OPTION 2: HEALTH INSURANCE- CAPSTONE PROJECT

Srikar Vedula

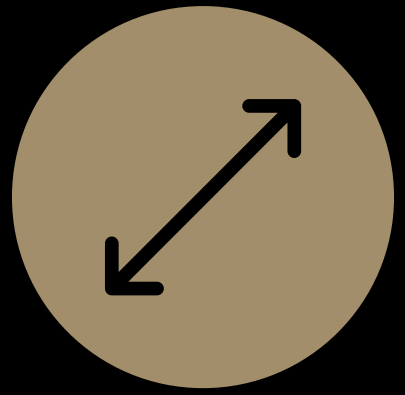
Background

90% OF THE PEOPLE IN THE US ARE INSURED

66% OF EMPLOYEES ARE COVERED BY PRIVATE HEALTH INSURANCE

Goals

PROVIDE EXPLORATORY DATA ANALYSIS ON THE DATASET

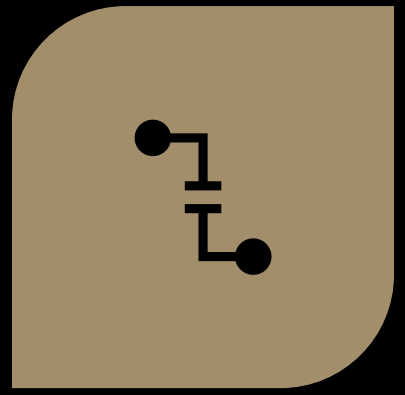


UNDERSTAND THE RELATIONSHIP BETWEEN INDIVIDUAL RATE, COUPLE RATE, AND DEPENEDANT RATE AND SEE HOW THEY ARE ALL RELATED. HOW DOES THE AV RELATE TO THE RATES?

APPLY THE TIME SERIES MODEL TO FORECAST HOW THE PRICES WILL TREND

Hypothesis

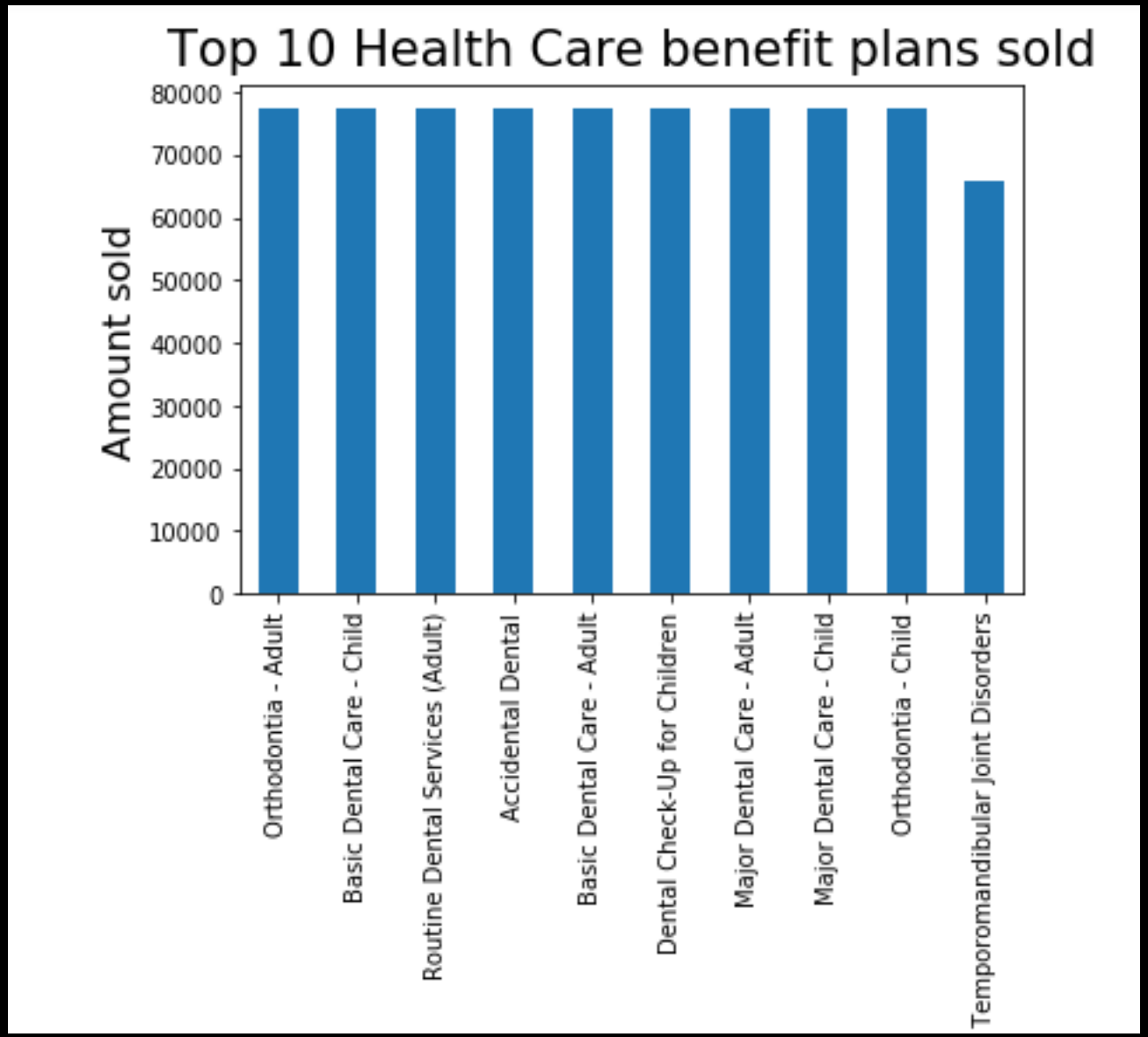
PREDICT THE SALES TRAJECTORY/ TREND AS TIME PASSES



PREDICT THE RELATIONSHIP BETWEEN THE INDIVIDUAL RATE AND THE COUPLE/CODEPENDANCY RATE.

PREDICT RATE WITH AV VALUE

EXPLORATORY DATA ANALYSIS


Top 10 Health Care benefit plans sold
Amount sold
80000
70000
60000
50000
40000
30000
20000
10000
0
Orthodontia - Adult
Basic Dental Care - Child
Routine Dental Services (Adult)
Accidental Dental
Basic Dental Care - Adult
Dental Check-Up for Children
Major Dental Care - Adult
Major Dental Care - Child
Orthodontia - Child
Temporomandibular Joint Disorders

