Assessment Report for AIA

KEE Consulting
Los Angeles

October 31, 475

1 Data Infrastructure

Overall the data infrastructure is in good shape.

Greatest weakness of current dataset is that it is being populated by numerous agents each with varying standards. This poses two problems:

- The accuracy of the data becomes questionable:

  A bond with a "discharged" status may or may not have been forfeited. This makes the use of the bond status unreliable by itself.

- The variability of the data becomes unmanageable:

  For example strings such as babby mama as defendant relationship makes data categorization nearly impossible. Solution would be to provide a drop down choices (i.e. ex-partner).

2 Project Roadmaps

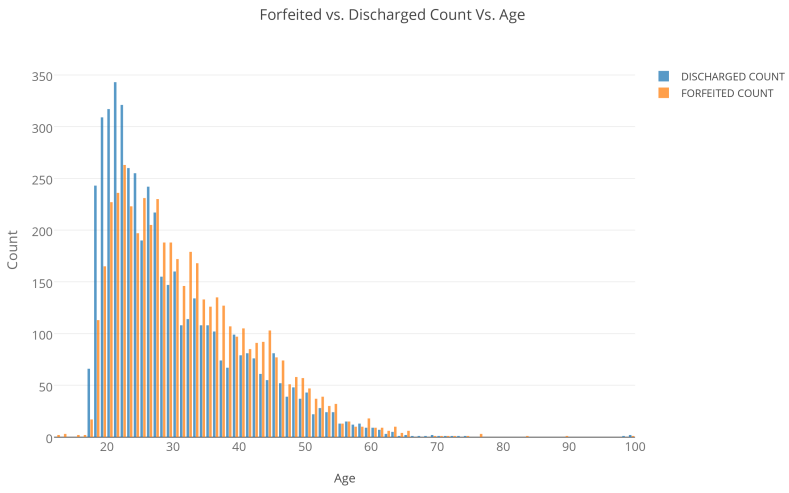
2.1 Project A : A linear regression model for Failure to Appear

The goal is to construct a model which relates the probability of failure to appear (FTA) to variables through a coefficient for each variable. The vision datasets is used jointly with the AIMS dataset.

As a proof of concept, four data variables were looked at for the initial model:

Characteristic of the defendant:

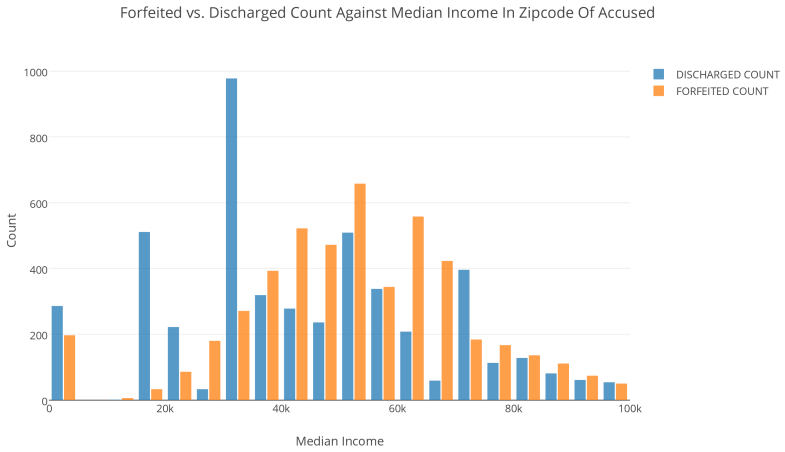
1. Age at time of the bond



2. Gender

Characteristic of the environment:

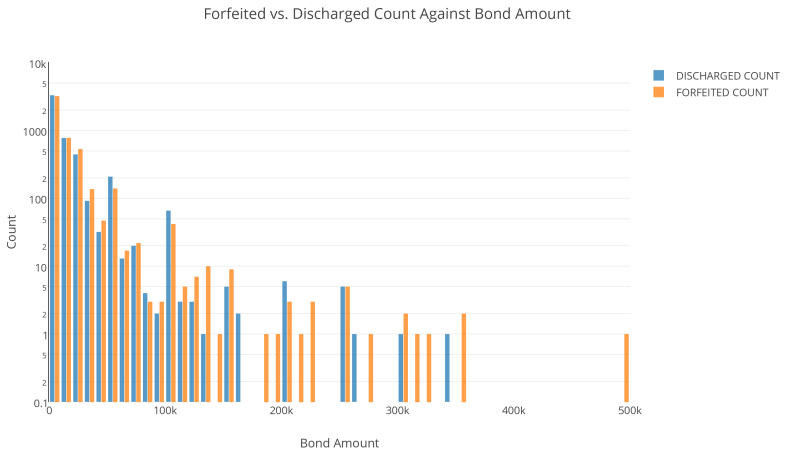
3. zipcode → income



The average income for a zipcode was obtained through an api to the latest available U.S. Census.

