**Faculty of Science, Engineering and Built Environment**



**MIS771 – Descriptive Analytics And Visualisation**

Assignment 1

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**Email from Natalia**

**To:** Edmond Kendrick

**From:** Natalia Navarska

**Subject:** Analysis results of car insurance brokerage services

Hello Eddie,

Greeting of the day,

I have studied and analyzed the car insurance brokerage services. Also, please find the attached detailed analysis excel sheet named as “219248489.excel”.

**Introduction**

This analysis is conducted to prove the taglines, which is always advertised by an insurance broker that they can save vehicles owners hundreds of dollars each year on insurance premium. The analysis is conducted on 400 random customers who took the services of four different car insurance broker named iChoose, uChoose, vChoose, yChoose based on vehicle type(4WD, Luxury, Sport, Family). The sample has been taken from both urban and rural area of different states of Australia, such as NSW, VIC, Queensland, Tasmania, and others. The sample size includes both gender male and females as well as with different valuations methods such as ’Agreed value Policy’ and ‘market value Policy.’ Moreover, this analysis is also considered the proportion of customers who approached their insurance provider before reaching out to a broker. Different Descriptive and inferential techniques have been applied to verify the above-given statement based on different factors such as sample size, number of variables, type of data, and so on. The body includes the theoretical results of analysis and extract of analysis is included in the Appendix.

1. The broker iChoose saved 49864 dollars of their customers, and on an average, it saved 262 dollars for their customers whereas, another broker uChoose and ychoose saved $16221 and $19602 respectively in total. However, on average, yChoose saved $204.188 of their customers, which is far from the average saving of uChoose with 230 dollars. However, least saved by vchoose with average 137.381 for every customer and it saved 5770 dollars in total. So, we can interpret from detailed analysis results that iChoose was able to save more money from their customer as compared to other customers. However, with 95 % confidence, we can say that average saving on insurance premium by broker iChoose is less and equal to mean a saving of broker uChoose.(Refere Figure 1 in Appendix)

2. There are a total of 400 customers. Out of them, only 95 and 305 Customers lived in the rural area and urban area, respectively. However, out of 400customer, only 92 customers who either dissatisfied or very dissatisfied with their insurance broker in both areas. It is noticeable that 34.73% is the proportion of dissatisfied (either dissatisfied or very dissatisfied) customers in the rural area whereas, 19.34 % of customers were dissatisfied in an urban area. So, from these results and with 95% confidence, we can conclude that the proportion of dissatisfied urban customers is less than the proportion of dissatisfied rural customers across all urban and rural customers.(Refer figure 2 and 3 in Appendix)

3. (a) on average, the rural customers saved 193 dollars on premium insurance, which is greater than premium insurance saving of urban area with 240 dollars. so it shows rural customer saved more from premium insurance than urban customers. we can conclude that with 95% confidence that there is not enough evidence to prove that the mean saving savings on insurance premium for rural and urban is equal. So, we can say that average savings on insurance premium differ between urban and rural customers.(Refer figure 4 in Appendix)

(b). There are only 44 customers has ‘Agreed value policy’ where the majority of customers (356) took ‘Market value policy.’ However, on average saving, there is no minor difference between saving of customer with ‘ Agreed value policy’ and ‘Market value policy’ which is 4 dollar because on average customers with ‘Agreed value policy’ saved 360 dollars whereas ‘Market value policy’ customers saved 213 dollars in total. From these figures, we can conclude with ‘Agreed value policy’ saved more than ‘Market value policy.’ We are 95% confident that the average saving with ‘Agreed value ‘ and ‘Market value’ lies between 16.26 and 278.11.( Refer figure 5 in Appendix)

(C). There is a total of 167 females who took insurance whereas 233 males. The numbers of females with Diamond no claim bonus rating is 107 which is less than the number of males with diamond level no claim bonus rating (i.e., 186), as well as We can conclude with 95% confidence that there is enough evidence to the proportion of female customers with diamond level NCBR is greater or equal to the proportion of male customers. In this scenario, the difference lies between 6% and 25%. (Refer figure 6 in Appendix)

4(a) the majority of premium insurance customers sides in NSW accounted for 127 whereas only 61 and 89 customers live in Queensland and Victoria respectively. There is a minor difference of 2 dollars between the average saving of Victoria (242 dollars) and Queensland(240 dollars), but NSW saved higher than others with 266 dollars on average. However, I am 95% confident that there is that average saving on insurance premium is not differing between Victoria, NSW, and Queensland. (Refer figure 7 and 8 in Appendix)

