勝算比 | 信賴區間 | 勝算比 | | 信賴區間 |  | | | | | | | | | |  | |  |  | |  | |  |  |  | |  | | | | | | | | |  |
| X2=1 | 11.9453 | | (11.6747,12.2223) | 7.0304 | (6.8475,7.2182) | 1.0363 | | (1.0238,1.0490) |  | | | | | | | | | |  | |  |  | |  | |  |  |  | |  | | | | | | | | |  |
| X2=2 | 5.2857 | | (5.0962,5.4822) | 4.6628 | (4.4523,4.8834) | 0.798 | | (0.78060.8158) |  | | | | | | | | | |  | |  |  | |  | |  |  |  | |  | | | | | | | | |  |
| CMH | 61461.4536 | | | 29081.099 | | 22.1611 | | |  |  | | | | |  | |  | | | | | |  |  |  | | | | |  | |  | |  | |
| P-value | <.0001 | | | <.0001 | | <.0001 | | |  |  | | | | |  | |  | | | | | |  |  |  | | | | |  | |  | |  | |
| B-D | 1385.3203 | | | 229.6973 | | 413.3774 | | |  |  | | | | |  | |  | | | | | |  |  |  | | | | |  | |  | |  | |
| P-value | <.0001 | | | <.0001 | | <.0001 | | |  |  | | | | |  | |  | | | | | |  |  |  | | | | |  | |  | |  | |
| 共同勝算比 | 9.4699 | | (9.2890,9.6543) | 6.3347 | (6.1914,6.4812) | 0.9748 | | (0.9645,0.9852) |  | | | | | | | | | |  | |  |  | |  | |  |  |  | |  | | | | | | | | |  |
| 邊際勝算比 | 9.6295 | | (9.4451 ,9.8174) | 6.3345 | (6.1913, 6.4810) | 0.978 | | (0.9677 ,0.9885) |  | | | | | | | | | |  | |  |  | |  | |  |  |  | |  | | | | | | | | |  |
| 辛普森詭論 | 無 | |  | 無 |  | 無 | |  |  | | | | | | | | | |  | |  |  | |  | |  |  |  | |  | | | | | | | | |  |

|  |  |  |
| --- | --- | --- |
|  | X2(1,2)&X3(1,2) | |
|  | 勝算比 | 信賴區間 |
| X1=1 | 1.9702 | (0.2049,18.9431) |
| X1=2 | 1.3737 | (1.3407,1.4075) |
| X1=3 | 1.2126 | (1.1946,1.2309) |
| X1=4 | 0.9338 | (0.9151,0.9529) |
| X1=5 | 1.3062 | (1.2628,1.3511) |
| X1=6 | 0.6078 | (0.5866,0.6299) |
| X1=7 | 0.9111 | (0.8690,0.9552) |
| CMH | 381.9457 |  |
| P-value | <0.0001 |  |
| B-D | 1979.5787 |  |
| P-value | <0.0001 |  |
| 共同勝算比 | 1.1007 | (1.0901,1.1114) |
| 邊際勝算比 | 1.0930 | (1.0832 ,1.1030) |
| 辛普森詭論 | 有 |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| X1=1 | X2\*X3 | 1 | 0.0035 | 0.3583 | 0.5495 | 0.3385 | 0.5607 | No Reject H0 |
| X1=2 | X2\*X3 | 1 | 0.0578 | 658.3752 | <.0001 | 639.0652 | <.0001 | Reject H0 |
| X1=3 | X2\*X3 | 1 | 0.0389 | 636.7529 | <.0001 | 632.4155 | <.0001 | Reject H0 |
| X1=4 | X2\*X3 | 1 | -0.0143 | 43.9138 | <.0001 | 44.0281 | <.0001 | Reject H0 |
| X1=5 | X2\*X3 | 1 | 0.0523 | 240.7665 | <.0001 | 245.2691 | <.0001 | Reject H0 |
| X1=6 | X2\*X3 | 1 | -0.1011 | 759.5901 | <.0001 | 735.7494 | <.0001 | Reject H0 |
| X1=7 | X2\*X3 | 1 | -0.0192 | 14.8856 | 0.0001 | 14.8256 | 0.0001 | Reject H0 |