Characteristic of the bond:

4. Bond Amount



2.1.1 Validity of model

A regression model: A statistical analysis used to predict scores on an outcome variable based on scores on one or more predictor variables.

Can be as simple as:

$$Y = B_0 + B_1X_1 + B_2X_2 + \ldots + \epsilon \tag{1}$$

- Y: outcome variable (ex: Will fail to appear?)
- X: pridictor variables (ex: Defendents age, bail amount ...)
- B: coeffecients relating X's and Y
- ϵ: error terms (a.k.a residual)

Finding a relationship between X and Y which minimizes the model errors gives us:

```
Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.3472  -1.0933  -0.7349   1.1296   1.8166

Coefficients:
                Estimate Std. Error z value Pr(>|z|)
(Intercept)    -1.835339   0.099919 -18.368  < 2e-16 ***
catBond_Amount  0.013388   0.006470   2.069  0.03854 *
age             0.031466   0.002381  13.213  < 2e-16 ***
catZipIncome    0.183926   0.010761  17.092  < 2e-16 ***
genderM        -0.166691   0.053297  -3.128  0.00176 **
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1   1
```

example model predicitions:

Defendent 1:

- Age: 38
- Gender: Female
- Bond Amount $35,000
- Zipcode Income $75,392

Probablity calculated by the model: 75% to fail to appear In reality, the bond was forfeited. This is called a "true positive".

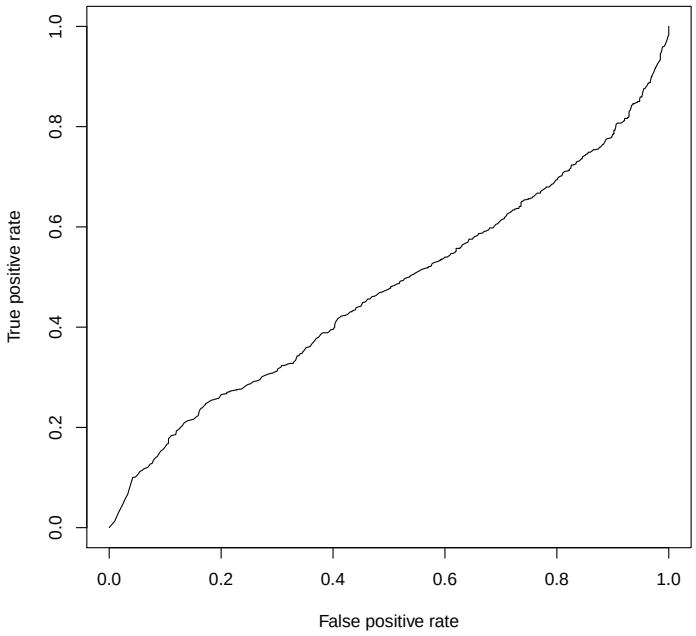
Defendent 2:

- Age: 23
- Gender: Male
- Bond Amount: $5,000
- Zipcode Income: $101,905

Probablity calculated by the model: 62% to fail to appear In reality, the defendant appeared in court and the bond was discharged. This is called a "false positive".

The aim is to maximize true positives and minimize false positives.