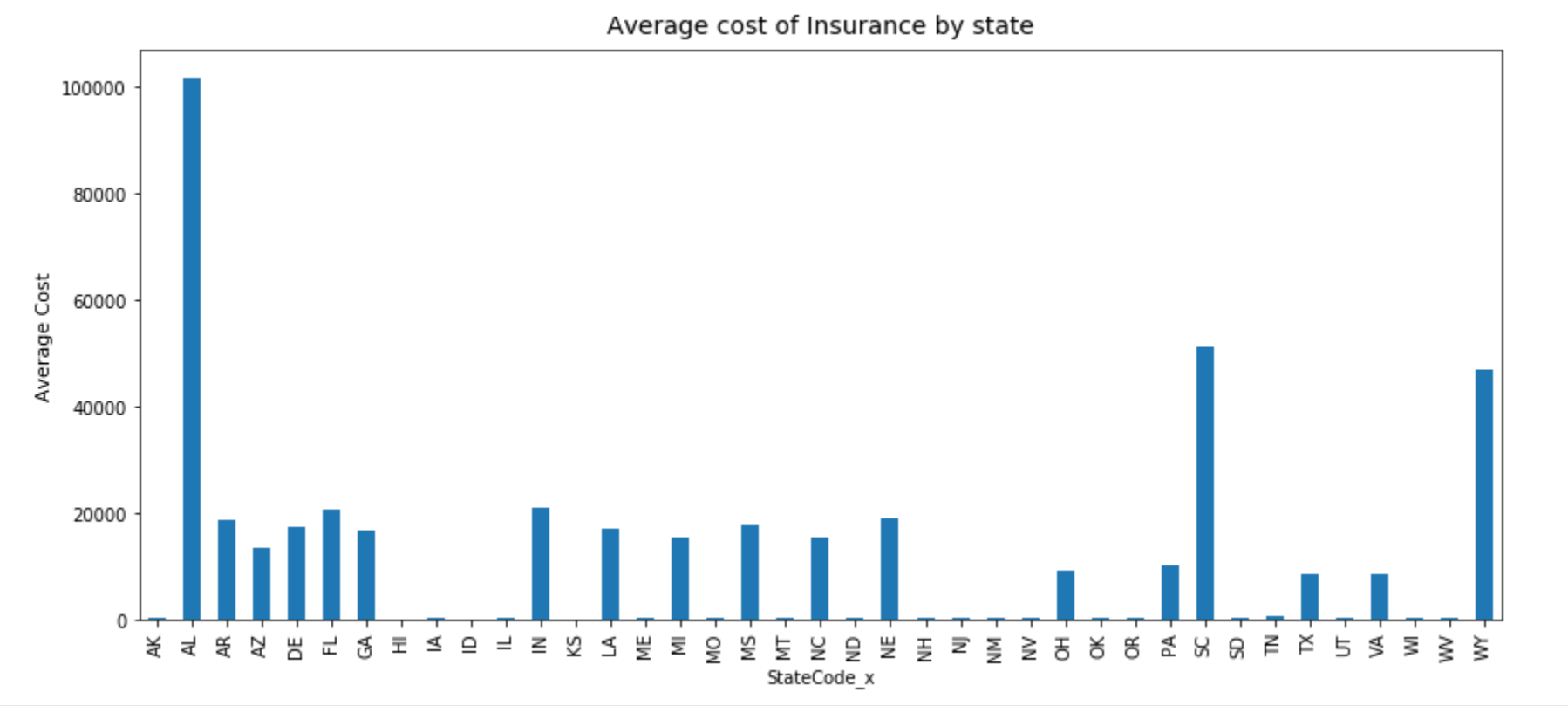
Top 10 Benefit plans

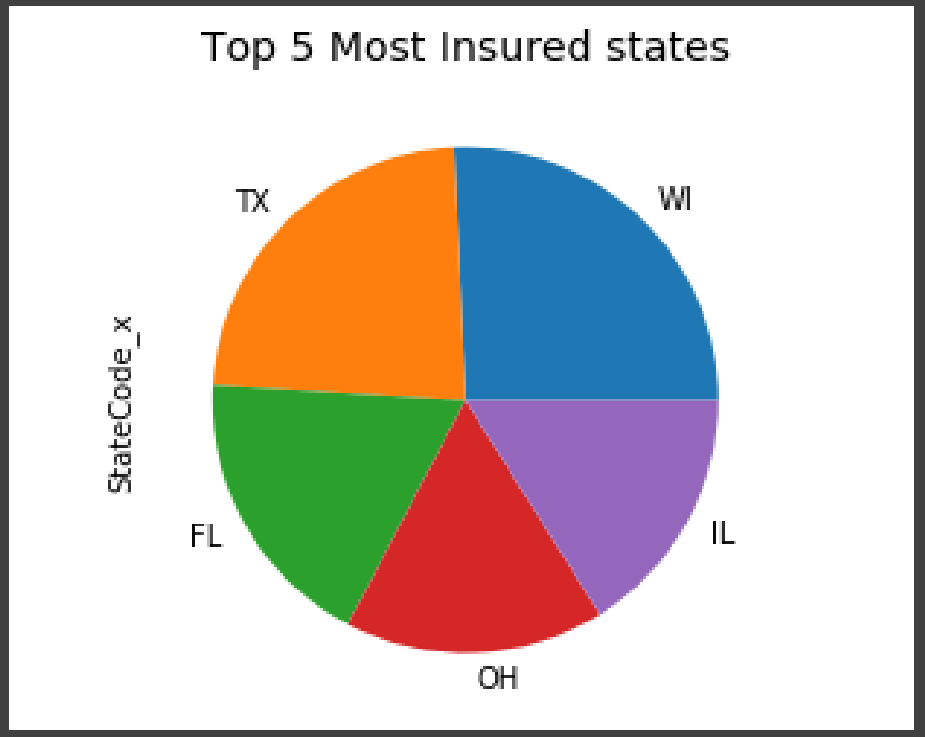
Orthodontia - Adult	77377
Basic Dental Care - Child	77353
Routine Dental Services (Adult)	77353
Accidental Dental	77353
Basic Dental Care - Adult	77353
Dental Check-Up for Children	77353
Major Dental Care - Adult	77353
Major Dental Care - Child	77353
Orthodontia - Child	77345
Treatment for Temporomandibular Joint Disorders	65724

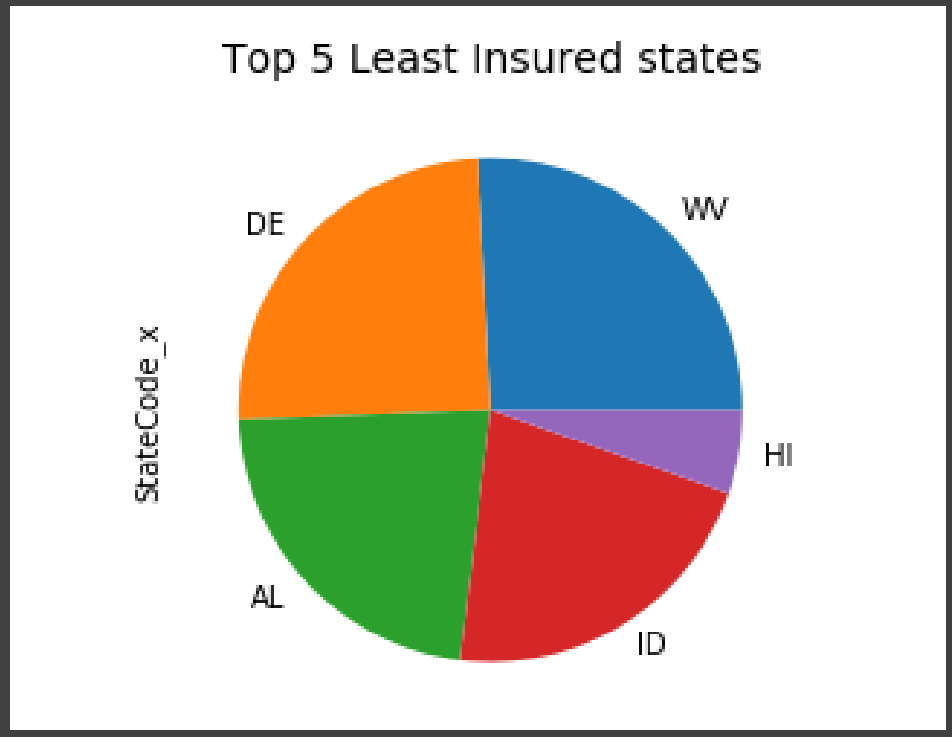
Bottom 10 benefit plans

Hospice Outpatient	2
Routine Exams and X-rays - Child	2
Coimplex Oral Surgery	2
Orthodontia for Cleft Palate or Cleft Lip only - Child	2
Immediate Dentiures	2
Vital pulpotomy	1
root Canal Therapy and Retreatment	1
Prefab Resin Crown	1
Posterior Composites - Child	1
Implant Adult	1

