Customer spending patterns

Question: What is the driving force to what a customer is willing to pay, and how can we use it to our advantage?

Approach: We will do data exploration. What trends exist? Is there any obvious significance in our data? Regression tree vs. logistic regression for a possible pricing model that will allow for predictions in the future.

The Big Bang: An interactive tool that gives a user diagnostics in which will allow a business user to understand trends and model predictions of ranges of values in which a customer is likely to purchase.

Abstract

Central to development of society is transportation, more specifically freight and good transportation. As our society has grown so too has our technology. Currently technology and data is growing at an alarming rate. Petabytes of information exists, and few people know how to utilize it. Databases have become massive and extremely expensive. For multiple reasons: security, confidentiality, and many others; companies are not willing to move their data to high efficiency data storage centers (such as Hadoop). Transportation data is collected at extremely high rates, which is more than a single person can analyze. It has become crucial to squeeze as many pennies out of the data as possible. Currently intermodal (multiple means of transporting goods) companies have flat rate pricing systems, but it is their desire to incorporate a more dynamic pricing model which utilizes statistical methods and data visualization. It is this projects goal to attempt to understand the consumer of intermodal transportation services and develop a deployable interactive tool in which we can interactively observe consumers buying habits.

1 Introduction:

The most essential part of big data is ensuring reproducible of data products by any (business or otherwise) user. This is a difficult task. Everyone is different, and no two people have the exact same skills or the same understanding of data. However, for any study it becomes crucial to understand the data, how it is stored, and where it is coming from. In this article we will first define some terms that are common to the transportation business. Then, we will explore the data in order to fully understand everything that will be presented in this project. Last, we will analyze the data, create a data product, and will discuss the results.

1.1 Understanding Intermodal Transportation

Transportation business is extremely complicated. Millions of moving and working parts are constantly in motion. Each part can be collected and stored as observable data. Clearly any data from such a complicated industry needs to

have a common language. So, we must first define a few common transportation terms. These words will be used throughout the paper and are essential to understanding our objectives.

1. Intermodal transportation - Intermodal transportation is the movement of freight by more than one type of carrier. Carriers include trains, trucks, barge, etc.

2. Drayage - Location where freight is moved from one transportation type to another: train to truck, truck to barge, or any other transportation combination.

3. Ramp - defined by city, state, and three letter acronym giving location and specific ramp for the transaction.

4. Broker LOB - Stands for "broker type and line of business". There are three main categories: management firm, brokerage, intermodal company.

5. Bill to name - Company which the transportation services were purchased from. Often when dealing with brokers they act as an intermediate between two companies in order to find the cheapest means of transportation.

1.2 Understanding Intermodal Data

This data This data was offered for this research from a door to door intermodal sales company. The company is door to door in the sense that each purchase will consist of transportation where, from origin truck delivers freight to a train at a drayage location, then train delivers to truck at another drayage location, last truck delivers the freight to it's final destination. This can be layered and more complicated especially including multiple different types of transportation. We will only focus on truck to train and train to truck transactions. Due to the extreme levels of confidentiality in which the data was originally stored, we have eliminated all columns of which could be identified to any individual. We will show a few of the rows in the "exploration of the data" section.

2 Exploration of the data

Exploration of the data is a major component of this project. The data contains various fields of how a person interacted with the website for transportation services. Each click, interaction and view produces a single row of data. When

an individual logs into the website they are requested to fill out personal information. We will not concern our selves with this information due to customer privacy. However, when an individual first logs into the system they will create an unique Customer ID. This ID starts with an X followed by three letters and three numbers. Each time that Customer logs in they create a phantom contract. Inorder for a contract to be created the individual needs to select a location and day for freight transportation. At this point a contract is created and the customer is then guided towards purchasing signing terms of agreement. Also, at this point various fields are filled in including revenue, first origin to drayage cost ($ORIG\_DRAY\_COST$), second drayage to destination cost ($DEST\_DRAY\_COST$), rail cost, profit (COC), first origin to drayage miles, second drayage to destination miles, rail miles, total miles, visit date, customer type, bill to city, drayage ramp locations. Lastly, if the individual accepts and purchases a Load Number is create.

We have also created three vaiables at this time: profit per mile, cost per mile, revenue per mile. These variables standardize purchasing details. Distance of transportation is the driving factor of cost. Later we will augment the data inorder to look at an individual purchasing patterns we will create a buyrare variable.

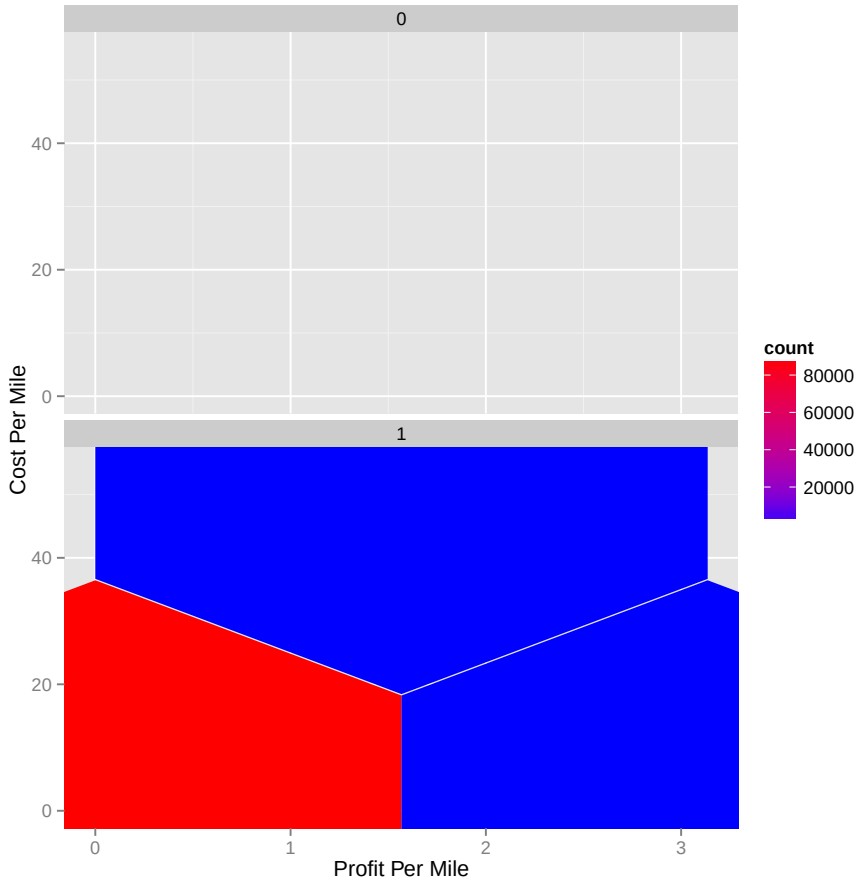

Figure 1: This is a honeycomb plot of profit per mile versus cost per mile. It demonstrates the density of where individual would buy.

This is a hexagonal plot or otherwise known as honeycomb plot. It is informative in the case where density and occurrence want to be demonstrated. In this graph we were interested in seeing where a majority of the purchasing is occurring. We separated Loads (Confirmed purchases) from Search (Has not purchased). On the x-axis we have profit per mile and on the y-axis is the cost per mile. The data was standardized so that some one transporting commodities on a greater distance would not look like an outlier. As distance is often the primary factor that would increase the rail cost significantly. Other factors that could have significance on cost in which are not easily demonstrated include: geography, weather, union strikes, and others that are more rare (union strikes, etc).

By plotting profit vs cost we can observe the revenue. We can see that the margin is very tight in transportation as red demonstrates high density. The darkest red is just right of $0 profit. It is also shown that the density of the buyers are almost exactly in the same region as the searchers, however; the outliers for cost and for profit are seldomly purchased. Notice that there is also negative profits. In many instances it is more profitable to take a loss in profit in order to get a rail car to an appropriate destination where it could make a profit. This is the rail theory headhaul versus backhaul in practice. We will want to investigate this in much more detail later.

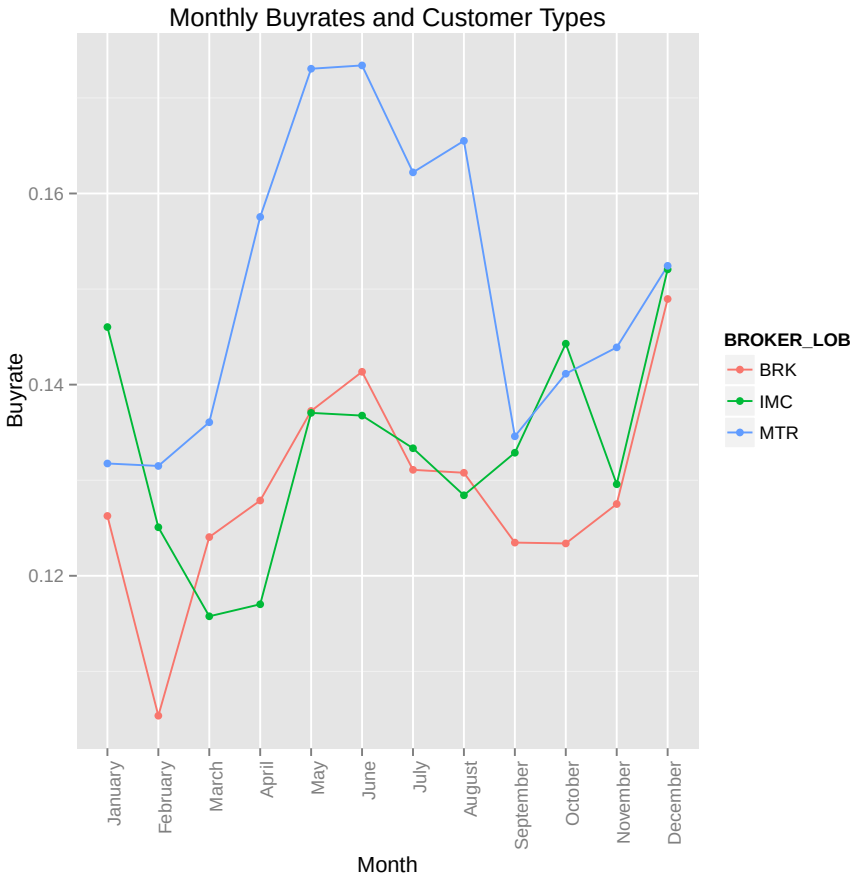

Figure 2: This plot over time shows that MTR buyers are different than IMC and BRK buyers during the summer months.

This is a time series of customer buying rates. There are a few expected occurances. For one, holiday months should have higher buy rates. This is most noticable in the month of December. When there is a need to transport a large amount of goods, there should be an increase in buyrates as transportation becomes constraint and demand is on a rise. Specifically, during this time there is more of a demand then there is availability.

We were expecting that all of the customer types would have similar or the same buyrates across the months. However, this is not the case here. MTR during the months of March through August seem to increase their buying patterns. This is interesting, this tells us that there are different buying patterns for each of the customer types. We will need to separate the customer groups when we build our statistical models.