* X2\*X3 |X1
* X2\*X3 |Y

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 條件 | 變數 | 自由度 | Cramer-V | X2 | X2 p-value | G2 | G2 p-value | 結論 |
| Y=1 | X2\*X3 | 1 | 0.0090 | 43.9302 | <0.0001 | 43.8735 | <0.0001 | Reject H0 |
| Y=2 | X2\*X3 | 1 | 0.0095 | 33.1247 | <0.0001 | 33.0778 | <0.0001 | Reject H0 |
| Y=3 | X2\*X3 | 1 | 0.0805 | 1022.3922 | <0.0001 | 1012.3404 | <0.0001 | Reject H0 |

|  |  |  |
| --- | --- | --- |
|  | X2(1,2)&X3(1,2) | |
|  | 勝算比 | 信賴區間 |
| Y=1 | 1.0436 | (1.0305,1.0568) |
| Y=2 | 1.0459 | (1.0300,1.0619) |
| Y=3 | 1.5048 | (1.4675,1.5431) |
| CMH | 386.3150 |  |
| P-value | <0.0001 |  |
| B-D | 707.461 |  |
| P-value | <0.0001 |  |
| 共同勝算比 | 1.0951 | (1.0852,1.1050) |
| 邊際勝算比 | 1.0930 | (1.0832 ,1.1030) |
| 辛普森詭論 | 有 | |

* X3\*Y | X2
* 條件卡方——控制X2=1的情形下，X3 \* Y

H0：性別為男生的情況下，婚姻狀態與購買商品次數無關聯

H1：性別為男生的情況下，婚姻狀態與購買商品次數有關聯

α=0.05

P-value =0.0002

因為P-value =0.0002<0.05，所以拒絕 H0，性別為男生的情況下，婚姻狀態與購買商品次數有顯著關聯。Cramer V=0.0046表示性別為男生的情況下，婚姻狀態與購買商品次數的相關程度較弱。

條件勝算比——控制X2=1的情形下，X3(1,2)\* Y(1,2)

： ：

0.05

，表示在性別為男生的情況下，沒有結婚購買商品1的次數對購買商品2的勝算是有結婚購買商品1的次數對購買商品2勝算的倍。的信賴區間為(0.9779，0.9972)不包含1，所以在性別為男生的情況下，婚姻狀態(無結婚，有結婚)與購買商品次數(商品1，商品2)之間有顯著關聯。

* 條件卡方——控制X2=2的情形下，X3 \* Y

H0：性別為女生的情況下，婚姻狀態與購買商品次數無關聯

H1：性別為女生的情況下，婚姻狀態與購買商品次數有關聯

α=0.05

P-value <0.0001

因為P-value <0.0001，所以拒絕 H0，性別為女生的情況下，婚姻狀態與購買商品次數有顯著關聯。Cramer V=0.0562表示性別為女生的情況下，婚姻狀態與購買商品次數的相關程度較弱。

條件勝算比——控制X2=2的情形下，X3(1,2)\* Y(1,2)

： ：

0.05

，表示在性別為女生的情況下，沒有結婚購買商品1的次數對購買商品2的勝算是有結婚購買商品1的次數對購買商品2勝算的倍。的信賴區間為(0.9728，1.0068)包含1，所以在性別為女生的情況下，婚姻狀態(無結婚，有結婚)與購買商品次數(商品1，商品2)之間無顯著關聯。

* MH和BD檢定——控制X2的情形下，X3(1,2) \* Y(1,2)

MH

H0：

H1：不全為1, i=1,2

0.05, CMH=7.6859，因為P-value=0.0056<0.05，所以拒絕 H0，條件勝算比不全獨立。

BD

H0：

H1： 不全相等, i=1,2

0.05, BD=0.0460，因為P-value=0.8301>0.05，所以不拒絕H0，沒有充分證據說明不全相等。

* 共同勝算比——控制X2的情形下，X3(1,2) \* Y(1,2)