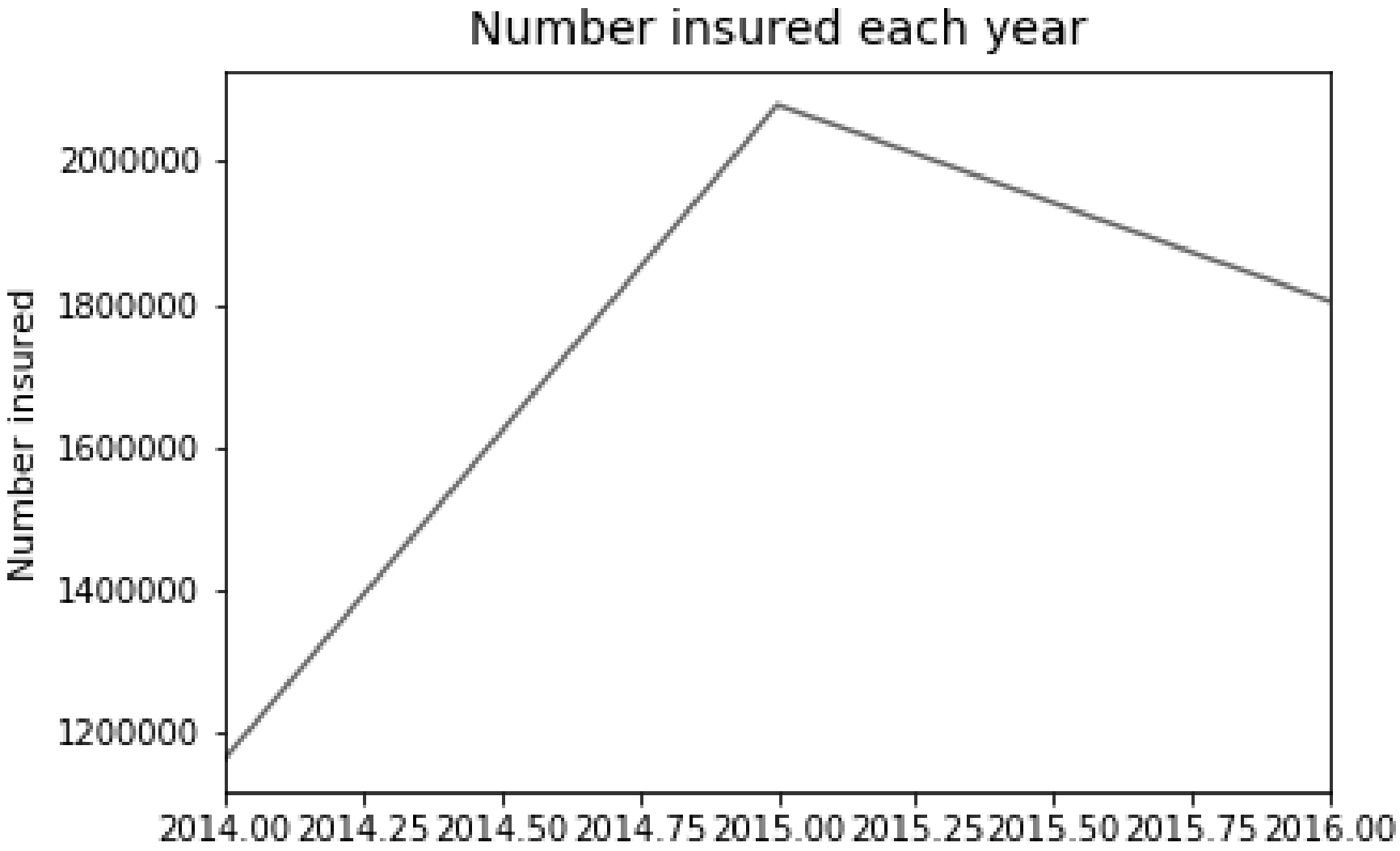
How expensive are insurance plans by state?