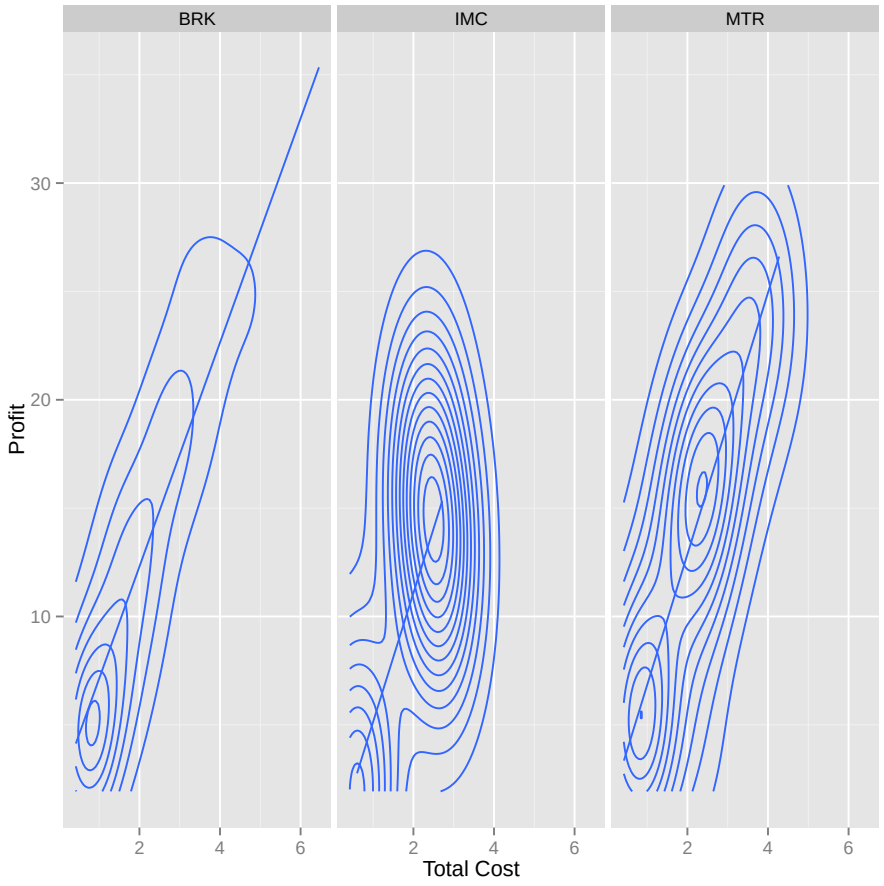

Figure 3: Faceted we can see that each of the the three groups that are priced have a linear trend. This is evidence that Cost is a flat rate.

This graphic provides proof that the flat rate system is enforced to some degree. There is some divergence but for the most part the data and our graphics is supporting this notion. Also, notice that the three customer types all have very similar linear trends. It is interesting to note that the IMC has a very dense local point at just above 2 dollars per mile. They are localizing the revenue which is generated.

```
## Error in eval(expr, envir, enclos):  argument is missing, with no
default
```