4(b)insurance company divided the insurance according to vehicle types such as 4WD, Luxury, and Sportscar. The same number of customers took insurance on 4wd and Luxury with 62 customers; however, 42 customers took premium insurance on Sportscar. However, it is noticeable that Sportscar customers saved more on average with 692 dollars, followed by 507 dollars by Luxury cars insurance customers whereas least saved by customers who had 4WD premium insurance. So we can say that average saving on premium insurance is significantly different according to vehicle type, which is also proved by inferential analysis results. (Refer figure 8 in Appendix)

5. Out of 400, 331 does not approach their insurance provider before reaching out to a broker whereas the least number of customers approached their insurance provider before reaching out to a broker accounted for 69. It is seen that 14 % customer approached AAMI insurer whereas almost some proportion of customers approached Allianz, Coles, GIO, NRMA noticed as 8%. However, only 10% and 11% of customers approached RAVC and YOUI insurer. We can conclude that the proportion of customers who approached their insurance provider before reaching out to a broker is not different between the insurance provider. (Refer figure 9 and 10 in Appendix)

6. As yours Previous notes prepared by Raj related to Vehicle type and the valuation method that there are 40 customers and 5 customers for each category. The least average saved by those customers on premium insurance with family vehicle type in agreed value policy and market value policy with 78 dollars and 44 dollars whereas highest saved by customers who have Luxury vehicles in both policies accounted by 952 dollars and 583 dollars on average. Customers who had 4WD with Agreed value policy validation method saved 456 on average, which three times than market value policy on the same vehicle type. In conclusion, customers with agreed value have more average saving than ‘Market value policy’ according to their vehicle type in total. It is clear from inferential results that average saving is always effect by valuation method either ‘Market value policy’ or ‘Agreed value Policy.’ It is also clearly seen that vehicle type also put an effect on the average saving of customers on insurance premium. However, the interaction of the valuation method and Vehicle type has no effect on average savings on insurance premium. (Refer figure 11,12,13, and 14 in Appendix)

Conclusion:

The type of broker plays an essential role on average saving on insurance premium. However, according to results, there is no sufficient evidence which broker saves more, but it is clear that iChoose saved less or equal to uChoose. But according to the area, average savings on insurance premium is differ between urban and rural customers as well as we are too much confidence that the proportion of dissatisfied urban customers is less than the proportion of dissatisfied rural customers across all urban and rural customers. Apart from this, customers with ‘agreed value policy’ saved more on average than the second policy. Moreover, the average saving on insurance premium is significantly differing between states (VIC, NSW, Queensland) but according to vehicle type(4WD, Luxury, Sports Car), it does not differ. Most noticeable that the proportion of customers who approached their insurance provider before reaching out to a broker is not different between the insurance provider. Customers who consider valuation method and vehicle type together on insurance premium does not affect average saving. However, when we take sperate, it affects the average saving of customers and customers can take more benefit.

Regards,

Nat

**Appendix: Data analysis results**

|  |  |  |
| --- | --- | --- |
|  | ***iChoose*** | ***uChoose*** |
|  |  |  |
| Mean | 262.4421053 | 230.8472 |
| Standard Error | 25.88252108 | 36.67158 |
| Median | 127 | 94.5 |
| Mode | 0 | 0 |
| Standard Deviation | 356.7659324 | 311.1687 |
| Sample Variance | 127281.9305 | 96825.93 |
| Kurtosis | 4.120997653 | 4.678094 |
| Skewness | 1.82640257 | 1.933557 |
| Range | 2034 | 1645 |
| Minimum | -78 | -69 |
| Maximum | 1956 | 1576 |
| Sum | 49864 | 16621 |
| Count | 190 | 72 |
| Largest(1) | 1956 | 1576 |
| Smallest(1) | -78 | -69 |
| Confidence Level(95.0%) | 51.05573371 | 73.12105 |
| Q1 | 0 | 24 |
| Q2 | 127 | 94.5 |
| Q3 | 412.5 | 388.75 |
| IQR | 412.5 | 364.75 |

FIGURE 1: Summary saving of iChoose and uChoose

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Count of Customer\_Sat** |  |  |  |  |  |
| **Area** | **Dissatisfie** | **Very Dissatisfied** | **Grand Total** | **Total Customers** | **Proportion** |
| Rural | 23 | 10 | 33 | 95 | 34.73684211 |
| Urban | 34 | 25 | 59 | 305 | 19.3442623 |
| **Grand Total** | **57** | **35** | **92** | **400** | **54.0811044** |