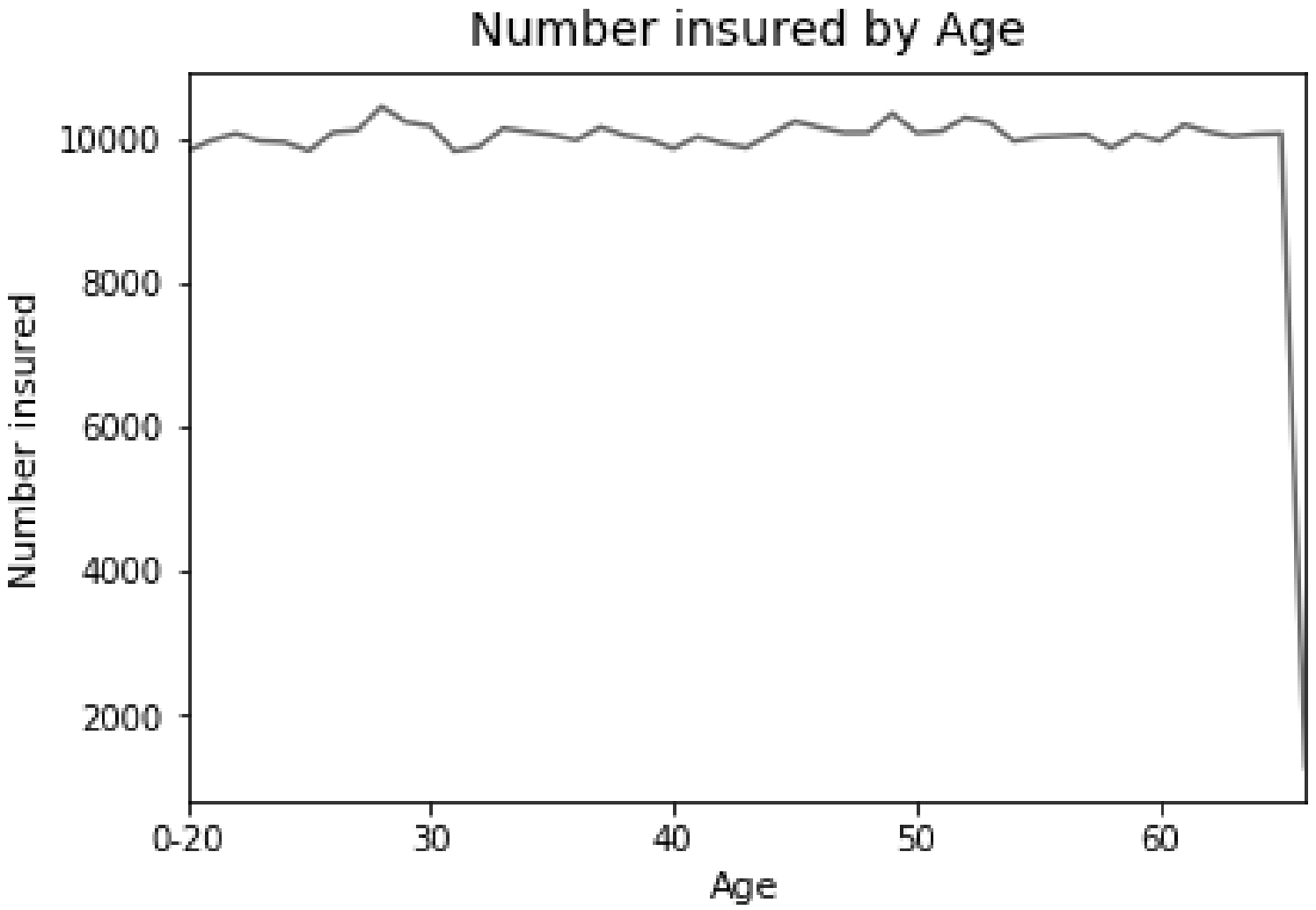






MOST/LEAST INSURED STATES

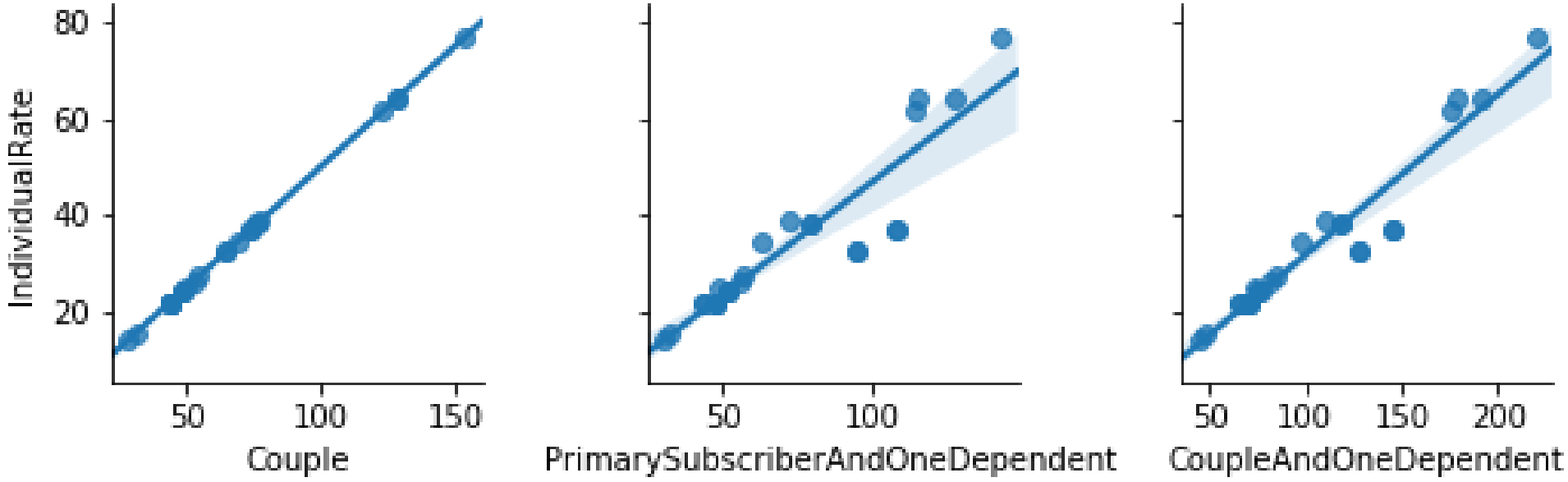

Number insured each year
Number insured
2000000
1800000
1600000
1400000
1200000
2014.00
2014.25
2014.50
2014.75
2015.00
2015.25
2015.50
2015.75
2016.00

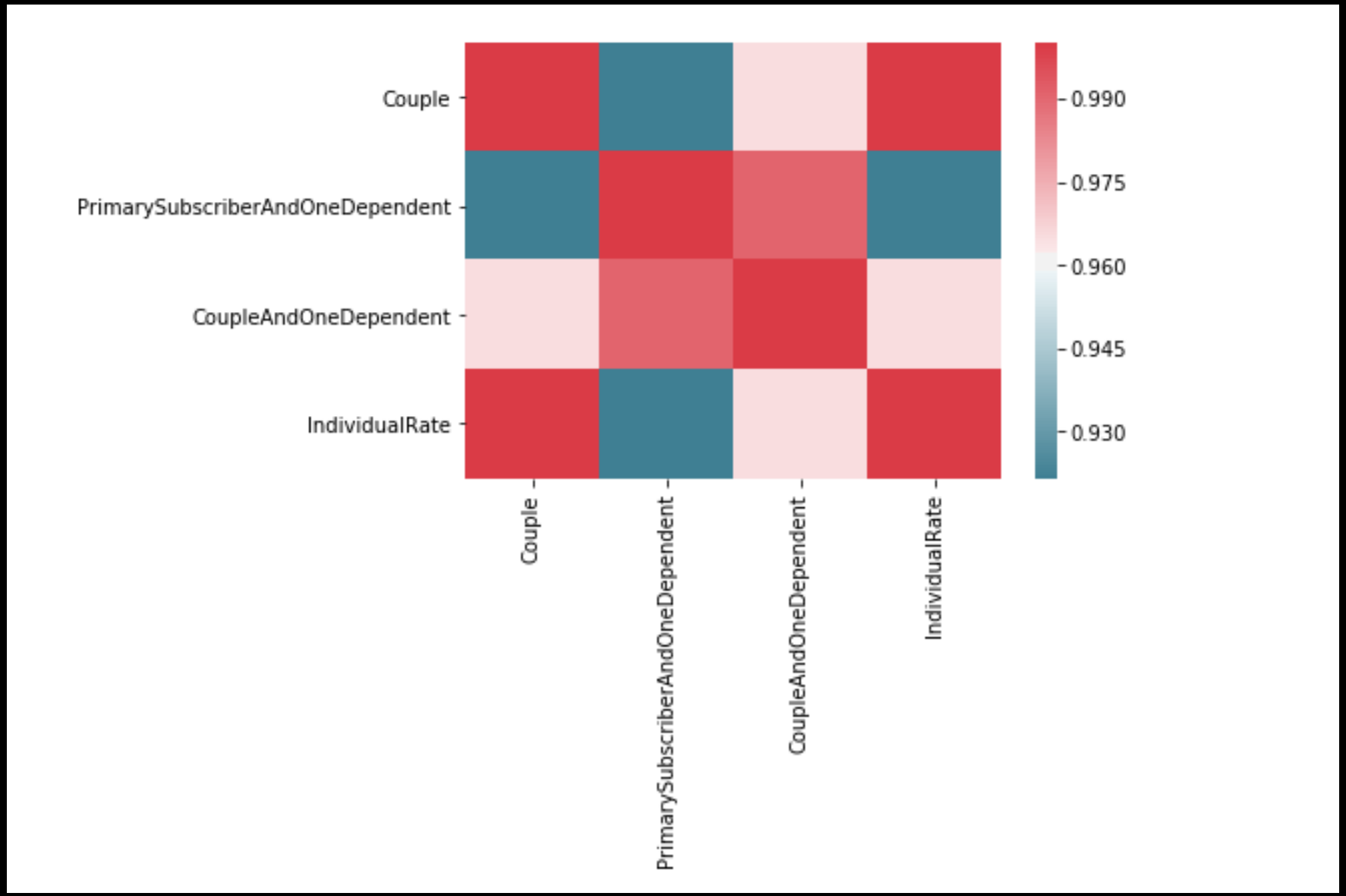

Number insured by Age
Number insured
10000
8000
6000
4000
2000
0-20
30
40
50
60
Age

LINEAR REGRESSION MODEL

Model 1: Relationship between Couple/Dependent vs Individual Rate

```
feature_cols = ['Couple','PrimarySubscriberAndOneDependent','CoupleAndOneDependent']
X = V[feature_cols]
y = V.IndividualRate
```


IndividualRate
80
60
40
20
50
100
150
Couple
50
100
PrimarySubscriberAndOneDependent
50
100
150
200
CoupleAndOneDependent


Couple
PrimarySubscriberAndOneDependent
CoupleAndOneDependent
IndividualRate
Couple
PrimarySubscriberAndOneDependent
CoupleAndOneDependent
IndividualRate
0.990
0.975
0.960
0.945
0.930

Prediction Results:

RMSE: 13.912514114263885

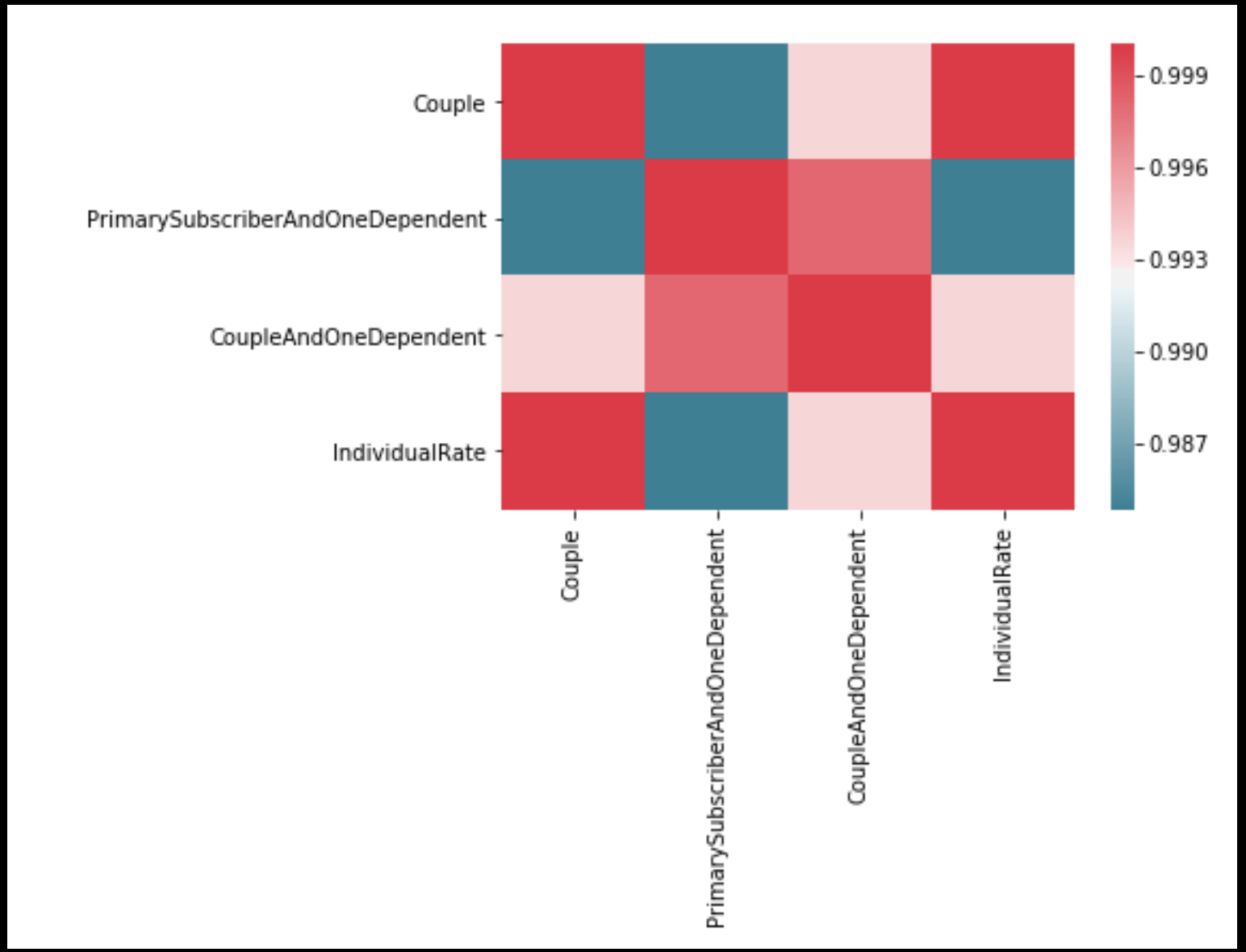
Accuracy: 99.999993287012 17%

Model 2: Relationship between Individual Rate vs AV

What is AV?

- % of costs of the benefit plan that will be covered by health insurance companies

Prediction: Strong positive relationship between AV and Rate

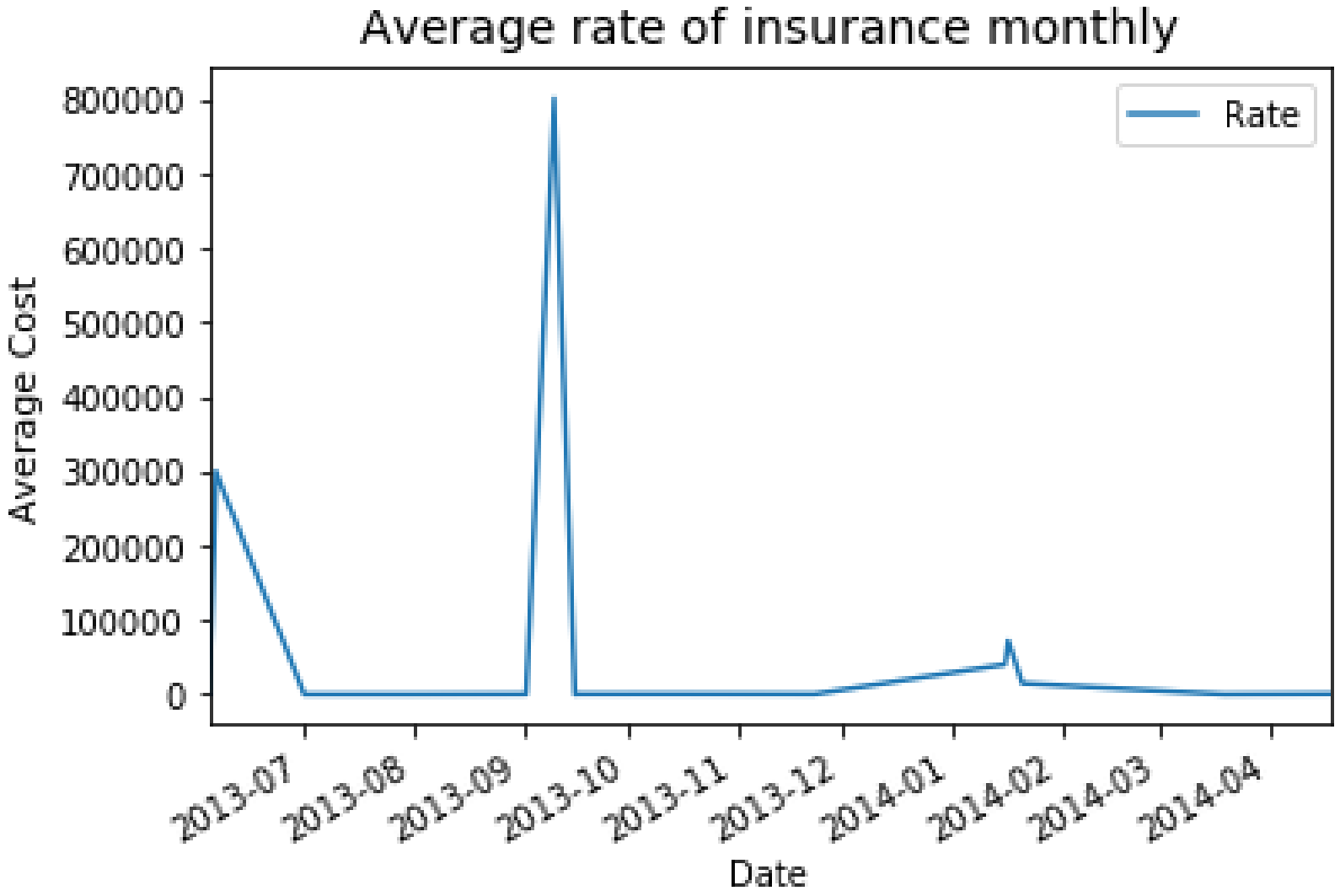

Couple
PrimarySubscriberAndOneDependent
CoupleAndOneDependent
IndividualRate
0.999
0.996
0.993
0.990
0.987
Couple
PrimarySubscriberAndOneDependent
CoupleAndOneDependent
IndividualRate