3 Statistical Analysis:

```
IMCDataSet2<-profitCostMod2

summary(profitCostMod2)
```

```
##       YRMO            Search       Buy          PHANTOM_CONTRACT
##  Min.   :201305   Min.   :1   Min.   :0.0000   Min.   :     0
##  1st Qu.:201307   1st Qu.:1   1st Qu.:0.0000   1st Qu.:     0
##  Median :201310   Median :1   Median :0.0000   Median :     0
##  Mean   :201339   Mean   :1   Mean   :0.1318   Mean   : 38135
##  3rd Qu.:201401   3rd Qu.:1   3rd Qu.:0.0000   3rd Qu.:     0
##  Max.   :201404   Max.   :1   Max.   :1.0000   Max.   :333555
##
##     CONTRACT        LOAD.NUMBER          LOAD           LH_REVENUE
##  Min.   :      0   #N/A   :617750   Min.   :0.00000   Min.   :  742
##  1st Qu.:      0   1457870:     1   1st Qu.:0.00000   1st Qu.: 2221
##  Median :      0   1458652:     1   Median :0.00000   Median : 2701
##  Mean   : 221889   1459711:     1   Mean   :0.07268   Mean   : 2779
##  3rd Qu.:      0   1461408:     1   3rd Qu.:0.00000   3rd Qu.: 3310
##  Max.   :1961447   1461555:     1   Max.   :1.00000   Max.   :16431
##                    (Other): 48411
##   ACC_REVENUE      TOTAL_REVENUE   ORIG_DRAY_COST   DEST_DRAY_COST
##  Min.   :  0.000   Min.   :  742   Min.   :   0.0   Min.   :    0.0
##  1st Qu.:  0.000   1st Qu.: 2222   1st Qu.: 203.1   1st Qu.:  199.1
##  Median :  0.000   Median : 2702   Median : 294.6   Median :  272.7
##  Mean   :  1.003   Mean   : 2780   Mean   : 405.0   Mean   :  402.7
##  3rd Qu.:  0.000   3rd Qu.: 3310   3rd Qu.: 507.3   3rd Qu.:  501.7
##  Max.   :330.000   Max.   :16431   Max.   :8166.8   Max.   :11047.8
##
##    RAIL_COST        TOTAL_COST          COC            ORIG_MILES
##  Min.   : 234.5   Min.   :  686.8   Min.   : -79.99   Min.   :  0.00
##  1st Qu.:1261.6   1st Qu.: 2082.5   1st Qu.:  95.05   1st Qu.: 18.00
##  Median :1574.5   Median : 2523.4   Median : 135.90   Median : 41.00
##  Mean   :1682.5   Mean   : 2610.3   Mean   : 168.49   Mean   : 81.66
##  3rd Qu.:2144.0   3rd Qu.: 3127.8   3rd Qu.: 195.60   3rd Qu.:117.00
##  Max.   :4749.3   Max.   :16115.1   Max.   :1520.58   Max.   :996.00
##
##    DEST_MILES       RAIL_MILES    TOTAL_MILES   OTR_EQUIV_MILES
##  Min.   :  0.00   Min.   :   0   Min.   :   0   Min.   :   0
##  1st Qu.: 15.00   1st Qu.:1513   1st Qu.:1699   1st Qu.:1548
##  Median : 35.00   Median :1997   Median :2164   Median :2027
##  Mean   : 78.75   Mean   :1956   Mean   :2116   Mean   :1984
##  3rd Qu.:110.00   3rd Qu.:2402   3rd Qu.:2559   3rd Qu.:2414
##  Max.   :994.00   Max.   :3252   Max.   :4117   Max.   :3716
```

```
##
##  TRUNC.QREC.CREATE_DT.  CUSTOMER_ID     BROKER_LOB
##  10/1/2013:  3504      XTQN056: 10843   #N/A:   318
##  10/2/2013:  3480      XTQO072:  9961   0   :   449
##  10/3/2013:  3418      XTPO147:  9539   BRK :439034
##  2/6/2014 :  3354      XUPQ506:  7892   IMC :159006
##  6/13/2013:  3331      XTPC379:  7862   MTR : 67359
##  9/25/2013:  3314      XTPR022:  7780
##  (Other)  :645765      (Other):612289
##        BILL_TO_CITY    BILL_TO_STATE    ORIG_RAMP_LOCATION
##  NAPERVILLE  : 46584   IL     :134783   ELA     : 81003
##  JACKSONVILLE: 39157   CA     : 86061   LTH     : 53775
##  CONCORD     : 38861   FL     : 55859   COI     : 50112
##  SKOKIE      : 21470   TN     : 35010   DAL     : 39540
##  CHICAGO     : 21087   MI     : 24415   GB2     : 35611
##  MEMPHIS     : 18234   NJ     : 24349   GB1     : 35231
##  (Other)     :480773   (Other):305689   (Other):370894
##  DEST_RAMP_LOCATION   ProfitMile     CostMile      RevMile
##  ELA     : 75664     Min.   :  0   Min.   :  1   Min.   :  1
##  LTH     : 44461     1st Qu.:  0   1st Qu.:  1   1st Qu.:  1
##  GB1     : 36307     Median :  0   Median :  1   Median :  1
##  DAL     : 35113     Mean   :Inf   Mean   :Inf   Mean   :Inf
##  HOU     : 33142     3rd Qu.:  0   3rd Qu.:  1   3rd Qu.:  2
##  COI     : 31036     Max.   :Inf   Max.   :Inf   Max.   :Inf
##  (Other):410443

IMCDataSet3<-IMCDataSet2 %>%
  group_by(CUSTOMER_ID) %>%
  mutate(Buyrate=Buy/Search) %>%
  filter((BROKER_LOB=="BRK" | BROKER_LOB=="IMC" | BROKER_LOB=="MTR") & RevMile>0 &RevMile<15

x<-data.frame(orig=as.character(IMCDataSet3$ORIG_RAMP_LOCATION), dest=as.character(IMCDataSe
x$orig<-as.character(x$orig)
x$dest<-as.character(x$dest)
x1<-sort(unique(c(x[,1],x[,2])))
x_ind<-data.frame(loc=x1, ind=1:length(x1))

xx<-sqldf("select a.*,b.ind as orig_ind from x as a left join x_ind as b on a.orig=b.loc")

## Loading required package: tcltk

xxx<-sqldf("select a.*, b.ind as dest_ind from xx as a left join x_ind as b on a.dest=b.loc'

comb<-function(orig,dest,orig_ind,dest_ind){
  if(orig_ind<=dest_ind)
  {
```

```
    out<-paste(orig,dest, sep="-")
  } else
  {
    out<-paste(dest,orig,sep="-")
  }
  return(out)
}
orig_dest<-apply(xxx,1,function(x) comb(x[1],x[2],x[3],x[4]))
OD<-data.frame(xxx,orig_dest)
od<-OD$orig_dest
IMCDataSet3<-cbind(IMCDataSet3, od)

trainIndex<-createDataPartition(IMCDataSet3$CUSTOMER_ID, p=.8,
                                list = FALSE,
                                times=1)

DSTrain<-IMCDataSet3[trainIndex,]
DSTest<-IMCDataSet3[-trainIndex,]

dim(DSTrain)

## [1] 70355    32

dim(DSTest)

## [1] 17401    32

unique(DSTrain$od)

##   [1] MRV-TAC BRK-DPO COI-GB1 ELA-MRV TAC-XJX GB2-TAC BRK-GB2 BRK-LTC
##   [9] COI-GB4 BRK-DAL ELA-HOU ELA-MRN BRK-BUF GB4-HOU CBF-ICT DAL-ELA
##  [17] ELP-GB4 DPO-ELA LTC-MIA MRN-OAK DPO-HOU AYR-ELA DAL-LTH BRK-ERL
##  [25] GB2-LTH DPO-SLC DAL-SEA BTH-ELA DPO-LTH HOU-SEA LTH-MRN KAN-LTH
##  [33] DPO-SEA BRK-KAN BRK-HOU ELA-KAN AUS-LTH LTH-TTS LTH-PIT AUS-BRK
##  [41] DVR-OAK GB2-OAK GB4-TUC DAL-GB4 GB3-LTH GB3-ICT COI-XKE ELA-GB1
##  [49] DAL-MRV DAL-DPO HAR-TAC DPO-PLR CHR-LTC HAR-LTH COI-XCM DVR-ELA
##  [57] KAN-SLC BRK-MRN KAN-SEA COI-XPH BTH-TAC AYR-LTH ELA-ERL BUF-TAC
##  [65] MRV-PLR ERL-TAC LTH-MRV PLR-XAH ELA-STX CRX-LTH COI-TOL BRK-GB3
##  [73] HOU-LTH LTC-TAC CRX-ELA AUS-TAC JAX-LTC TAC-TAY AUS-SLC SLC-XSY
##  [81] ELA-GB3 ELA-PIT ELA-HAR SPK-XBL ERL-SPK COI-XCL KAN-OAK BTH-COI
##  [89] TUC-XCS COI-NFK DAL-MRN CBF-SEA ELA-PLR GPA-ICT LTC-TTS ELA-XPO
##  [97] HAR-TUC ERL-HOU GB1-SLC BTH-SLC BRK-MIA BRK-HAR LTH-XTP HAR-OAK
## [105] BRK-TTS LTH-TAC BRK-LTH MRN-SEA ELA-SLC TAC-TTS PLR-YDC PIT-TAC
## [113] BRK-PLR ELA-NFK ABY-LTH DAL-PIT HOU-TOL AYR-TAC BRK-MRV OAK-XKE
## [121] DVR-GB2 DVR-ERL CHR-LTH STX-YDC BRK-NFK DAL-ERL BTH-HOU AUS-OAK
## [129] BRK-PIT PIT-PLR HOU-PIT ERL-OAK MIA-OAK LTH-MIA AYR-COI CBF-OAK
```

```
## [137] BUF-SLC AYR-OAK OAK-PLR LTH-NFK 2MN-PLR CHR-TAC HAR-SLC BUF-ELA
## [145] ABY-ELA AYR-LVG DAL-TOL HOU-MRV AYR-DAL BHM-ICT BUF-COI LTH-XCN
## [153] 2MN-LTH MRN-SLC SPK-XPH DVR-XKE AYR-SLC MIA-SLC SPK-XPO HAR-HOU
## [161] BTH-LTH AUS-LTC COL-ELA HOU-PLR JAX-OAK CBF-LTH LTH-XCM COI-TAY
## [169] BRK-XJX LTH-TAY JAX-LTH HAR-PLR TAC-XCM NFK-TAC PIT-SLC LTH-XCL
## [177] BUF-TUC ATL-LTH COI-XSY TUC-XBF OAK-XCM OAK-XSY OAK-XBF BUF-DAL
## [185] OAK-XPH BUF-LTH BUF-PLR PLR-XMI BUF-HOU AYR-HOU PLR-XCL GB2-SPK
## [193] GB1-LVG BTH-PLR OAK-SLC ELA-TAY MRV-OAK OAK-STX OAK-XBL OAK-XCR
## [201] AYR-BRK LTH-XPO COI-ELP DAL-HAR PLR-XCR BRK-XCL JAX-TAC MRN-PLR
## [209] BRK-XKE BRK-CHR BRK-XAH MRV-TUC TAC-XPH SPK-XCL OAK-TOL HOU-TAY
## [217] PLR-XKE DPO-OAK ERL-PLR SPK-XCM DVR-MRV MRV-SLC BRK-TOL 2MN-BRK
## [225] TAC-XBL ABY-TAC BTH-DAL ERL-LTH ERL-SLC ELA-TOL LTH-TOL MIA-TAC
## [233] ELA-XMI ELA-XOR DVR-PIT ABY-HOU STX-XBF PLR-XCS HOU-NFK STX-XAH
## [241] TAC-XSY LVG-MRV BUF-OAK SPK-XSY ELP-XSY LTC-LTH SLC-XBF HOU-XBF
## [249] OAK-XCL CHR-SLC SLC-TOL PLR-XCB TUC-XCL HAR-LVG LTH-XCR SPK-XCR
## [257] OAK-TAY DAL-TAY SPK-TAY BRK-TAY SPK-XCB BTH-OAK ABY-BRK ERL-LVG
## [265] BRK-HUN COI-XBF ERL-TUC AYR-PLR CHR-OAK BUF-DVR TAC-XCL AYR-STX
## [273] DVR-HOU ELP-HOU HOU-XCL LTH-XKE TAC-TOL AYR-TUC DAL-NFK AYR-DVR
## [281] SLC-XWR BRK-XBF DAL-XWR TUC-XCR PIT-SPK STX-XCS JAX-SLC SLC-XPH
## [289] BRK-XCS BTH-TUC SLC-XTP PLR-XPH SLC-XCS STX-XTP STX-XCL TAC-XPO
## [297] HOU-XWR 2MN-DVR TAC-XTP OAK-PIT TAC-XKE SLC-XCM ABY-LVG ELP-XWR
## [305] ELP-HAR ELP-XCM BTH-LVG STX-XMI HOU-XKE STX-XPH ELP-ERL DAL-XKE
## [313] ABY-DAL TUC-XKE SLC-XOR CHR-SPK DVR-TAY DAL-XCL TAY-TUC AYR-SPK
## [321] OAK-XAH 1ED-PLR DAL-XSY 2MN-TAC SLC-TAY PLR-XPO AUS-SPK SLC-XBL
## [329] BRK-XBL BRK-XCR DVR-HAR HAR-SPK BRK-BTH DVR-XCM HOU-XCM SPK-XOR
## [337] LTH-XMI ABY-OAK TUC-XCM AUS-DVR BRK-XCB BTH-DVR TUC-XMI SLC-XKE
## [345] TAC-XBF BUF-SPK DAL-XCM SLC-XMI ELA-XBL 2ED-DAL NFK-SLC LTH-XBF
## [353] SPK-XAH OAK-XPO MIA-SPK ELP-XPH BUF-LVG 2ED-HOU BRK-XTP ELP-XCL
## [361] ABY-PLR ELP-XTP ELA-LVG PLR-XWR ERL-STX STX-XKE LTH-XJX NFK-OAK
## [369] STX-XPO TUC-XPO 2MT-ELA DVR-XCL ELA-XNS PLR-XJX ELA-XJX TUC-XAH
## [377] 2MN-ELP SLC-TTS DVR-XMI PLR-XOR BRK-XCN TAC-XMI SLC-XPO SPK-XKE
## [385] SLC-XCL DVR-JAX HOU-MRN ELP-XMI LTH-XOR TAC-XOR ELP-XKE LTH-XCS
## [393] DAL-XPH STX-XCB SLC-XCR JAX-SPK HOU-XCB ELA-XSV TUC-XPH SLC-XAH
## [401] MRV-STX HOU-XBL BRK-XPH ELP-XAH HAR-STX DVR-XAH 2MN-ELA DVR-XJX
## [409] SLC-XJX SPK-XTP BRK-JAX ELP-XOR ABY-SLC 2MN-TUC TUC-XOR SPK-XSV
## [417] 2TR-SLC PLR-XSY 1CG-PLR PIT-STX LVG-PIT BRK-XCM DVR-XTP ELP-XJX
## [425] OAK-XOR LTH-XPH MRV-SPK ELP-XPO ABY-SPK COI-XMR LTH-XBL LTH-XSY
## [433] 2TR-PLR DVR-NFK 1WN-DAL ELP-XBL SPK-XNS ABY-COI TUC-XSY TUC-XTP
## [441] BRK-XSY TUC-XBL 1WN-COI DAL-XNS SLC-XCB 2TR-HOU BRK-XOR NFK-PLR
## [449] SPK-XCS EDM-PLR TUC-XCN PLR-TOL STX-XMR CIN-ELA PLR-XCN AUS-TUC
## [457] STX-XJX LTH-XSV OAK-XTP TAC-XCS DAL-XBL DVR-MIA 2TR-ELA TTS-TUC
## [465] TUC-XBM HOU-XSY SLC-XNS DVR-XPH 1TR-ELP CHR-DVR DVR-XPO TAC-XCR
## [473] LVG-TAY TOR-TUC OAK-XWR 1WN-HOU 2MN-DAL TUC-XNS BTH-SPK DVR-XSY
## [481] 2MN-HOU PLR-XBL TUC-XCB DVR-XBL PLR-XTP PLR-XBF 1TR-TUC
## 502 Levels: 1CG-PLR 1ED-PLR 1TR-ELP 1TR-TUC 1WN-COI 1WN-DAL ... TUC-XTP
```

```
unique(DSTest$od)
```

```
##   [1] BRK-JAX GB4-HOU PLR-YDC GB2-LTH BUF-LTH HOU-TAY COI-GB4 LTC-TAC
##   [9] COI-GB1 BRK-GB2 DAL-GB4 DVR-GB2 GB2-OAK KAN-LTH LTH-MIA DAL-ELA
##  [17] LTH-XNS GB2-TAC ELA-GB3 LTH-NFK PLR-XKE BRK-HOU OAK-PIT ERL-OAK
##  [25] ELA-HOU ELA-GB1 DAL-LTH GB4-TUC GB3-LTH JAX-TAC DPO-ELA DAL-SEA
##  [33] ELA-MRN MRV-TAC BRK-BUF COI-XKE MIA-OAK BUF-TAC CRX-LTH BRK-LTC
##  [41] HAR-LTH DVR-ELA ELA-KAN ELP-GB4 DPO-LTH KAN-SEA AUS-LTC LTH-TTS
##  [49] CHR-TAC BRK-MRN LTH-MRV MIA-SLC CBF-ICT BUF-ELA HOU-SEA ERL-HOU
##  [57] BRK-MIA BTH-SLC ELP-XCB DPO-PLR ELA-HAR DAL-ERL LTH-MRN BRK-HAR
##  [65] BUF-COI HAR-OAK JAX-OAK COI-XCM DPO-SEA GB3-ICT ELA-STX ERL-LTH
##  [73] GB1-SLC BTH-LTH ELA-MRV BRK-KAN KAN-SLC BRK-LTH AUS-BRK CHR-LTC
##  [81] AUS-OAK AUS-LTH LTC-MIA AYR-LTH COL-ELA HOU-LTH ELA-ERL HAR-STX
##  [89] BRK-DAL ELA-PLR BRK-MRV BTH-TAC DAL-DPO ERL-SLC BRK-GB3 HAR-HOU
##  [97] HAR-SPK ERL-TUC HAR-TAC AYR-OAK AYR-DAL GB2-SPK CHR-SLC AYR-TAC
## [105] BRK-DPO AUS-TAC MRN-SEA CBF-SEA BTH-ELA BRK-PIT BTH-DAL COI-ELP
## [113] DVR-OAK DPO-OAK AYR-ELA DPO-HOU JAX-LTC BRK-TTS HOU-MRV COI-XCL
## [121] DAL-HAR BTH-COI ERL-PLR GPA-ICT MRV-OAK ELP-XWR PLR-XCB AYR-PLR
## [129] BUF-DAL BRK-XCL HAR-PLR KAN-OAK HAR-SLC LTH-PIT COI-XPH BRK-TOL
## [137] AYR-COI MRN-OAK BUF-PLR LTH-TAC HOU-XBF MRV-TUC BRK-ERL LTC-TTS
## [145] DAL-TAY SLC-TAY ELA-NFK STX-YDC HOU-PIT ELA-TAY MRN-SLC ATL-LTH
## [153] ERL-TAC OAK-XKE DAL-XSY JAX-SLC PIT-PLR BRK-CHR MRV-PLR LTH-XCM
## [161] LTH-XBF BUF-LVG AYR-BRK OAK-XCL PLR-XMI BTH-PLR LTH-XKE LTH-XTP
## [169] COI-TOL TAC-TAY BRK-TAY OAK-XCM ELA-SLC JAX-LTH ELA-PIT BHM-ICT
## [177] LTH-TAY AUS-SLC ELA-XPO LTH-XJX AYR-SLC CBF-OAK DVR-JAX COI-TAY
## [185] HOU-TOL TUC-XKE OAK-XBF MRV-SLC SLC-XWR BUF-SLC BUF-OAK OAK-STX
## [193] DVR-ERL LTH-TOL OAK-TAY BTH-HOU LTH-XCL SLC-XBL LTH-XOR DPO-SLC
## [201] SLC-XCL ERL-LVG CHR-LTH BTH-OAK CBF-LTH PIT-TAC LTH-XCR CRX-ELA
## [209] TAC-XCL PIT-SPK HAR-TUC AYR-HOU NFK-TAC OAK-XAH PIT-SLC SPK-XAH
## [217] BRK-XPH HOU-XCL LTH-XPO BTH-TUC ELA-XBL COI-XSY BRK-XCB BUF-SPK
## [225] DAL-PIT SLC-XPO TAC-XPH ELP-HAR ELP-XCM DVR-XKE LTC-LTH BUF-HOU
## [233] BRK-HUN TAC-TOL 2MN-LTH OAK-PLR SLC-TTS SLC-XTP LVG-MRV TUC-XPH
## [241] TAC-XCM BRK-BTH TAC-XPO OAK-SLC OAK-TOL TAC-XBL DAL-XCM DVR-XSY
## [249] DAL-XKE AYR-STX SPK-XCM AYR-DVR DVR-XPO COI-NFK TAC-XJX SLC-XCM
## [257] MRN-PLR PLR-XOR PLR-XCN SLC-XSY AYR-SPK BRK-XCM ERL-SPK BUF-TUC
## [265] TAC-TTS DAL-MRV PLR-XSY SPK-XCL CHR-OAK DVR-XJX BRK-NFK ABY-OAK
## [273] NFK-SLC SLC-XCR SPK-TAY TAC-XSY DVR-PIT 2MT-ELA SPK-XJX LVG-PIT
## [281] PLR-XAH PLR-TAY DVR-HAR 2ED-DAL 2MN-BRK BUF-DVR ELA-XJX BRK-XCN
## [289] MRV-SPK SLC-TOL AUS-SPK SPK-XTP DVR-HOU AYR-LVG PLR-XPH ELA-TOL
## [297] ELP-ERL TUC-XCL PLR-XPO SLC-XKE STX-XBF NFK-OAK OAK-XSY DAL-XCL
## [305] GB1-LVG STX-XPO BRK-PLR TUC-XJX STX-XJX TUC-XTP LTH-XSY HOU-PLR
## [313] HOU-XBL STX-XCB DAL-TOL DAL-MRN TAC-XCS PLR-XWR BTH-DVR STX-XTP
## [321] OAK-XPO OAK-XCR BRK-XKE BRK-CIN COI-XBF STX-XMI BRK-XJX TUC-XAH
## [329] BRK-XTP PLR-TOL ABY-COI ELA-XNS ELP-XCL DVR-MRV TUC-XPO TUC-XSY
## [337] TAC-XMI ELP-XPH DAL-NFK ABY-ELA TUC-XMI HOU-NFK LTH-XBL ELA-XMI
## [345] DAL-XBF MIA-SPK SPK-XNS JAX-SPK MRV-STX PLR-XJX SPK-XKE DVR-TAY
```

```
## [353] ELP-XBL SLC-XPH 2MN-ELA HOU-MRN BRK-XAH SPK-XOR ABY-TAC SPK-XPH
## [361] DVR-XCL ABY-HOU TUC-XBF AYR-TUC STX-XPH PLR-XCM 1CG-PLR LTH-XCB
## [369] ELP-XCN ABY-BRK DVR-XBF ELP-XCR ELP-MRV DVR-MIA BRK-XPO PLR-XBL
## [377] HAR-LVG DAL-XBL ELA-XOR DVR-NFK 2TR-SLC 2MN-DAL 2TR-ELA 2TR-TAC
## [385] TUC-XCB 1WN-DAL ABY-SLC SLC-XAH MIA-TAC DVR-XMI TUC-XBL ABY-LTH
## 502 Levels: 1CG-PLR 1ED-PLR 1TR-ELP 1TR-TUC 1WN-COI 1WN-DAL ... TUC-XTP
```

```
lm.fit<-lm(RevMile~BROKER_LOB+TOTAL_MILES+ORIG_RAMP_LOCATION,DSTrain)
summary(lm.fit)
```

```
##
## Call:
## lm(formula = RevMile ~ BROKER_LOB + TOTAL_MILES + ORIG_RAMP_LOCATION,
##     data = DSTrain)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.6176 -0.1846 -0.0377  0.1379 27.5225
##
## Coefficients:
##                          Estimate Std. Error t value Pr(>|t|)
## (Intercept)             1.784e+00  1.655e-01  10.775  < 2e-16 ***
## BROKER_LOBIMC           8.160e-03  2.599e-03   3.139  0.00169 **
## BROKER_LOBMTR           1.098e-02  3.480e-03   3.155  0.00161 **
## TOTAL_MILES            -2.433e-04  2.469e-06 -98.523  < 2e-16 ***
## ORIG_RAMP_LOCATION2MN   5.027e-01  1.764e-01   2.850  0.00437 **
## ORIG_RAMP_LOCATION2TR -7.180e-03  1.977e-01  -0.036  0.97103
## ORIG_RAMP_LOCATIONABY   2.130e-01  1.689e-01   1.261  0.20723
## ORIG_RAMP_LOCATIONATL -1.771e-01  1.730e-01  -1.023  0.30611
## ORIG_RAMP_LOCATIONAUS -1.047e-01  1.657e-01  -0.632  0.52765
## ORIG_RAMP_LOCATIONAYR -1.545e-01  1.658e-01  -0.932  0.35122
## ORIG_RAMP_LOCATIONBRK -1.153e-01  1.655e-01  -0.697  0.48601
## ORIG_RAMP_LOCATIONBTH -2.575e-01  1.661e-01  -1.550  0.12108
## ORIG_RAMP_LOCATIONBUF -1.458e-01  1.659e-01  -0.879  0.37949
## ORIG_RAMP_LOCATIONCBF   2.534e-01  1.666e-01   1.520  0.12839
## ORIG_RAMP_LOCATIONCHR -4.477e-02  1.660e-01  -0.270  0.78746
## ORIG_RAMP_LOCATIONCOI   2.665e-02  1.655e-01   0.161  0.87204
## ORIG_RAMP_LOCATIONCOL -1.403e-01  1.812e-01  -0.774  0.43884
## ORIG_RAMP_LOCATIONCRX   7.405e-02  3.309e-01   0.224  0.82290
## ORIG_RAMP_LOCATIONDAL -3.246e-01  1.655e-01  -1.961  0.04984 *
## ORIG_RAMP_LOCATIONDPO   8.187e-02  1.656e-01   0.494  0.62096
## ORIG_RAMP_LOCATIONDVR -1.467e-01  1.661e-01  -0.883  0.37707
## ORIG_RAMP_LOCATIONELA   1.078e-01  1.655e-01   0.652  0.51462
## ORIG_RAMP_LOCATIONELP   4.915e-01  1.678e-01   2.930  0.00339 **
## ORIG_RAMP_LOCATIONERL -2.574e-01  1.656e-01  -1.555  0.12007
## ORIG_RAMP_LOCATIONGB1 -2.843e-01  1.655e-01  -1.718  0.08583 .
```

```
## ORIG_RAMP_LOCATIONGB2  4.244e-02  1.655e-01   0.256  0.79767
## ORIG_RAMP_LOCATIONGB3 -1.653e-01  1.657e-01  -0.998  0.31839
## ORIG_RAMP_LOCATIONGB4  2.844e-02  1.655e-01   0.172  0.86356
## ORIG_RAMP_LOCATIONHAR -1.891e-01  1.657e-01  -1.141  0.25375
## ORIG_RAMP_LOCATIONHOU -2.077e-01  1.655e-01  -1.255  0.20961
## ORIG_RAMP_LOCATIONHUN  2.467e-01  3.309e-01   0.746  0.45580
## ORIG_RAMP_LOCATIONICT  1.135e-01  1.658e-01   0.685  0.49353
## ORIG_RAMP_LOCATIONJAX -7.026e-02  1.664e-01  -0.422  0.67291
## ORIG_RAMP_LOCATIONKAN  5.976e-03  1.656e-01   0.036  0.97121
## ORIG_RAMP_LOCATIONLTC  5.270e-01  1.655e-01   3.184  0.00145 **
## ORIG_RAMP_LOCATIONLTH  7.320e-02  1.655e-01   0.442  0.65821
## ORIG_RAMP_LOCATIONLVG  1.606e+00  2.340e-01   6.863 6.79e-12 ***
## ORIG_RAMP_LOCATIONMIA -7.751e-02  1.667e-01  -0.465  0.64205
## ORIG_RAMP_LOCATIONMRN -1.075e-01  1.656e-01  -0.649  0.51626
## ORIG_RAMP_LOCATIONMRV -2.215e-01  1.657e-01  -1.337  0.18128
## ORIG_RAMP_LOCATIONNFK  2.028e-01  1.681e-01   1.206  0.22788
## ORIG_RAMP_LOCATIONOAK  1.799e-01  1.657e-01   1.086  0.27746
## ORIG_RAMP_LOCATIONPIT  3.735e-02  1.659e-01   0.225  0.82189
## ORIG_RAMP_LOCATIONPLR  9.333e-02  1.659e-01   0.563  0.57371
## ORIG_RAMP_LOCATIONSEA  1.998e-03  1.659e-01   0.012  0.99039
## ORIG_RAMP_LOCATIONSLC -8.500e-02  1.656e-01  -0.513  0.60766
## ORIG_RAMP_LOCATIONSPK  2.848e-01  1.668e-01   1.707  0.08776 .
## ORIG_RAMP_LOCATIONSTX  1.075e-01  1.672e-01   0.643  0.52033
## ORIG_RAMP_LOCATIONTAC -2.238e-01  1.655e-01  -1.352  0.17630
## ORIG_RAMP_LOCATIONTAY -2.905e-01  1.668e-01  -1.741  0.08168 .
## ORIG_RAMP_LOCATIONTOL  5.938e-02  1.667e-01   0.356  0.72172
## ORIG_RAMP_LOCATIONTTS -1.214e-01  1.682e-01  -0.722  0.47037
## ORIG_RAMP_LOCATIONTUC  1.726e-01  1.659e-01   1.040  0.29820
## ORIG_RAMP_LOCATIONXAH  4.921e-01  1.940e-01   2.537  0.01119 *
## ORIG_RAMP_LOCATIONXBF  2.707e-01  2.339e-01   1.157  0.24723
## ORIG_RAMP_LOCATIONXBL  7.448e-02  2.616e-01   0.285  0.77586
## ORIG_RAMP_LOCATIONXCB  2.073e-01  1.866e-01   1.110  0.26679
## ORIG_RAMP_LOCATIONXCL  2.386e-01  2.340e-01   1.020  0.30785
## ORIG_RAMP_LOCATIONXCM  3.151e-01  2.616e-01   1.205  0.22837
## ORIG_RAMP_LOCATIONXCN  3.097e-01  2.093e-01   1.480  0.13889
## ORIG_RAMP_LOCATIONXCR  2.634e-01  1.835e-01   1.435  0.15127
## ORIG_RAMP_LOCATIONXCS  3.323e-03  1.910e-01   0.017  0.98612
## ORIG_RAMP_LOCATIONXJX  9.395e-02  2.340e-01   0.402  0.68802
## ORIG_RAMP_LOCATIONXKE  2.589e-01  2.339e-01   1.107  0.26839
## ORIG_RAMP_LOCATIONXMI -8.895e-03  2.616e-01  -0.034  0.97287
## ORIG_RAMP_LOCATIONXOR  2.828e-01  2.616e-01   1.081  0.27966
## ORIG_RAMP_LOCATIONXPH  1.661e-01  2.093e-01   0.794  0.42729
## ORIG_RAMP_LOCATIONXPO  2.102e-02  1.866e-01   0.113  0.91034
## ORIG_RAMP_LOCATIONXSY  3.127e-01  2.616e-01   1.195  0.23195
## ORIG_RAMP_LOCATIONXTP  2.108e-01  3.309e-01   0.637  0.52396
```

```
## ORIG_RAMP_LOCATIONYDC  1.070e-01  1.659e-01   0.645  0.51896
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2865 on 70284 degrees of freedom
## Multiple R-squared:  0.3963,Adjusted R-squared:  0.3957
## F-statistic: 659.1 on 70 and 70284 DF,  p-value: < 2.2e-16
```

```
lm.fit2<-lm(RevMile~od+TOTAL_MILES+BROKER_LOB,DSTrain)
summary(lm.fit2)
```

```
##
## Call:
## lm(formula = RevMile ~ od + TOTAL_MILES + BROKER_LOB, data = DSTrain)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9.7448 -0.1376 -0.0203  0.1106 19.4751
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)    3.221e-01  2.704e-01   1.191 0.233595
## od1ED-PLR     -2.386e-01  3.112e-01  -0.767 0.443285
## od1TR-ELP      4.091e-01  3.812e-01   1.073 0.283163
## od1TR-TUC     -2.160e-01  3.812e-01  -0.567 0.570996
## od1WN-COI      1.037e+00  3.812e-01   2.720 0.006534 **
## od1WN-DAL      1.590e+00  3.301e-01   4.816 1.47e-06 ***
## od1WN-HOU      1.288e+00  3.812e-01   3.379 0.000728 ***
## od2ED-DAL      8.872e-01  2.952e-01   3.005 0.002658 **
## od2ED-HOU     -3.686e-01  3.112e-01  -1.184 0.236305
## od2MN-BRK      5.746e-01  3.301e-01   1.741 0.081756 .
## od2MN-DAL      1.332e+00  3.114e-01   4.278 1.89e-05 ***
## od2MN-DVR      2.328e+00  3.303e-01   7.050 1.81e-12 ***
## od2MN-ELA      1.145e-01  2.859e-01   0.401 0.688779
## od2MN-ELP      8.761e-01  3.301e-01   2.654 0.007966 **
## od2MN-HOU      9.333e-01  3.813e-01   2.448 0.014377 *
## od2MN-LTH      2.308e-01  2.765e-01   0.834 0.404012
## od2MN-PLR      6.749e-01  3.014e-01   2.239 0.025152 *
## od2MN-TAC      5.820e-01  3.112e-01   1.870 0.061509 .
## od2MN-TUC      5.241e-01  3.812e-01   1.375 0.169149
## od2MT-ELA     -4.164e-01  3.014e-01  -1.381 0.167169
## od2TR-ELA     -7.023e-01  3.301e-01  -2.127 0.033392 *
## od2TR-HOU      1.131e-01  3.301e-01   0.343 0.731888
## od2TR-PLR     -1.645e-01  3.301e-01  -0.498 0.618288
## od2TR-SLC      1.869e-01  3.812e-01   0.490 0.623865
## odABY-BRK     -7.399e-01  2.913e-01  -2.540 0.011084 *
```

```
## odABY-COI     -3.998e-01  2.842e-01  -1.407 0.159542
## odABY-DAL      4.849e-01  2.805e-01   1.728 0.083947 .
## odABY-ELA     -9.510e-01  2.798e-01  -3.399 0.000677 ***
## odABY-HOU      2.673e-01  2.859e-01   0.935 0.349779
## odABY-LTH     -9.944e-01  2.785e-01  -3.570 0.000357 ***
## odABY-LVG     -3.415e-01  3.812e-01  -0.896 0.370257
## odABY-OAK     -9.861e-01  2.843e-01  -3.468 0.000525 ***
## odABY-PLR      3.454e-02  3.812e-01   0.091 0.927806
## odABY-SLC      1.449e-01  3.812e-01   0.380 0.703787
## odABY-SPK     -4.763e-01  3.113e-01  -1.530 0.126024
## odABY-TAC     -6.899e-01  2.913e-01  -2.368 0.017866 *
## odATL-LTH     -7.864e-01  2.737e-01  -2.873 0.004067 **
## odAUS-BRK     -7.129e-01  2.701e-01  -2.639 0.008317 **
## odAUS-DVR      1.031e+00  3.014e-01   3.420 0.000626 ***
## odAUS-LTC     -4.298e-01  2.698e-01  -1.593 0.111139
## odAUS-LTH     -6.708e-01  2.698e-01  -2.486 0.012920 *
## odAUS-OAK     -5.447e-01  2.707e-01  -2.012 0.044201 *
## odAUS-SLC     -9.086e-03  2.714e-01  -0.033 0.973298
## odAUS-SPK     -4.207e-01  2.784e-01  -1.511 0.130755
## odAUS-TAC     -7.383e-01  2.703e-01  -2.731 0.006310 **
## odAUS-TUC      6.474e-01  3.301e-01   1.961 0.049847 *
## odAYR-BRK     -1.056e+00  2.709e-01  -3.899 9.67e-05 ***
## odAYR-COI     -7.123e-01  2.705e-01  -2.633 0.008466 **
## odAYR-DAL      1.349e-01  2.706e-01   0.498 0.618172
## odAYR-DVR      3.252e-02  2.797e-01   0.116 0.907446
## odAYR-ELA     -1.237e+00  2.701e-01  -4.578 4.70e-06 ***
## odAYR-HOU      1.655e-02  2.706e-01   0.061 0.951234
## odAYR-LTH     -1.078e+00  2.702e-01  -3.990 6.63e-05 ***
## odAYR-LVG     -7.897e-01  2.859e-01  -2.762 0.005751 **
## odAYR-OAK     -1.195e+00  2.718e-01  -4.397 1.10e-05 ***
## odAYR-PLR     -1.491e-01  2.713e-01  -0.550 0.582655
## odAYR-SLC     -3.983e-01  2.727e-01  -1.461 0.144066
## odAYR-SPK     -4.698e-01  2.912e-01  -1.613 0.106680
## odAYR-STX     -1.398e-01  2.805e-01  -0.499 0.618123
## odAYR-TAC     -9.840e-01  2.714e-01  -3.626 0.000288 ***
## odAYR-TUC     -3.231e-01  2.842e-01  -1.137 0.255566
## odBHM-ICT     -8.571e-02  2.703e-01  -0.317 0.751163
## odBRK-BTH     -8.858e-01  2.806e-01  -3.157 0.001597 **
## odBRK-BUF     -7.241e-01  2.717e-01  -2.666 0.007686 **
## odBRK-CHR     -8.058e-01  2.707e-01  -2.977 0.002913 **
## odBRK-DAL     -1.472e-01  2.698e-01  -0.545 0.585441
## odBRK-DPO     -2.305e-01  2.698e-01  -0.854 0.393010
## odBRK-ERL     -9.475e-01  2.702e-01  -3.506 0.000455 ***
## odBRK-GB2     -4.379e-01  2.696e-01  -1.624 0.104385
## odBRK-GB3     -2.775e-01  2.703e-01  -1.027 0.304463
```

```
## odBRK-HAR     -8.085e-01  2.704e-01  -2.990 0.002789 **
## odBRK-HOU     -3.384e-01  2.699e-01  -1.254 0.209868
## odBRK-HUN     -5.393e-01  3.812e-01  -1.415 0.157205
## odBRK-JAX     -9.736e-01  2.740e-01  -3.554 0.000380 ***
## odBRK-KAN      4.196e-03  2.699e-01   0.016 0.987596
## odBRK-LTC      8.203e-01  2.699e-01   3.039 0.002373 **
## odBRK-LTH      1.727e+00  2.711e-01   6.370 1.90e-10 ***
## odBRK-MIA     -1.169e+00  2.708e-01  -4.316 1.59e-05 ***
## odBRK-MRN     -5.893e-01  2.698e-01  -2.184 0.028969 *
## odBRK-MRV     -9.210e-01  2.706e-01  -3.404 0.000664 ***
## odBRK-NFK     -8.307e-01  2.763e-01  -3.006 0.002647 **
## odBRK-PIT     -6.412e-01  2.726e-01  -2.352 0.018669 *
## odBRK-PLR     -2.362e-01  3.013e-01  -0.784 0.433079
## odBRK-TAY     -9.175e-01  2.742e-01  -3.346 0.000821 ***
## odBRK-TOL     -4.255e-01  2.714e-01  -1.568 0.116928
## odBRK-TTS     -1.045e+00  2.749e-01  -3.800 0.000145 ***
## odBRK-XAH     -6.868e-01  2.859e-01  -2.402 0.016305 *
## odBRK-XBF     -4.518e-01  3.113e-01  -1.451 0.146692
## odBRK-XBL     -5.836e-01  3.812e-01  -1.531 0.125837
## odBRK-XCB     -6.339e-01  2.859e-01  -2.217 0.026597 *
## odBRK-XCL     -6.169e-01  2.727e-01  -2.262 0.023714 *
## odBRK-XCM     -5.890e-01  3.113e-01  -1.892 0.058518 .
## odBRK-XCN     -5.711e-01  3.812e-01  -1.498 0.134107
## odBRK-XCR     -6.911e-01  3.812e-01  -1.813 0.069895 .
## odBRK-XCS     -8.636e-01  3.113e-01  -2.774 0.005540 **
## odBRK-XJX     -8.765e-01  3.302e-01  -2.654 0.007946 **
## odBRK-XKE     -7.972e-01  2.785e-01  -2.862 0.004204 **
## odBRK-XOR     -8.162e-01  3.303e-01  -2.471 0.013460 *
## odBRK-XPH     -6.915e-01  2.954e-01  -2.341 0.019227 *
## odBRK-XSY     -6.452e-01  3.812e-01  -1.692 0.090598 .
## odBRK-XTP     -8.600e-01  3.015e-01  -2.853 0.004337 **
## odBTH-COI     -5.382e-01  2.701e-01  -1.992 0.046333 *
## odBTH-DAL      1.886e-01  2.726e-01   0.692 0.489074
## odBTH-DVR      4.344e-01  3.301e-01   1.316 0.188243
## odBTH-ELA     -9.798e-01  2.707e-01  -3.619 0.000296 ***
## odBTH-HOU      2.022e-01  2.738e-01   0.739 0.460082
## odBTH-LTH     -1.100e+00  2.703e-01  -4.071 4.68e-05 ***
## odBTH-LVG     -5.666e-01  2.953e-01  -1.919 0.054994 .
## odBTH-OAK     -1.159e+00  2.748e-01  -4.217 2.48e-05 ***
## odBTH-PLR     -3.236e-02  2.721e-01  -0.119 0.905325
## odBTH-SLC     -2.157e-01  2.749e-01  -0.785 0.432587
## odBTH-SPK     -5.739e-01  3.812e-01  -1.505 0.132205
## odBTH-TAC     -8.610e-01  2.754e-01  -3.126 0.001772 **
## odBTH-TUC     -2.891e-01  2.778e-01  -1.040 0.298132
## odBUF-COI     -3.988e-01  2.702e-01  -1.476 0.139993
```