Figure 2: Pivot table of Proportion of Dissatisfied Customers in Rural and Urban

Figure 3: customer Dissatisfaction in Rural and Urban area

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Rural Savings*** |  |  | ***Urban Savings*** |  |
|  |  |  |  |  |
| Mean | 193.3157895 |  | Mean | 240.957377 |
| Standard Error | 28.23507251 |  | Standard Error | 19.06957156 |
| Median | 100 |  | Median | 124 |
| Mode | 0 |  | Mode | 0 |
| Standard Deviation | 275.2014451 |  | Standard Deviation | 333.0357498 |
| Sample Variance | 75735.83539 |  | Sample Variance | 110912.8107 |
| Kurtosis | 5.146444733 |  | Kurtosis | 5.290710082 |
| Skewness | 2.10577059 |  | Skewness | 2.043994406 |
| Range | 1360 |  | Range | 2034 |
| Minimum | -87 |  | Minimum | -78 |
| Maximum | 1273 |  | Maximum | 1956 |
| Sum | 18365 |  | Sum | 73492 |
| Count | 95 |  | Count | 305 |
| Largest(1) | 1273 |  | Largest(1) | 1956 |
| Smallest(1) | -87 |  | Smallest(1) | -78 |
| Confidence Level(95.0%) | 56.06139836 |  | Confidence Level(95.0%) | 37.52506747 |
|  |  |  |  |  |
| Q1 | 12 |  | Q1 | 7.5 |
| Q2 | 100 |  | Q2 | 126 |
| Q3 | 311.75 |  | Q3 | 363.75 |
| IQR | 299.75 |  | IQR | 356.25 |
| Upper Fence | 761.375 |  | Upper Fence | 898.125 |
| Lower Fence | -437.625 |  | Lower Fence | -526.875 |

Figure 4: Summary Saving in Rural and Urban Area

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Agreed value Savings*** | |  | ***Market value Savings*** | |
|  |  |  |  |  |
| **Mean** | **360.6363636** |  | **Mean** | **213.4522472** |
| Standard Error | 63.1048583 |  | Standard Error | 16.06541763 |
| Median | 257.5 |  | Median | 105 |
| Mode | 39 |  | Mode | 0 |
| **Standard Deviation** | **418.5902748** |  | **Standard Deviation** | **303.1216935** |
| Sample Variance | 175217.8182 |  | Sample Variance | 91882.76109 |
| Kurtosis | 2.125316584 |  | Kurtosis | 6.201555819 |
| Skewness | 1.525254902 |  | Skewness | 2.150111636 |
| Range | 1727 |  | Range | 2043 |
| Minimum | -76 |  | Minimum | -87 |
| Maximum | 1651 |  | Maximum | 1956 |
| Sum | 15868 |  | Sum | 75989 |
| **Count** | **44** |  | **Count** | **356** |
| Largest(1) | 1651 |  | Largest(1) | 1956 |
| Smallest(1) | -76 |  | Smallest(1) | -87 |
| Confidence Level(95.0%) | 127.2630755 |  | Confidence Level(95.0%) | 31.59535709 |
|  |  |  |  |  |
| Q1 | 69.25 |  | Q1 | 0 |
| Q2 | 257.5 |  | Q2 | 105 |
| Q3 | 494.75 |  | Q3 | 342.25 |
| IQR | 425.5 |  | IQR | 342.25 |
| Upper Fence | 1133 |  | Upper Fence | 855.625 |
| Lower Fence | -569 |  | Lower Fence | -1283.4375 |

Figure 5: Summary saving with ‘Agreed value ‘ and ‘Market value’ policy

|  |  |  |
| --- | --- | --- |
|  | **Count of Female NCBR** | **Count of Male NCBR** |
| Diamond | 107 | 186 |
| **Grand Total** | **107** | **186** |

Figure 6: Pivot table: Female and Male customers with NCBR

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Anova: Single Factor |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| SUMMARY |  |  |  |  |  |  |
| ***Groups*** | ***Count*** | ***Sum*** | ***Average*** | ***Variance*** |  |  |
| **Victoria Savings** | 89 | 21568 | 242.337079 | 115231.0442 |  |  |
| **New south walesSavings** | 127 | 33903 | 266.952756 | 114626.2517 |  |  |
| **Quensland Savings** | 61 | 14662 | 240.360656 | 87200.56776 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| ***Source of Variation*** | ***SS*** | ***df*** | ***MS*** | ***F*** | ***P-value*** | ***F crit*** |
| **Between Groups** | 44578.57 | 2 | 22289.2843 | 0.204836754 | 0.814904969 | 3.028725648 |
| **Within Groups** | 29815274 | 274 | 108814.867 |  |  |  |
| **Total** | **29859852** | **276** |  |  |  |  |