,表示控制性別的情況下，沒有結婚購買商品1的次數對購買商品2的勝算是有結婚購買商品1的次數對購買商品2勝算的倍。由於的信賴區間為(0.9796，0.9965)不包含1，所以控制性別的情況下，婚姻狀態(無結婚，有結婚)與購買商品的次數(商品1，商品2)之間有顯著關聯。

* X2\*Y | X3
* 條件卡方——控制X3=1的情形下，X2 \* Y

H0：婚姻狀態為無的情況下，性別與購買商品次數無關聯

H1：婚姻狀態為無的情況下，性別與購買商品次數有關聯

α=0.05 7.0706

P-value =<.0001

因為P-value =<.0001，所以拒絕 H0，婚姻狀態為無的情況下，性別與購買商品次數有顯著關聯。Cramer V=0.0633表示婚姻狀態為無的情況下，性別與購買商品次數的相關程度較弱。

條件勝算比——控制X3=1的情形下，X2(1,2)\* Y(1,2)

： ：

0.05

，表示在婚姻狀態為無的情況下，男性購買商品1的次數對購買商品2的勝算是女性購買商品1的次數對購買商品2勝算的倍。的信賴區間為(0.9708，0.9958)不包含1，所以在婚姻狀態為無的情況下，性別(男，女)與購買商品次數(商品1，商品2)之間有顯著關聯。

* 條件卡方——控制X3=2的情形下，X2 \* Y

H0：婚姻狀態為有的情況下，性別與購買商品次數無關聯

H1：婚姻狀態為有的情況下，性別與購買商品次數有關聯

α=0.05

P-value =<.0001

因為P-value =<.0001，所以拒絕 H0，婚姻狀態為有的情況下，性別與購買商品次數有顯著關聯。Cramer V=0.0633表示婚姻狀態為有的情況下，性別與購買商品次數的相關程度較弱。

條件勝算比——控制X3=2的情形下，X2(1,2)\* Y(1,2)

： ：

0.05

，表示在婚姻狀態為有的情況下，男性購買商品1的次數對購買商品2的勝算是女性購買商品1的次數對購買商品2勝算的倍。的信賴區間為(0.9705，1.0005)包含1，所以在婚姻狀態為有的情況下，性別(男，女)與購買商品次數(商品1，商品2)之間有顯著關聯。

* MH和BD檢定——控制X3的情形下，X2(1,2) \* Y(1,2)