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## odBUF-DAL      4.629e-01  2.707e-01   1.710 0.087271 .
## odBUF-DVR      6.544e-01  3.014e-01   2.171 0.029910 *
## odBUF-ELA     -7.709e-01  2.701e-01  -2.855 0.004310 **
## odBUF-HOU      3.977e-01  2.731e-01   1.456 0.145336
## odBUF-LTH     -6.631e-01  2.702e-01  -2.454 0.014145 *
## odBUF-LVG     -3.832e-01  2.762e-01  -1.387 0.165296
## odBUF-OAK     -8.723e-01  2.707e-01  -3.222 0.001273 **
## odBUF-PLR      6.558e-02  2.882e-01   0.228 0.819954
## odBUF-SLC     -4.860e-02  2.716e-01  -0.179 0.857975
## odBUF-SPK     -3.383e-01  2.911e-01  -1.162 0.245238
## odBUF-TAC     -6.397e-01  2.711e-01  -2.360 0.018293 *
## odBUF-TUC     -2.605e-01  2.751e-01  -0.947 0.343588
## odCBF-ICT      1.414e-01  2.698e-01   0.524 0.600368
## odCBF-LTH      2.039e-01  2.719e-01   0.750 0.453310
## odCBF-OAK      1.020e-01  2.707e-01   0.377 0.706184
## odCBF-SEA      1.249e-01  2.704e-01   0.462 0.644177
## odCHR-DVR      9.069e-01  3.113e-01   2.914 0.003574 **
## odCHR-LTC     -5.376e-01  2.698e-01  -1.992 0.046329 *
## odCHR-LTH     -8.073e-01  2.707e-01  -2.982 0.002866 **
## odCHR-OAK     -6.255e-01  2.816e-01  -2.221 0.026339 *
## odCHR-SLC     -1.948e-01  2.713e-01  -0.718 0.472695
## odCHR-SPK     -5.287e-01  2.953e-01  -1.790 0.073399 .
## odCHR-TAC     -8.165e-01  2.709e-01  -3.014 0.002582 **
## odCIN-ELA     -3.073e-01  3.301e-01  -0.931 0.351815
## odCOI-ELP      1.285e+00  2.708e-01   4.744 2.10e-06 ***
## odCOI-GB1     -4.789e-01  2.695e-01  -1.777 0.075611 .
## odCOI-GB4     -5.551e-01  2.696e-01  -2.059 0.039507 *
## odCOI-NFK     -5.071e-01  2.710e-01  -1.871 0.061329 .
## odCOI-TAY     -5.322e-01  2.722e-01  -1.955 0.050544 .
## odCOI-TOL     -4.226e-01  2.710e-01  -1.559 0.118913
## odCOI-XBF     -3.715e-01  2.953e-01  -1.258 0.208419
## odCOI-XCL     -3.691e-01  2.702e-01  -1.366 0.171937
## odCOI-XCM     -5.362e-01  2.702e-01  -1.984 0.047204 *
## odCOI-XKE     -6.799e-01  2.699e-01  -2.519 0.011766 *
## odCOI-XMR     -2.963e-01  3.812e-01  -0.777 0.436985
## odCOI-XPH     -5.493e-01  2.711e-01  -2.026 0.042785 *
## odCOI-XSY     -4.169e-01  2.741e-01  -1.521 0.128209
## odCOL-ELA     -4.857e-01  2.701e-01  -1.798 0.072137 .
## odCRX-ELA     -6.468e-01  2.698e-01  -2.397 0.016519 *
## odCRX-LTH     -8.015e-01  2.698e-01  -2.971 0.002972 **
## odDAL-DPO      1.868e+00  2.726e-01   6.852 7.32e-12 ***
## odDAL-ELA     -4.739e-02  2.696e-01  -0.176 0.860484
## odDAL-ERL      1.342e-01  2.700e-01   0.497 0.619226
## odDAL-GB4      3.916e-01  2.698e-01   1.451 0.146708
## odDAL-HAR      3.525e-01  2.711e-01   1.300 0.193440
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## odDAL-LTH     -1.872e-01  2.696e-01  -0.694 0.487587
## odDAL-MRN      2.060e+00  2.914e-01   7.070 1.56e-12 ***
## odDAL-MRV      2.092e-01  2.708e-01   0.772 0.439889
## odDAL-NFK      7.234e-01  2.816e-01   2.569 0.010195 *
## odDAL-PIT      6.728e-01  2.732e-01   2.462 0.013803 *
## odDAL-SEA     -2.242e-01  2.698e-01  -0.831 0.406020
## odDAL-TAY      3.546e-01  2.742e-01   1.293 0.195890
## odDAL-TOL      9.246e-01  3.015e-01   3.067 0.002164 **
## odDAL-XBL      7.577e-01  3.113e-01   2.434 0.014933 *
## odDAL-XCL      5.909e-01  2.883e-01   2.050 0.040391 *
## odDAL-XCM      7.818e-01  3.113e-01   2.512 0.012016 *
## odDAL-XKE      4.736e-01  2.745e-01   1.725 0.084485 .
## odDAL-XNS      1.369e+00  3.115e-01   4.393 1.12e-05 ***
## odDAL-XPH      6.634e-01  3.301e-01   2.010 0.044468 *
## odDAL-XSY      4.775e-01  2.815e-01   1.696 0.089886 .
## odDAL-XWR      5.120e-01  3.812e-01   1.343 0.179243
## odDPO-ELA     -2.559e-01  2.696e-01  -0.949 0.342571
## odDPO-HOU      1.592e+00  2.711e-01   5.871 4.35e-09 ***
## odDPO-LTH     -3.442e-01  2.697e-01  -1.276 0.201943
## odDPO-OAK     -3.704e-01  2.714e-01  -1.365 0.172289
## odDPO-PLR      6.883e-01  2.719e-01   2.531 0.011370 *
## odDPO-SEA     -1.476e-01  2.700e-01  -0.547 0.584576
## odDPO-SLC      4.370e-01  2.704e-01   1.616 0.106081
## odDVR-ELA      1.022e+00  2.700e-01   3.786 0.000153 ***
## odDVR-ERL      3.561e-01  2.749e-01   1.295 0.195173
## odDVR-GB2      1.290e+00  2.713e-01   4.755 1.99e-06 ***
## odDVR-HAR      5.566e-01  2.790e-01   1.995 0.046048 *
## odDVR-HOU      7.942e-01  2.761e-01   2.877 0.004018 **
## odDVR-JAX      3.198e-01  2.790e-01   1.146 0.251798
## odDVR-MIA      8.222e-02  3.812e-01   0.216 0.829213
## odDVR-MRV      4.400e-01  2.805e-01   1.569 0.116756
## odDVR-NFK      5.955e-01  3.112e-01   1.913 0.055712 .
## odDVR-OAK      8.421e-01  2.721e-01   3.094 0.001973 **
## odDVR-PIT      9.006e-01  2.798e-01   3.219 0.001287 **
## odDVR-TAY      4.529e-01  2.911e-01   1.555 0.119836
## odDVR-XAH      6.035e-01  3.014e-01   2.002 0.045250 *
## odDVR-XBL      1.952e-01  3.812e-01   0.512 0.608643
## odDVR-XCL      4.648e-01  3.014e-01   1.542 0.123048
## odDVR-XCM      4.046e-01  3.112e-01   1.300 0.193576
## odDVR-XJX      3.339e-01  3.301e-01   1.011 0.311874
## odDVR-XKE      2.265e-01  2.769e-01   0.818 0.413404
## odDVR-XMI      2.664e-01  2.881e-01   0.925 0.355112
## odDVR-XPH      3.463e-01  3.301e-01   1.049 0.294198
## odDVR-XPO      1.172e-02  2.911e-01   0.040 0.967885
## odDVR-XSY      1.478e-01  3.013e-01   0.490 0.623785
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## odDVR-XTP      2.670e-01  2.911e-01   0.917 0.359030
## odEDM-PLR     -1.814e-01  3.812e-01  -0.476 0.634185
## odELA-ERL     -1.201e+00  2.698e-01  -4.453 8.47e-06 ***
## odELA-GB1     -5.254e-01  2.696e-01  -1.949 0.051313 .
## odELA-GB3     -2.605e-01  2.698e-01  -0.965 0.334298
## odELA-HAR     -7.931e-01  2.698e-01  -2.940 0.003286 **
## odELA-HOU      5.601e-02  2.696e-01   0.208 0.835458
## odELA-KAN      3.246e-02  2.697e-01   0.120 0.904188
## odELA-LVG      2.822e+00  3.118e-01   9.050  < 2e-16 ***
## odELA-MRN     -2.262e-01  2.696e-01  -0.839 0.401387
## odELA-MRV     -9.839e-01  2.698e-01  -3.647 0.000266 ***
## odELA-NFK     -6.186e-01  2.727e-01  -2.268 0.023317 *
## odELA-PIT     -5.899e-01  2.700e-01  -2.185 0.028901 *
## odELA-PLR      5.324e-01  2.700e-01   1.972 0.048614 *
## odELA-SLC      1.265e+00  2.708e-01   4.673 2.98e-06 ***
## odELA-STX      5.793e-01  2.700e-01   2.145 0.031916 *
## odELA-TAY     -1.042e+00  2.707e-01  -3.850 0.000118 ***
## odELA-TOL     -5.733e-01  2.784e-01  -2.059 0.039460 *
## odELA-XBL     -3.256e-01  2.953e-01  -1.103 0.270140
## odELA-XJX     -1.065e-01  3.301e-01  -0.323 0.746963
## odELA-XMI     -1.500e-01  2.806e-01  -0.535 0.592837
## odELA-XNS      1.970e-01  3.013e-01   0.654 0.513329
## odELA-XOR     -5.029e-02  3.112e-01  -0.162 0.871650
## odELA-XPO     -4.578e-01  2.953e-01  -1.550 0.121118
## odELA-XSV     -2.595e-01  3.301e-01  -0.786 0.431877
## odELP-ERL      2.044e-01  2.769e-01   0.738 0.460430
## odELP-GB4     -2.685e-03  2.699e-01  -0.010 0.992061
## odELP-HAR      5.566e-01  3.013e-01   1.847 0.064756 .
## odELP-HOU      1.526e+00  3.015e-01   5.063 4.13e-07 ***
## odELP-XAH      7.822e-01  3.812e-01   2.052 0.040188 *
## odELP-XBL      3.627e-01  3.301e-01   1.099 0.271935
## odELP-XCL      4.677e-01  3.812e-01   1.227 0.219816
## odELP-XCM      5.547e-01  2.859e-01   1.940 0.052329 .
## odELP-XJX      8.232e-01  3.301e-01   2.494 0.012644 *
## odELP-XKE      4.404e-01  3.013e-01   1.461 0.143886
## odELP-XMI      6.251e-01  3.812e-01   1.640 0.101044
## odELP-XOR      7.656e-01  3.301e-01   2.319 0.020385 *
## odELP-XPH      2.094e-01  2.881e-01   0.727 0.467328
## odELP-XPO      1.024e-01  3.301e-01   0.310 0.756447
## odELP-XSY      2.038e-01  3.812e-01   0.535 0.592848
## odELP-XTP      8.745e-01  3.812e-01   2.294 0.021776 *
## odELP-XWR      1.533e-01  3.013e-01   0.509 0.610885
## odERL-HOU      1.539e-01  2.701e-01   0.570 0.568687
## odERL-LTH     -1.259e+00  2.702e-01  -4.661 3.16e-06 ***
## odERL-LVG     -6.144e-01  2.778e-01  -2.211 0.027032 *
```

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## odERL-OAK     -1.015e+00  2.702e-01  -3.756 0.000173 ***
## odERL-PLR      5.166e-02  2.730e-01   0.189 0.849939
## odERL-SLC     -2.767e-01  2.704e-01  -1.023 0.306188
## odERL-SPK     -6.040e-01  2.770e-01  -2.181 0.029201 *
## odERL-STX      4.076e-01  3.301e-01   1.235 0.216885
## odERL-TAC     -9.042e-01  2.704e-01  -3.344 0.000826 ***
## odERL-TUC     -2.971e-01  2.733e-01  -1.087 0.277002
## odGB1-LVG      3.282e-01  2.762e-01   1.188 0.234720
## odGB1-SLC      3.205e-03  2.697e-01   0.012 0.990518
## odGB2-LTH     -4.930e-01  2.696e-01  -1.829 0.067436 .
## odGB2-OAK     -5.233e-01  2.698e-01  -1.940 0.052419 .
## odGB2-SPK     -5.359e-02  2.702e-01  -0.198 0.842769
## odGB2-TAC     -4.822e-01  2.696e-01  -1.788 0.073723 .
## odGB3-ICT     -5.148e-01  2.697e-01  -1.909 0.056303 .
## odGB3-LTH     -4.082e-01  2.698e-01  -1.513 0.130279
## odGB4-HOU      4.834e-01  2.698e-01   1.792 0.073165 .
## odGB4-TUC     -9.576e-03  2.697e-01  -0.036 0.971681
## odGPA-ICT     -3.304e-01  2.719e-01  -1.215 0.224205
## odHAR-HOU      1.990e-01  2.704e-01   0.736 0.461645
## odHAR-LTH     -8.472e-01  2.699e-01  -3.139 0.001696 **
## odHAR-LVG     -4.239e-01  2.815e-01  -1.506 0.132172
## odHAR-OAK     -1.015e+00  2.709e-01  -3.746 0.000180 ***
## odHAR-PLR      1.310e-01  2.745e-01   0.477 0.633232
## odHAR-SLC     -1.502e-01  2.709e-01  -0.554 0.579368
## odHAR-SPK     -5.299e-01  2.815e-01  -1.882 0.059811 .
## odHAR-STX      2.933e-01  2.797e-01   1.049 0.294371
## odHAR-TAC     -8.064e-01  2.702e-01  -2.985 0.002840 **
## odHAR-TUC     -2.047e-01  2.769e-01  -0.739 0.459885
## odHOU-LTH     -1.634e-01  2.697e-01  -0.606 0.544631
## odHOU-MRN      1.786e+00  3.814e-01   4.682 2.84e-06 ***
## odHOU-MRV      2.636e-01  2.706e-01   0.974 0.329907
## odHOU-NFK      5.661e-01  2.798e-01   2.023 0.043040 *
## odHOU-PIT      5.514e-01  2.715e-01   2.031 0.042292 *
## odHOU-PLR      2.791e+00  3.116e-01   8.958  < 2e-16 ***
## odHOU-SEA     -4.448e-01  2.697e-01  -1.649 0.099171 .
## odHOU-TAY      3.988e-01  2.751e-01   1.450 0.147148
## odHOU-TOL      7.150e-01  2.748e-01   2.602 0.009272 **
## odHOU-XBF      5.608e-01  2.751e-01   2.038 0.041541 *
## odHOU-XBL      8.537e-01  3.302e-01   2.586 0.009725 **
## odHOU-XCB      8.133e-01  3.302e-01   2.463 0.013792 *
## odHOU-XCL      5.184e-01  2.779e-01   1.865 0.062149 .
## odHOU-XCM      8.985e-01  3.302e-01   2.721 0.006502 **
## odHOU-XKE      6.038e-01  2.912e-01   2.074 0.038104 *
## odHOU-XSY      3.731e-01  3.812e-01   0.979 0.327627
## odHOU-XWR      3.818e-01  2.911e-01   1.312 0.189668
```