**Figure 7: Single Factor Anova: summary salary statistics of Victoria , NSW and Quensland**

|  |  |  |  |
| --- | --- | --- | --- |
| **Tukey Kramer Multiple Comparisons** | | | |
|  |  |  | |
|  | **Sample** | **Sample** | |
| **Group** | **Mean** | **Size** | |
| **4WD Savings** | 285.6452 | 62 | |
| **Luxury Savings** | 507.9194 | 62 | |
| **Sports Savings** | 692.7551 | 49 | |
|  |  |  | |
| Other Data | |  | |
| Level of significance | 0.05 |  | |
| Numerator d.f. | 3 |  | |
| Denominator d.f. | 170 |  | |
| MSW | 94153.95 |  | |
| Q Statistic | 3.31 |  | |
|  | | | **Absolute** | | **Std. Error** | **Critical** |  |
| **Comparison** | | | **Difference** | | **of Difference** | **Range** | **Results** |
| **4WD Savings to Luxury Savings** | | | 222.2741935 | | 38.96937426 | 128.9886 | **Means are different** |
| **4WD Savings to Sports Savings** | | | 407.1099408 | | 41.47361424 | 137.2777 | **Means are different** |
| **Luxury Savings to Sports Savings** | | | 184.8357472 | | 41.47361424 | 137.2777 | **Means are different** |

**Figure 8: Tukey Kramer Multiple Comparisons**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Observed Frequencies** | | | | | | | | |
| **Insurance Provider** | | | | | | | | |
| **Approached Insurer** | **AAMI** | **Allianze** | **Coles** | **GIO** | **NRMA** | **RACV** | **Youi** | **Total** | |
| **No** | 67 | 43 | 40 | 42 | 44 | 49 | 46 | 331 | |
| **Yes** | 16 | 7 | 6 | 5 | 7 | 9 | 19 | 69 | |
| **Total** | 83 | 50 | 46 | 47 | 51 | 58 | 65 | 400 | |
|  |  |  |  |  |  |  |  |  | |
| **Expected Frequencies** | | | | | | | | |
| **Insurance Provider** | | | | | | | | |
| **Approached Insurer** | **AAMI** | **Allianze** | **Coles** | **GIO** | **NRMA** | **RACV** | **Youi** | **Total** | |
| **No** | 68.6825 | 41.375 | 38.065 | 38.8925 | 42.2025 | 47.995 | 53.7875 | 331 | |
| **Yes** | 14.3175 | 8.625 | 7.935 | 8.1075 | 8.7975 | 10.005 | 11.2125 | 69 | |
| **Total** | 83 | 50 | 46 | 47 | 51 | 58 | 65 | 400 | |

**Figure 9: Chi- square to test expected Frequencies and observed Frequencies of different insurance**

**approaches.**

|  |  |
| --- | --- |
| Marascuilo Procedure |  |
|  |  |
| Level of Significance | 0.05 |
| Square Root of Critical Value | 3.548462659 |
|  |  |
| Group Sample Proportions | |
| 1: AAMI | 0.192771084 |
| 2: Allianz | 0.14 |
| 3: Coles | 0.130434783 |
| 4: GIO | 0.106382979 |
| 5: NRMA | 0.137254902 |
| 6: RACV | 0.155172414 |
| 7:YOUI | 0.292307692 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **MARASCUILO TABLE** | | |  |  |
| Proportions | Absolute Differences | Critical Range |  |  |
| AAMI-Allianz | 0.052771084 | 0.824040995 | Not significant | |
| AAMI-Coles | 0.062336302 | 0.814475777 | Not significant | |
| AAMI-GIO | 0.086388106 | 0.790423973 | Not significant | |
| AAMI-NRMA | 0.055516182 | 0.821295897 | Not significant | |
| AAMI-RACV | 0.037598671 | 0.839213408 | Not significant | |
| AAMI-YOUI | 0.099536608 | 0.976348687 | Not significant | |
|  |  |  |  |  |
| Allianze-Coles | 0.009565217 | 0.627219555 | Not significant | |
| Allianze-GIO | 0.033617021 | 0.603167751 | Not significant | |
| Allianze-NRMA | 0.002745098 | 0.634039674 | Not significant | |
| Allianze-RACV | 0.015172414 | 0.651957186 | Not significant | |
| Allianze-YOUI | 0.152307692 | 0.789092465 | Not significant | |
|  |  |  |  |  |
| Coles-GIO | 0.024051804 | 0.569225934 | Not significant | |
| Coles-NRMA | 0.006820119 | 0.600097858 | Not significant | |
| COLES-RACV | 0.024737631 | 0.618015369 | Not significant | |
| COLES-YOUI | 0.16187291 | 0.755150648 | Not significant | |
|  |  |  |  |  |
| GIO-NRMA | 0.030871923 | 0.51475093 | Not significant | |
| GIO-RACV | 0.048789435 | 0.532668441 | Not significant | |
| GIO-YOUI | 0.185924714 | 0.66980372 | Not significant | |
|  |  |  |  |  |
| NRMA-RACV | 0.017917512 | 0.642216308 | Not significant | |
| NRMA-YOUI | 0.15505279 | 0.779351587 | Not significant | |
|  |  |  |  |  |
| RACV-YOVI | 0.137135279 | 0.842931208 | Not significant | |

