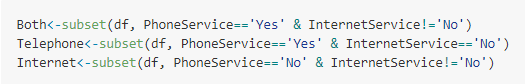
Assignment 7- Telco Churn

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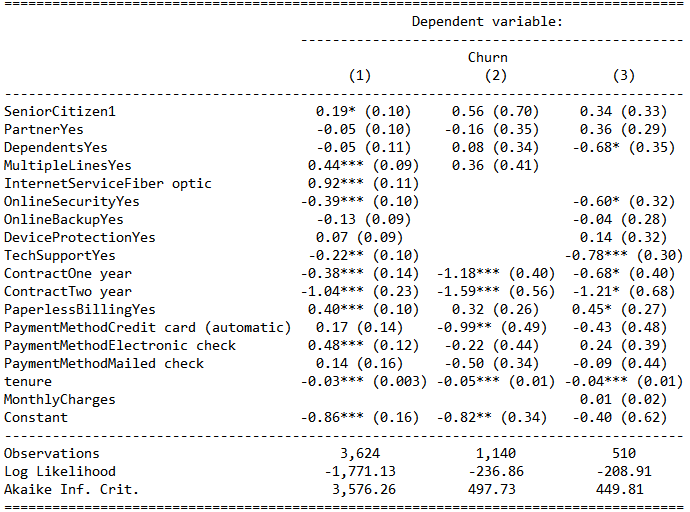
1. I did the following steps:
   1. I checked for nulls in the main data set. There were 11 nulls so I removed those rows completely.
   2. Encoded Churn column
   3. I made separate data sets for Telephone only, Internet only and for customers using both services using the following block of code. 
   4. Then I converted all categorical variables to factors in the 3 data sets.
   5. Dropped irrelevant columns from each data set. For example, all internet related columns were dropped in the telephone only dataframe.

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| **Applicable to all Customers (All data frames)** | | |
| **Variable** | **Effect** | **Rationale** |
| Partner | -ve | People with partners will likely have more users associated with their subscription so churning would be harder because switching cost might be high. |
| Dependents | -ve | People with dependents will likely have more users associated with their subscription so churning would be harder because switching cost might be high. |
| Senior Citizen | -ve | Senior Citizens are more likely churn since usually senior citizens aren’t that tech savvy so churn can be associated to lack of use or missed payments. |
| Payment Method | +ve/-ve | Automatic Payments might reduce churn since it will reduce involuntary churn due to unintentional non-payment. |
| Contract | +ve/-ve | Customers with month-to-month subscription might be more likely to churn because of the low commitment of the customer to the service to begin with. |
| Paperless Billing | +ve | Without receiving a mailed bill, customers could forget to send payment leading to involuntary churn. |
| Tenure | -ve | The longer the customer has stayed with the company, chances are that they are satisfied with the services and won’t churn. |
| Monthly Charges | -ve | Higher the charges, more the chances that a lower price alternative is available. (This variable would only be included if the model passes VIF test) |

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| **Specific to all Telephone Customers** | | |
| **Variable** | **Effect** | **Rationale** |
| Multiple Lines | -ve | More lines mean more customers are affected with the churn meaning that the switching cost might be high. Thus, reducing churn. |

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| **Specific to Internet Customers** | | |
| **Variable** | **Effect** | **Rationale** |
| Online Security | -ve | Online security shows commitment towards the subscription therefore the chances to churn would be less. |
| Online Backup | -ve | These customers are also using backup services meaning their switching costs would be higher leading to less churn. |
| Device Protection | -ve | Companies often have device protection if the customer has purchased the product from them on finance often. This hints towards longer contract terms and hence lesser chances to churn. |
| Tech Support | -ve | Tech support is a very important element of service. Customers with tech support might have a better overall experience of the subscription. |
| Internet Service **(for customers who have both telephone and internet)** | +ve/-ve | Fiber Optic Internet is expensive, and customers will demand great performance if they opt for it. This opens the possibilities for cheaper alternatives and since the customers would demand high speeds, therefore performance will be important. So, chances of churn here are higher if performance is not up to the mark |

StreamingTV, StreamingMovies and gender are not included since there was no evidence that it effected churn of customers.  
Total Charges was not included because of high correlation with tenure.

1. The stargazer of the 3 Logit models is shown below:  
   

4)

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| **Type of customer** | **Top Variables** | **Marginal Effect** |
| **Subscription to both internet and telephone** | Contract – 2 year | If the customer has a contract of 2 years, the odds of churning go down by 65% compared to customers who have a Month to Month plan keeping everything else constant. |
| Internet Service – Fiber Optic | Customers having Fiber Optic internet service have 2.5 times the odds of churning than customers having DSL keeping everything else constant |
| Payment Method – Electronic Check | If the customer uses electronic check as their payment method, then the odds of them to churn are 62% higher than customers who use automatic bank transfers keeping everything else constant. |
| **Subscription to internet only** | Contract | If the customer has a 2 year contract or 1 year contract, then the odds of him churning are 70% and 49% lower respectively of the odds of churning for the customer who has month to month contract. (keeping all other factors constant) |
| Tech Support | Customers having Tech Support have 54% lower odds of churning than customers having DSL keeping everything else constant. |
| Dependents | Customers having Dependents have 49% lower odds of churning than customers who don’t have dependents keeping everything else constant. |
| **Subscription to Telephone only** | Contract | If the customer has a 2 year contract or 1 year contract, then the odds of him churning are 80% and 69% lower respectively of the odds of churning for the customer who has month to month contract. (keeping all other factors constant) |
| Payment method – Credit Card | If the customer uses credit card automatic payment, then the odds of him churning are reduced by 63% of the odds of churning for the customer who uses automatic bank transfer. (keeping everything else constant) |
| Senior Citizen | Senior Citizens have 75% greater odds of churning than customers who are not senior citizens. (keeping everything else constant) |

5)   
**Note:** I assummed that retaining a customer would be less costly than acquiring new customers. Therefore, ideally the company would be incurring less cost if the model predicts that a customer will churn when in reality he will not. In this case, the company would incur less cost since it would send a cheap coupon or give the customer a call for a survey to see if they are satisfied with the service. The company would incur more cost on the other hand if the customer churns. Keeping this in mind, I have set lower cutoff rates to priortize recall over precision.

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|  | **Model** | | |
| **Measure** | **Customers with Both** | **Customers with Telephone only** | **Customers with Internet only** |
| Accuracy | 70.7% | 84.5% | 78.8% |
| AUC | 75.3% | 77.4% | 76.1% |
| Precision | 52% | 29% | 57% |
| Recall | 88% | 69% | 70% |
| F-1 Score | 0.65 | 0.41 | 0.63 |