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## odJAX-LTC     -5.692e-01  2.706e-01  -2.103 0.035436 *
## odJAX-LTH     -7.329e-01  2.713e-01  -2.701 0.006912 **
## odJAX-OAK     -6.160e-01  2.774e-01  -2.220 0.026406 *
## odJAX-SLC     -2.540e-01  2.707e-01  -0.938 0.348002
## odJAX-SPK     -3.991e-01  3.812e-01  -1.047 0.295094
## odJAX-TAC     -1.034e+00  2.741e-01  -3.772 0.000162 ***
## odKAN-LTH     -1.508e-01  2.697e-01  -0.559 0.575974
## odKAN-OAK     -1.877e-01  2.709e-01  -0.693 0.488287
## odKAN-SEA      2.745e-03  2.700e-01   0.010 0.991887
## odKAN-SLC      3.428e-01  2.705e-01   1.267 0.205030
## odLTC-LTH      3.243e+00  2.795e-01  11.602  < 2e-16 ***
## odLTC-MIA     -3.901e-01  2.698e-01  -1.446 0.148303
## odLTC-TAC      6.996e-01  2.698e-01   2.593 0.009510 **
## odLTC-TTS     -3.784e-01  2.701e-01  -1.401 0.161311
## odLTH-MIA     -8.507e-01  2.707e-01  -3.143 0.001674 **
## odLTH-MRN     -4.358e-01  2.698e-01  -1.615 0.106208
## odLTH-MRV     -1.033e+00  2.703e-01  -3.823 0.000132 ***
## odLTH-NFK     -7.829e-01  2.721e-01  -2.877 0.004016 **
## odLTH-PIT     -6.565e-01  2.708e-01  -2.424 0.015358 *
## odLTH-TAC      1.612e+00  2.709e-01   5.952 2.66e-09 ***
## odLTH-TAY     -1.036e+00  2.727e-01  -3.799 0.000145 ***
## odLTH-TOL     -5.787e-01  2.736e-01  -2.115 0.034416 *
## odLTH-TTS     -7.964e-01  2.718e-01  -2.930 0.003390 **
## odLTH-XBF     -3.794e-01  2.912e-01  -1.303 0.192608
## odLTH-XBL     -4.484e-01  3.302e-01  -1.358 0.174510
## odLTH-XCL     -4.362e-01  2.729e-01  -1.598 0.109997
## odLTH-XCM     -6.885e-01  2.714e-01  -2.537 0.011178 *
## odLTH-XCN     -2.682e-01  3.812e-01  -0.703 0.481749
## odLTH-XCR     -4.962e-01  2.816e-01  -1.762 0.078016 .
## odLTH-XCS     -4.227e-01  3.812e-01  -1.109 0.267502
## odLTH-XJX     -4.482e-01  3.113e-01  -1.440 0.149931
## odLTH-XKE     -7.467e-01  2.775e-01  -2.691 0.007125 **
## odLTH-XMI     -5.224e-01  3.114e-01  -1.678 0.093407 .
## odLTH-XOR     -3.231e-01  3.014e-01  -1.072 0.283753
## odLTH-XPH     -6.501e-01  3.302e-01  -1.969 0.048959 *
## odLTH-XPO     -5.980e-01  3.813e-01  -1.568 0.116776
## odLTH-XSV     -6.491e-01  3.301e-01  -1.966 0.049299 *
## odLTH-XSY     -5.948e-01  3.302e-01  -1.801 0.071635 .
## odLTH-XTP     -4.708e-01  2.732e-01  -1.723 0.084887 .
## odLVG-MRV     -5.934e-01  2.751e-01  -2.157 0.031005 *
## odLVG-PIT     -1.952e-01  2.881e-01  -0.677 0.498194
## odLVG-TAY     -5.629e-01  3.301e-01  -1.705 0.088180 .
## odMIA-OAK     -7.716e-01  2.708e-01  -2.850 0.004374 **
## odMIA-SLC     -4.338e-01  2.708e-01  -1.602 0.109151
## odMIA-SPK     -5.697e-01  2.807e-01  -2.030 0.042367 *
```