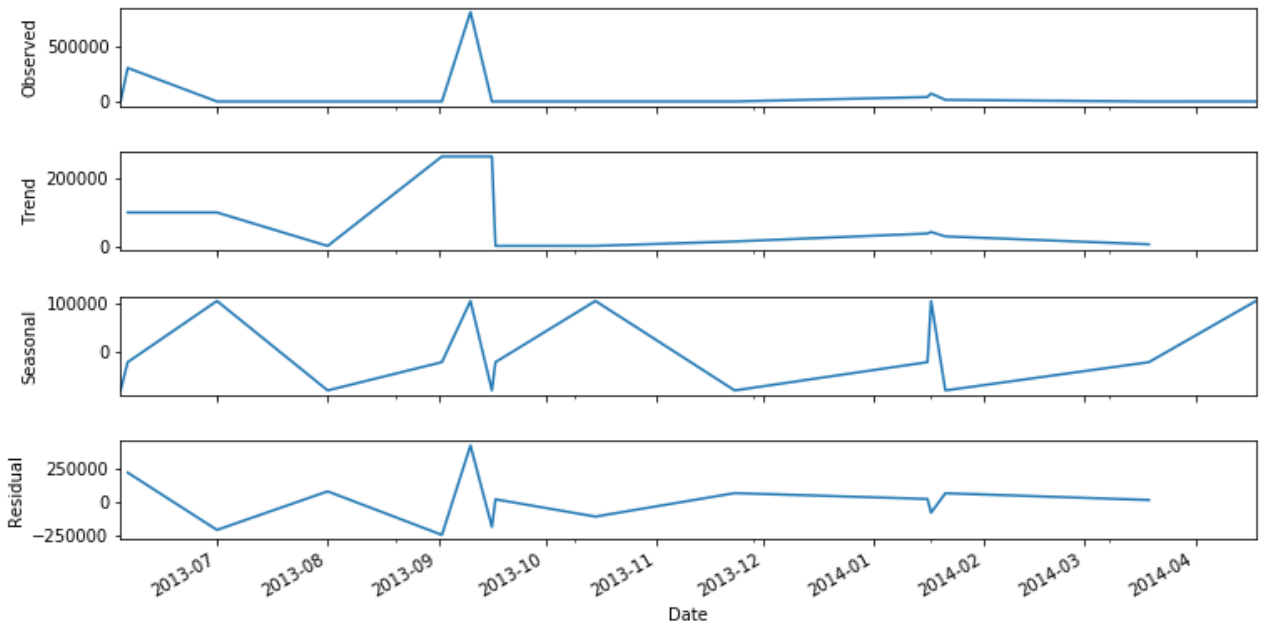
Prediction Results:

RMSE: 19.502271976487712

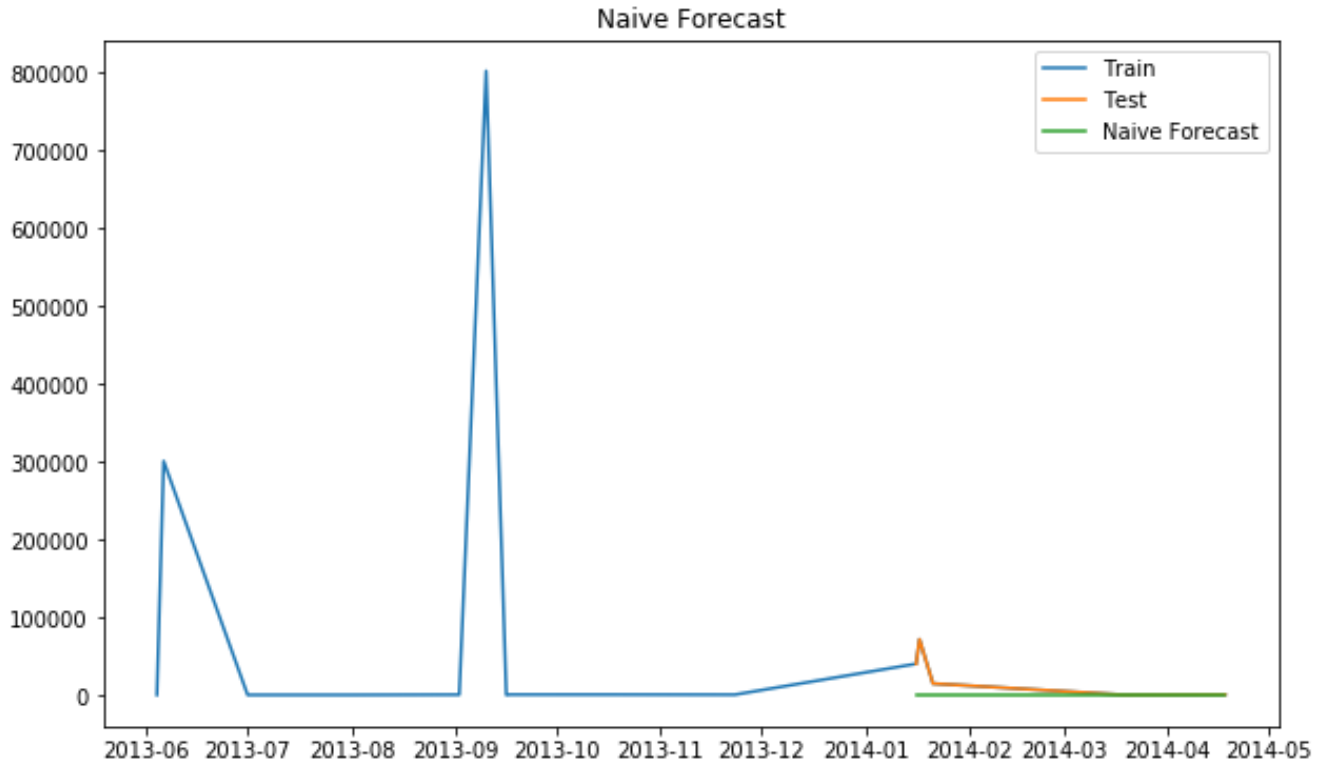
Accuracy: 99.99999020188253 %

TIME SERIES MODEL


Average rate of insurance monthly
Rate
800000
700000
600000
500000
400000
300000
200000
100000
0
Average Cost
2013-07
2013-08
2013-09
2013-10
2013-11
2013-12
2014-01
2014-02
2014-03
2014-04
Date