MH

H0：

H1：不全為1, i=1,2

0.05, CMH=10.3488，因為P-value=0.0013<0.05，所以拒絕 H0，條件勝算比不全獨立。

BD

H0：

H1： 不全相等, i=1,2

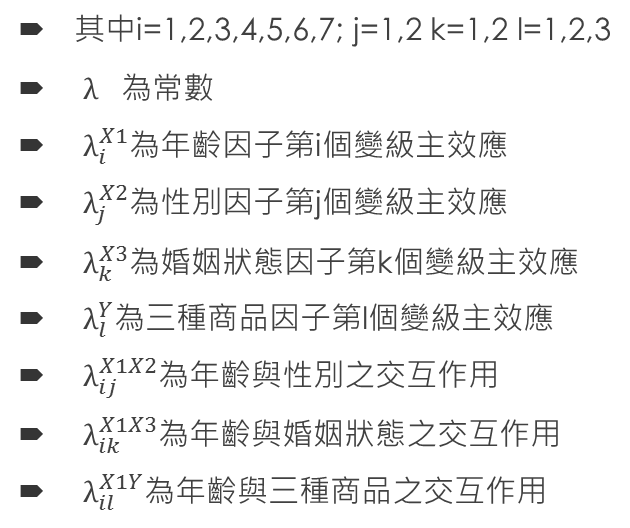
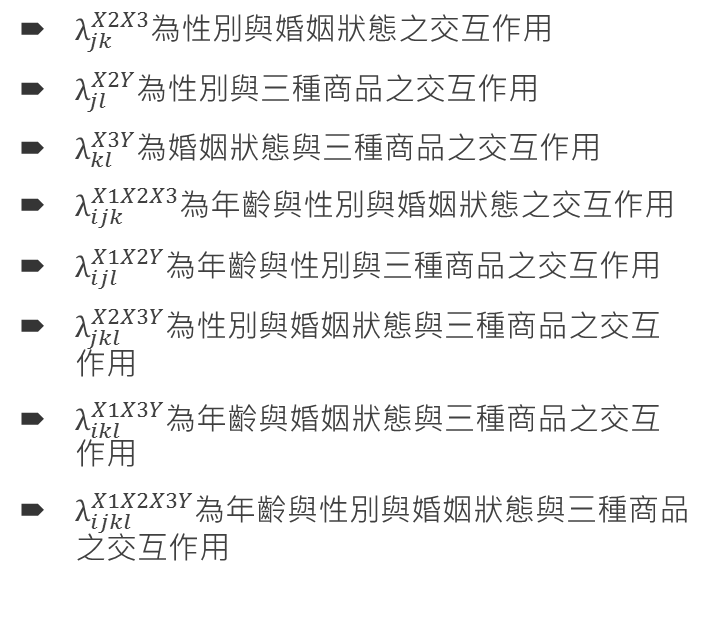
0.05, BD=0.0460，因為P-value=0.8301>0.05，所以不拒絕H0，沒有充分證據說明不全相等。

* 共同勝算比——控制X3的情形下，X2(1,2) \* Y(1,2)

,表示控制婚姻狀態的情況下，男性購買商品1的次數對購買商品2的勝算是女性購買商品1的次數對購買商品2勝算的倍。由於的信賴區間為(0.9746，0.9938)不包含1，所以控制性別的情況下，性別(男，女)與購買商品的次數(商品1，商品2)之間有顯著關聯。

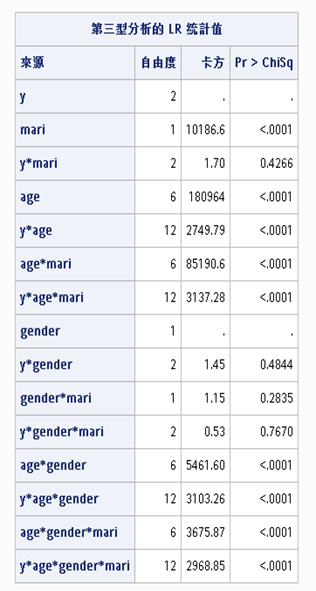
第四節、飽和模型

Log(u)=λ+λix1+λjx2+λkx3+λly+λijx1x2+λikx1x3+λilx1y+λjkx1x3λjlx2y+λkyx3y+λijkx1x2x3

λijlx1x2y+λijlx1x3y+λjklx2x3y+λijklx1x2x3y

： Y,X1,X2,X3四因子交互作用不存在

：

(1)0 (YX1X2X3) 0

(2)12(YX1X2, YX1X3, YX2X3, X1X2X3) 2968.8527

(3)14(YX1X3, YX2X3, X1X2X3) 4091.2804

(4)18(YX1X2, YX1X3, YX2X3) 5047.1052

(2)- (1):

G2=2968.8527-0=2968.8527

R.R. X2 >X12, 0.05=21.026

拒絕H0，4因子交互作用存在

1. 結論與建議

根據三維分析，男性有無結婚會影響到購買商品的次數，反而女性有無結婚並不影響，本來一開始我們以為女性必較容易因為婚姻關係影響購買慾，男性應該比較沒有影響，但分析出來的結論卻相反，證明女性不管在什麼條件下購買力都驚人。

模型出來的結論為四因子有交互作用影響。

1. 參考文獻

Alan Agresti(2013)。類別資料分析導論。臺北市：華泰