```
## odMIA-TAC     -1.112e+00  2.792e-01  -3.982 6.84e-05 ***
## odMRN-OAK     -5.062e-01  2.710e-01  -1.868 0.061806 .
## odMRN-PLR      7.327e-01  2.799e-01   2.618 0.008854 **
## odMRN-SEA     -4.858e-01  2.702e-01  -1.798 0.072135 .
## odMRN-SLC      7.987e-02  2.704e-01   0.295 0.767687
## odMRV-OAK     -1.016e+00  2.721e-01  -3.736 0.000187 ***
## odMRV-PLR     -6.735e-02  2.712e-01  -0.248 0.803839
## odMRV-SLC     -2.222e-01  2.721e-01  -0.816 0.414251
## odMRV-SPK     -6.462e-01  2.912e-01  -2.219 0.026479 *
## odMRV-STX      2.156e-01  3.014e-01   0.715 0.474391
## odMRV-TAC     -9.299e-01  2.705e-01  -3.437 0.000588 ***
## odMRV-TUC     -3.237e-01  2.774e-01  -1.167 0.243245
## odNFK-OAK     -9.506e-01  2.913e-01  -3.264 0.001100 **
## odNFK-PLR      9.900e-01  3.812e-01   2.597 0.009400 **
## odNFK-SLC     -2.755e-01  2.762e-01  -0.997 0.318601
## odNFK-TAC     -8.100e-01  2.740e-01  -2.956 0.003113 **
## odOAK-PIT     -6.087e-01  2.739e-01  -2.223 0.026252 *
## odOAK-PLR      8.105e-02  2.726e-01   0.297 0.766220
## odOAK-SLC      1.235e+00  2.749e-01   4.492 7.06e-06 ***
## odOAK-STX      6.795e-02  2.741e-01   0.248 0.804238
## odOAK-TAY     -9.793e-01  2.912e-01  -3.362 0.000773 ***
## odOAK-TOL     -5.814e-01  2.778e-01  -2.093 0.036372 *
## odOAK-XAH     -3.723e-01  2.912e-01  -1.279 0.200993
## odOAK-XBF     -3.652e-01  3.014e-01  -1.212 0.225605
## odOAK-XBL     -5.544e-01  3.113e-01  -1.781 0.074951 .
## odOAK-XCL     -5.005e-01  2.769e-01  -1.807 0.070718 .
## odOAK-XCM     -6.371e-01  2.774e-01  -2.296 0.021664 *
## odOAK-XCR     -5.805e-01  3.014e-01  -1.926 0.054135 .
## odOAK-XKE     -7.183e-01  2.780e-01  -2.584 0.009759 **
## odOAK-XOR     -5.597e-01  3.812e-01  -1.468 0.142058
## odOAK-XPH     -6.504e-01  3.302e-01  -1.970 0.048884 *
## odOAK-XPO     -6.775e-01  3.015e-01  -2.247 0.024623 *
## odOAK-XSY     -5.936e-01  3.014e-01  -1.969 0.048921 *
## odOAK-XTP     -4.231e-01  3.812e-01  -1.110 0.267065
## odOAK-XWR     -6.287e-01  3.813e-01  -1.649 0.099203 .
## odPIT-PLR      3.422e-01  2.797e-01   1.223 0.221235
## odPIT-SLC      1.199e-01  2.759e-01   0.434 0.663931
## odPIT-SPK     -3.028e-01  2.911e-01  -1.040 0.298354
## odPIT-STX      6.770e-01  3.812e-01   1.776 0.075766 .
## odPIT-TAC     -5.825e-01  2.724e-01  -2.138 0.032491 *
## odPLR-TOL      3.138e-01  3.301e-01   0.950 0.341924
## odPLR-XAH      8.971e-01  2.842e-01   3.156 0.001599 **
## odPLR-XBF      3.628e-01  3.812e-01   0.952 0.341199
## odPLR-XBL      1.295e-01  3.301e-01   0.392 0.694779
## odPLR-XCB      4.339e-01  2.742e-01   1.583 0.113535
```