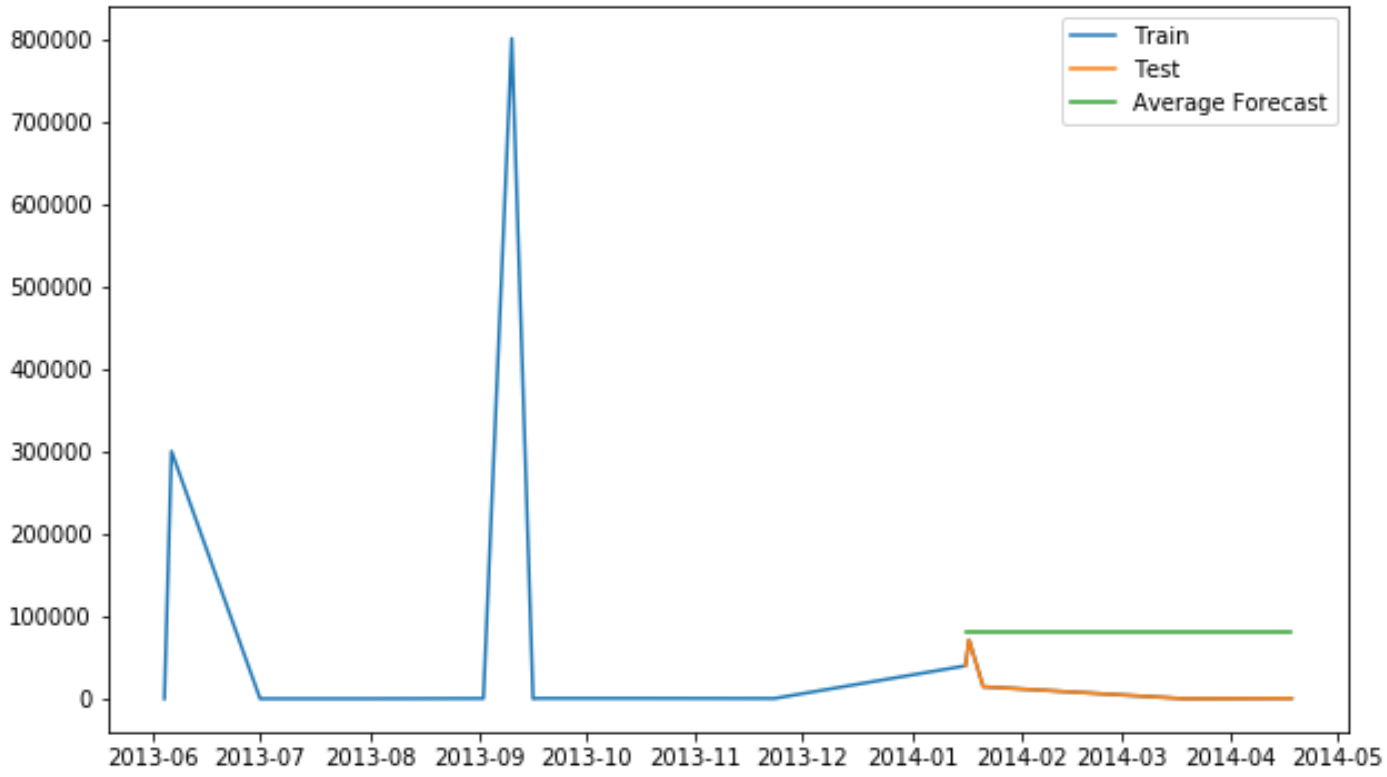


DECOMPOSITION



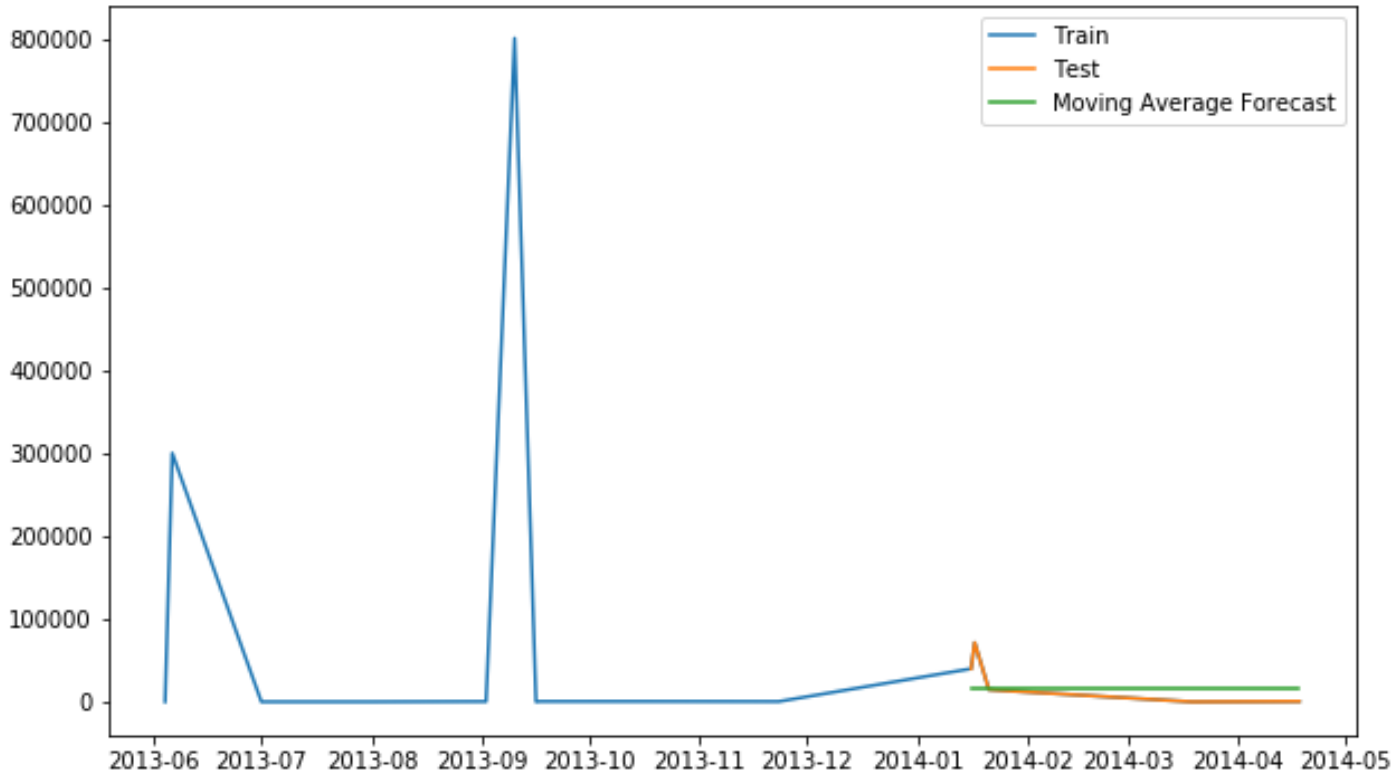
METHOD 1: NAÏVE FORECAST

RMSE: 36777.23347180845



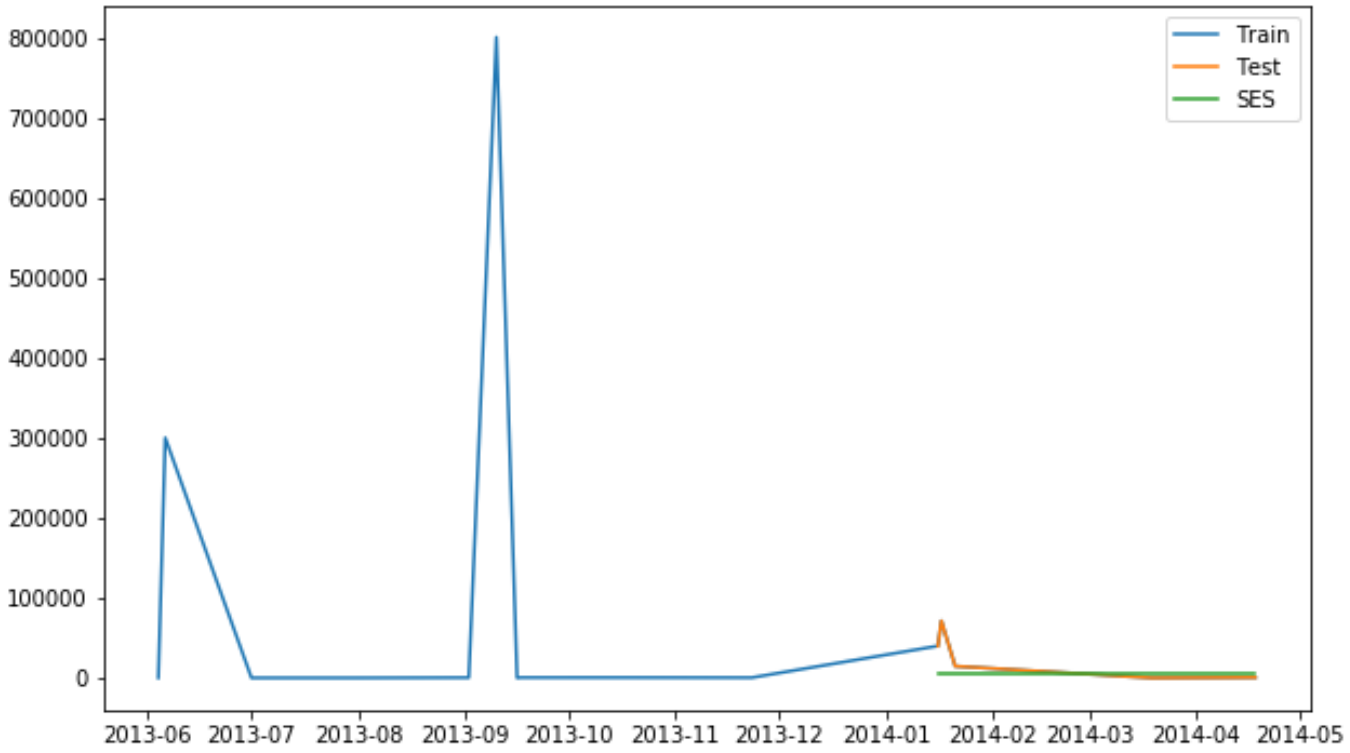
METHOD 2: SIMPLE AVERAGE

RMSE: 62870.083291250514



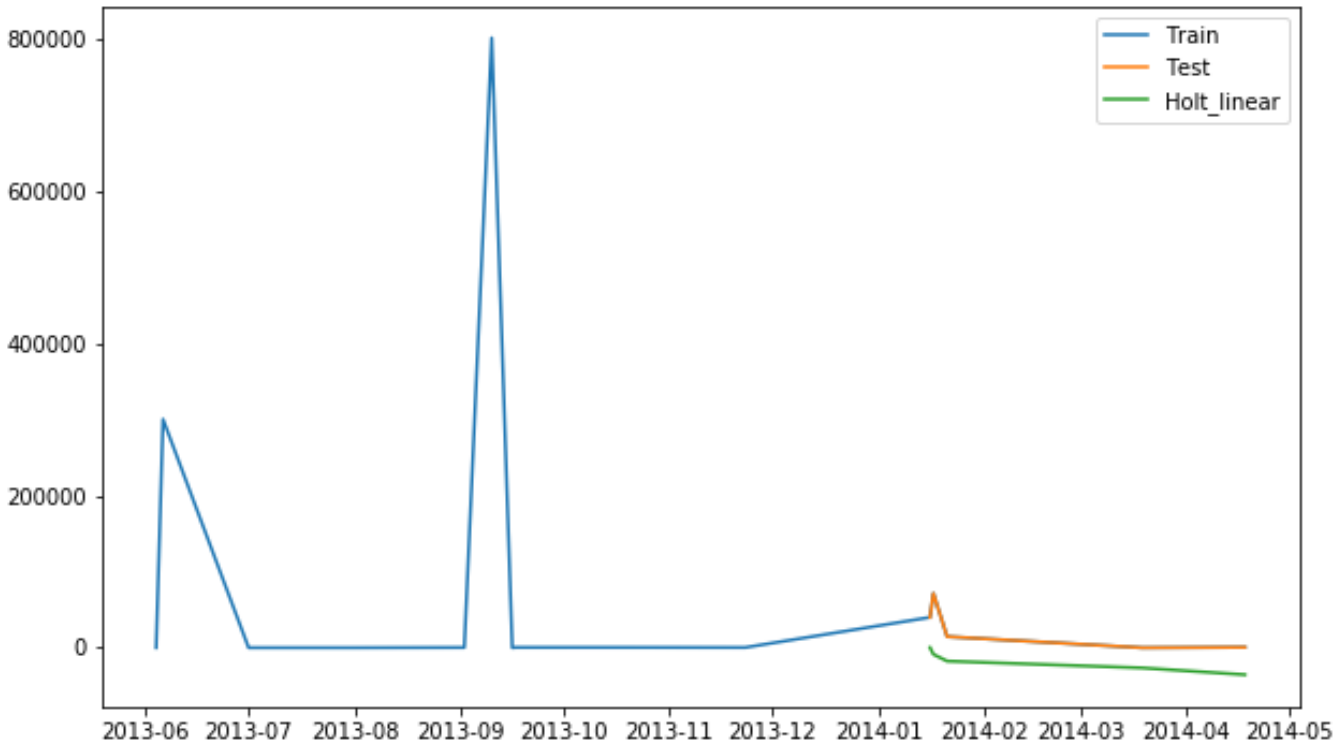
METHOD 3: MOVING AVERAGE

RMSE: 28775.95205935369



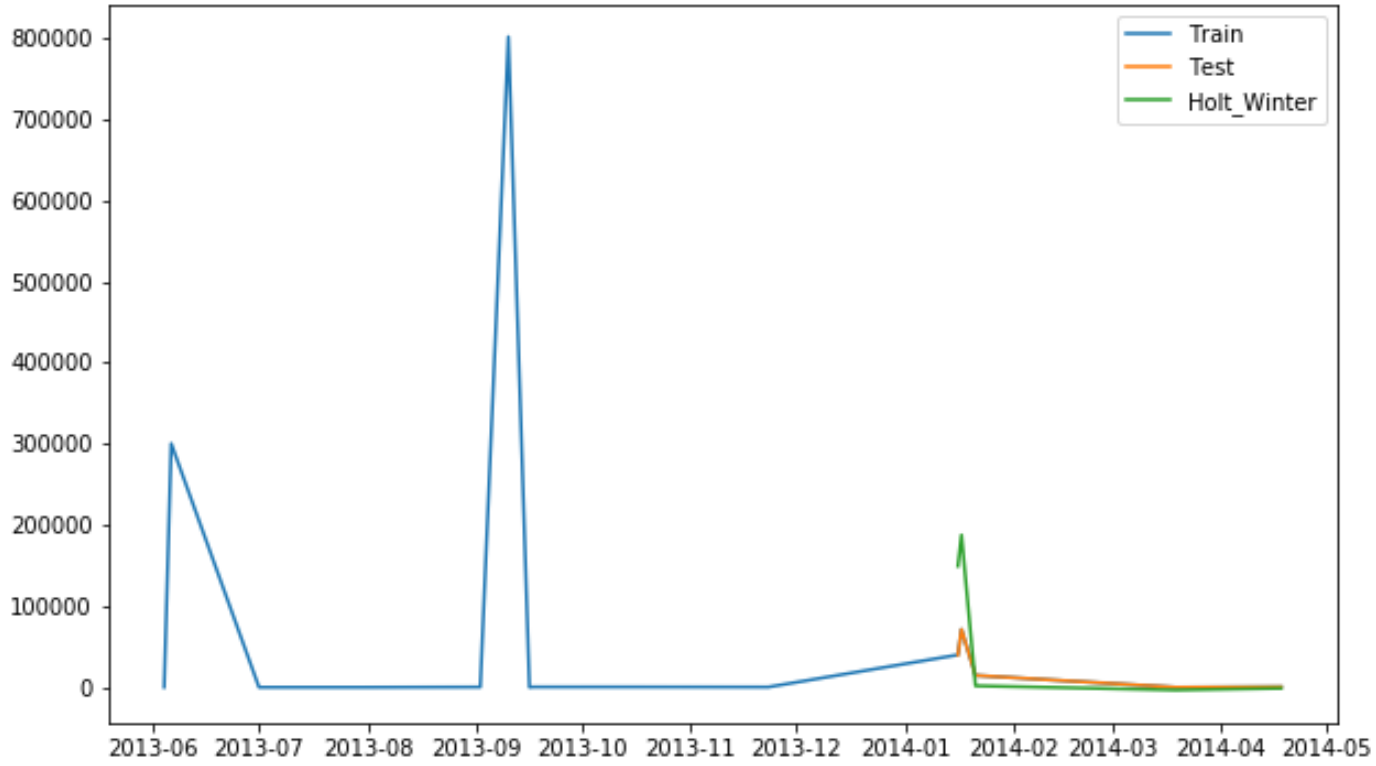
METHOD 4: SIMPLE EXPONENTIAL SMOOTHING

RMSE: 33818.097310680525



METHOD 5: HOLT'S LINEAR TREND

RMSE:46941.21779413684



METHOD 6: HOLT-WINTERS METHOD

RMSE:71622.94267948088

Conclusion

Dental plan is the most insured in the US

Insurance rates for the dental plans tend to decrease over time

Moving Average Forecast is the ideal time series model that can accurately predict the insurance rate for subsequent months

Strong linear relationship between different types of rates

Higher the insurance rate, higher % coverage is given

THANK YOU