**Figure 10: Marascuilo Procuedure and table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Valuation Method** | **4WD** | **Family** | **Sport** | **Luxury** |
| **Agreed Value** | 1068 | 169 | 1799 | 966 |
|  | 128 | 150 | 680 | 1144 |
|  | 98 | -59 | 373 | 893 |
|  | 560 | 22 | 143 | 1144 |
|  | 429 | 108 | 442 | 629 |
| **Market Value** | 104 | 54 | 99 | 1273 |
|  | 72 | 0 | 156 | 247 |
|  | 311 | 94 | 1084 | 357 |
|  | 146 | 84 | 357 | 676 |
|  | 135 | -10 | 131 | 366 |

**Figure 11: summary of Valuation method with vehicle type**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Anova: Two-Factor With Replication | | |  |  |  |  |
|  |  |  |  |  |  |  |
| **SUMMARY** | **4WD** | **Family** | **Sport** | **Luxury** | **Total** |  |
| **Agreed Value** |  |  |  |  |  |  |
| **Count** | 5 | 5 | 5 | 5 | 20 |  |
| **Sum** | 2283 | 390 | 3437 | 4776 | 10886 |  |
| **Average** | 456.6 | 78 | 687.4 | 955.2 | 544.3 |  |
| **Variance** | 155458.8 | 9067.5 | 422787.3 | 45420.7 | 242271.3 |  |
|  |  |  |  |  |  |  |
| **Market Value** |  |  |  |  |  |  |
| **Count** | 5 | 5 | 5 | 5 | 20 |  |
| **Sum** | 768 | 222 | 1827 | 2919 | 5736 |  |
| **Average** | 153.6 | 44.4 | 365.4 | 583.8 | 286.8 |  |
| **Variance** | 8574.3 | 2262.8 | 171554.3 | 173951.7 | 119989.9 |  |
|  |  |  |  |  |  |  |
| **Total** |  |  |  |  |  |  |
| **Count** | 10 | 10 | 10 | 10 |  |  |
| **Sum** | 3051 | 612 | 5264 | 7695 |  |  |
| **Average** | 305.1 | 61.2 | 526.4 | 769.5 |  |  |
| **Variance** | 98406.1 | 5349.289 | 292952.9 | 135814.9 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |
| **Source of Variation** | **SS** | **df** | **MS** | **F** | **P-value** | **F crit** |
| **Sample** | 663062.5 | 1 | 663062.5 | 5.363079 | 0.027131 | 4.149097 |
| **Columns** | 2753315 | 3 | 917771.5 | 7.423253 | 0.000657 | 2.90112 |
| **Interaction** | 173337.3 | 3 | 57779.1 | 0.467337 | 0.707116 | 2.90112 |
| **Within** | 3956310 | 32 | 123634.7 |  |  |  |
|  |  |  |  |  |  |  |
| **Total** | **7546024** | **39** |  |  |  |  |

**Figure 12: TWO factor anova with replication to check effect of vehicle type with valuation method**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Row Labels** | **Average of 4WD** | **Average of Family** | **Average of Sport** | **Average of Luxury** |
| Agreed Value | 1068 | 169 | 1799 | 966 |
| Market Value | 104 | 54 | 99 | 1273 |
| **Grand Total** | **586** | **111.5** | **949** | **1119.5** |
|  |  |  |  |  |

**Figure 13: summary salary statistics of valuation method with vehicle type**

**Figure 14: Saving comparsion of valuation method according to vehcle type**