```
## odPLR-XCL      2.235e-01  3.113e-01   0.718 0.472633
## odPLR-XCN      5.120e-01  3.302e-01   1.551 0.121012
## odPLR-XCR      4.842e-01  2.842e-01   1.704 0.088402 .
## odPLR-XCS      3.081e-01  2.860e-01   1.077 0.281331
## odPLR-XJX      6.577e-01  2.883e-01   2.281 0.022531 *
## odPLR-XKE      2.398e-01  2.712e-01   0.884 0.376516
## odPLR-XMI      3.695e-01  3.113e-01   1.187 0.235175
## odPLR-XOR      7.596e-01  2.954e-01   2.572 0.010117 *
## odPLR-XPH      2.906e-01  2.774e-01   1.048 0.294803
## odPLR-XPO      1.211e-01  2.841e-01   0.426 0.669957
## odPLR-XSY      2.923e-01  2.773e-01   1.054 0.291888
## odPLR-XTP      5.304e-01  3.812e-01   1.391 0.164180
## odPLR-XWR      1.278e-01  3.112e-01   0.411 0.681395
## odPLR-YDC      3.126e-01  2.698e-01   1.159 0.246663
## odSLC-TAY     -1.512e-01  2.805e-01  -0.539 0.589837
## odSLC-TOL      3.263e-01  2.815e-01   1.159 0.246460
## odSLC-TTS     -3.213e-01  2.756e-01  -1.166 0.243753
## odSLC-XAH      1.183e-01  3.112e-01   0.380 0.703816
## odSLC-XBF     -5.787e-03  3.301e-01  -0.018 0.986013
## odSLC-XBL     -1.045e-01  2.778e-01  -0.376 0.706734
## odSLC-XCB      1.700e-02  3.812e-01   0.045 0.964435
## odSLC-XCL     -1.447e-02  2.859e-01  -0.051 0.959622
## odSLC-XCM     -9.490e-02  2.797e-01  -0.339 0.734402
## odSLC-XCR     -1.188e-01  2.805e-01  -0.423 0.672062
## odSLC-XCS     -2.250e-01  3.013e-01  -0.747 0.455285
## odSLC-XJX     -1.587e-01  3.812e-01  -0.416 0.677189
## odSLC-XKE     -2.680e-01  2.778e-01  -0.965 0.334738
## odSLC-XMI     -3.114e-01  3.014e-01  -1.033 0.301536
## odSLC-XNS      1.459e-01  3.812e-01   0.383 0.701889
## odSLC-XOR     -1.889e-01  3.301e-01  -0.572 0.567227
## odSLC-XPH     -1.685e-01  2.815e-01  -0.599 0.549395
## odSLC-XPO     -2.533e-01  2.778e-01  -0.912 0.361851
## odSLC-XSY     -1.172e-01  2.815e-01  -0.416 0.677285
## odSLC-XTP     -2.253e-01  2.859e-01  -0.788 0.430699
## odSLC-XWR     -2.387e-01  2.815e-01  -0.848 0.396423
## odSPK-TAY     -3.838e-01  2.859e-01  -1.342 0.179480
## odSPK-XAH     -3.609e-01  2.784e-01  -1.297 0.194802
## odSPK-XBL     -4.193e-01  2.806e-01  -1.494 0.135106
## odSPK-XCB     -1.323e-01  2.859e-01  -0.463 0.643583
## odSPK-XCL     -1.704e-01  2.815e-01  -0.605 0.544961
## odSPK-XCM     -3.311e-01  2.912e-01  -1.137 0.255524
## odSPK-XCR     -4.256e-01  3.014e-01  -1.412 0.157901
## odSPK-XCS     -5.770e-01  3.113e-01  -1.854 0.063789 .
## odSPK-XKE     -4.255e-01  2.798e-01  -1.521 0.128319
## odSPK-XNS     -2.933e-01  3.812e-01  -0.770 0.441541
```

```
## odSPK-XOR     -4.392e-01  2.842e-01  -1.546 0.122223
## odSPK-XPH     -4.254e-01  2.953e-01  -1.441 0.149682
## odSPK-XPO     -6.061e-01  3.014e-01  -2.011 0.044363 *
## odSPK-XSV     -3.451e-01  2.912e-01  -1.185 0.235949
## odSPK-XSY     -4.077e-01  3.113e-01  -1.310 0.190252
## odSPK-XTP     -4.331e-01  2.953e-01  -1.467 0.142498
## odSTX-XAH      7.830e-01  3.302e-01   2.371 0.017742 *
## odSTX-XBF      5.086e-01  3.301e-01   1.541 0.123373
## odSTX-XCB      5.425e-01  3.014e-01   1.800 0.071876 .
## odSTX-XCL      1.957e-01  2.953e-01   0.663 0.507423
## odSTX-XCS      7.662e-01  3.812e-01   2.010 0.044440 *
## odSTX-XJX      6.561e-01  3.015e-01   2.176 0.029526 *
## odSTX-XKE      3.691e-01  3.112e-01   1.186 0.235627
## odSTX-XMI      6.586e-01  3.014e-01   2.185 0.028882 *
## odSTX-XMR      3.646e-01  3.113e-01   1.171 0.241490
## odSTX-XPH      2.954e-01  2.805e-01   1.053 0.292286
## odSTX-XPO      1.500e-01  3.812e-01   0.394 0.693890
## odSTX-XTP      8.492e-01  3.302e-01   2.572 0.010113 *
## odSTX-YDC      5.554e-01  2.714e-01   2.046 0.040727 *
## odTAC-TAY     -8.424e-01  2.828e-01  -2.979 0.002891 **
## odTAC-TOL     -3.595e-01  2.751e-01  -1.307 0.191288
## odTAC-TTS     -1.017e+00  2.742e-01  -3.710 0.000208 ***
## odTAC-XBF     -5.351e-01  3.812e-01  -1.404 0.160440
## odTAC-XBL     -6.658e-01  2.842e-01  -2.343 0.019139 *
## odTAC-XCL     -4.747e-01  2.841e-01  -1.671 0.094782 .
## odTAC-XCM     -6.243e-01  2.791e-01  -2.237 0.025281 *
## odTAC-XCR     -9.418e-01  3.814e-01  -2.470 0.013528 *
## odTAC-XCS     -9.292e-01  3.812e-01  -2.437 0.014803 *
## odTAC-XJX     -9.301e-01  2.817e-01  -3.302 0.000960 ***
## odTAC-XKE     -7.845e-01  3.812e-01  -2.058 0.039606 *
## odTAC-XMI     -9.975e-01  2.830e-01  -3.525 0.000423 ***
## odTAC-XOR     -9.123e-01  2.913e-01  -3.131 0.001742 **
## odTAC-XPH     -7.855e-01  2.775e-01  -2.831 0.004639 **
## odTAC-XPO     -7.749e-01  2.883e-01  -2.688 0.007182 **
## odTAC-XSY     -6.056e-01  2.791e-01  -2.170 0.030021 *
## odTAC-XTP     -8.991e-01  2.861e-01  -3.143 0.001675 **
## odTAY-TUC     -2.479e-01  3.812e-01  -0.650 0.515436
## odTOR-TUC      9.590e+00  3.113e-01  30.809  < 2e-16 ***
## odTTS-TUC      3.264e-01  3.812e-01   0.856 0.391808
## odTUC-XAH      5.952e-01  2.805e-01   2.121 0.033890 *
## odTUC-XBF     -4.797e-02  2.911e-01  -0.165 0.869126
## odTUC-XBL     -7.782e-02  3.812e-01  -0.204 0.838225
## odTUC-XBM      5.726e-01  3.812e-01   1.502 0.133089
## odTUC-XCB      2.309e-01  3.301e-01   0.699 0.484272
## odTUC-XCL      3.462e-03  2.790e-01   0.012 0.990100
```

```
## odTUC-XCM     -1.165e-01  3.112e-01  -0.374 0.708220
## odTUC-XCN      3.135e-01  3.112e-01   1.007 0.313749
## odTUC-XCR      1.628e-01  2.859e-01   0.569 0.569136
## odTUC-XCS     -1.302e-01  3.812e-01  -0.342 0.732621
## odTUC-XKE     -1.575e-01  2.769e-01  -0.569 0.569484
## odTUC-XMI      2.639e-01  2.911e-01   0.907 0.364664
## odTUC-XNS      5.051e-01  3.301e-01   1.530 0.125970
## odTUC-XOR      1.001e-01  3.812e-01   0.263 0.792922
## odTUC-XPH     -2.144e-01  2.911e-01  -0.736 0.461435
## odTUC-XPO     -2.252e-01  2.790e-01  -0.807 0.419677
## odTUC-XSY     -2.033e-01  3.112e-01  -0.653 0.513698
## odTUC-XTP      5.221e-01  3.812e-01   1.370 0.170741
## TOTAL_MILES    5.696e-04  1.017e-05  55.998  < 2e-16 ***
## BROKER_LOBIMC  1.506e-02  2.471e-03   6.096 1.09e-09 ***
## BROKER_LOBMTR  6.633e-03  3.322e-03   1.997 0.045877 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2695 on 69865 degrees of freedom
## Multiple R-squared:  0.469,Adjusted R-squared:  0.4653
## F-statistic: 126.2 on 489 and 69865 DF,  p-value: < 2.2e-16
```

```
lm.fit3<-lm(RevMile~TOTAL_MILES+BROKER_LOB,DSTrain)
summary(lm.fit3)
```

```
##
## Call:
## lm(formula = RevMile ~ TOTAL_MILES + BROKER_LOB, data = DSTrain)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.7934 -0.2236 -0.0228  0.1982 27.7408
##
## Coefficients:
##                 Estimate Std. Error  t value Pr(>|t|)
## (Intercept)    1.738e+00  5.179e-03  335.515  < 2e-16 ***
## TOTAL_MILES   -2.393e-04  2.382e-06 -100.489  < 2e-16 ***
## BROKER_LOBIMC  3.315e-02  3.099e-03   10.698  < 2e-16 ***
## BROKER_LOBMTR  1.616e-02  4.161e-03    3.882 0.000104 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3445 on 70351 degrees of freedom
## Multiple R-squared:  0.1264,Adjusted R-squared:  0.1264
## F-statistic:  3393 on 3 and 70351 DF,  p-value: < 2.2e-16
```

```
predtest<-predict(lm.fit,DSTest,interval="confidence",level=0.95,se.fit=T)
```

```
## Error in model.frame.default(Terms, newdata, na.action = na.action,
xlev = object$xlevels):  factor ORIG_RAMP_LOCATION has new levels CIN
```

Loyal Customers
High Demand Routes
Loyal Customers on High Demand Routes
Different Months?

4 Results

5 Conclusion