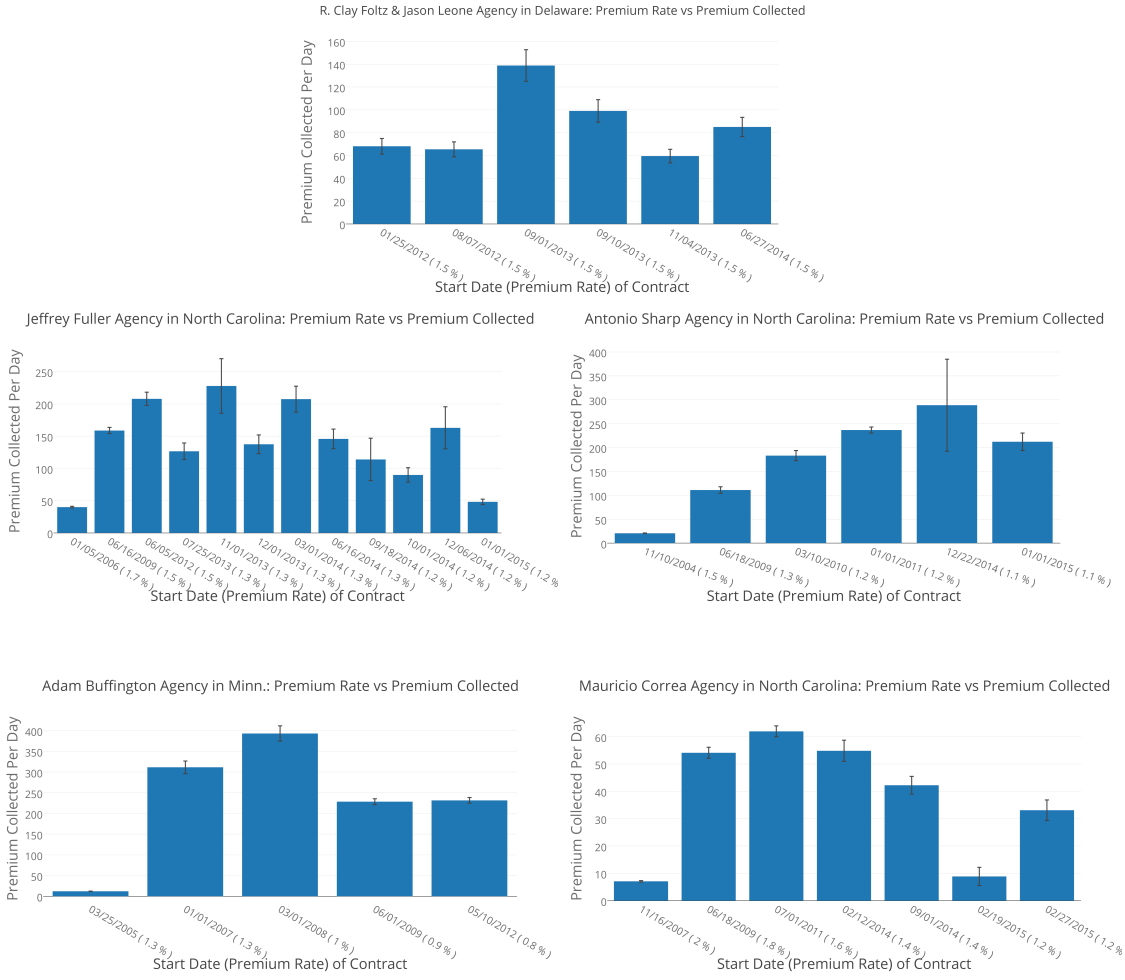
Project Goal



2.2 Project B: Reporting of agent performance

Build performance plots of agents and AIA. Reports could include three granularities, agent level, state level, and national level:

- premiums and BUF amount obtained from agents.
- Total penal written by agent
- granularity: agent, state, national
- comparison of these values by date ranges



In some fields, it is entirely expected that your R-squared values will be low. For example, any field that attempts to predict human behavior, such as psychology, typically has R-squared values lower than 50%. Humans are simply harder to predict than, say, physical processes.

```
Residuals:
   Min     1Q Median     3Q    Max
-4.875 -2.978 -1.478  1.250 19.538

Coefficients:
                     Estimate Std. Error t value Pr(>|t|)
(Intercept)            -6.677      2.694  -2.478  0.01406 *
PremiumPercentShifted   6.299      1.613   3.905  0.00013 ***
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1   1
```

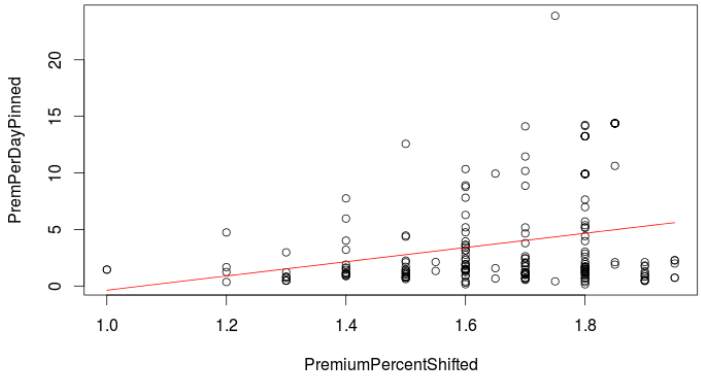
```
Residual standard error: 4.266 on 197 degrees of freedom
Multiple R-squared:  0.07183,Adjusted R-squared:  0.06712
F-statistic: 15.25 on 1 and 197 DF,  p-value: 0.0001296
```

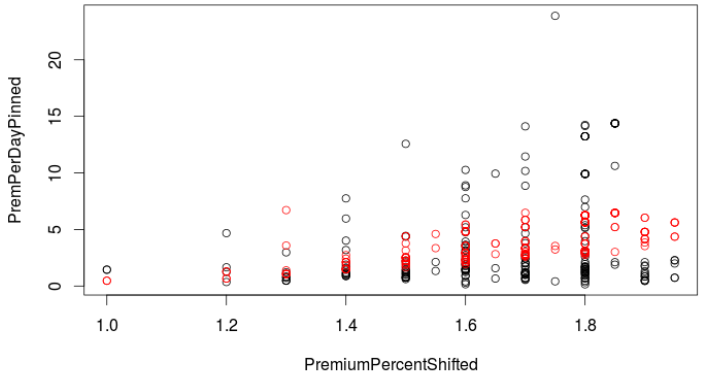
Adding another variable...

```
Residuals:
   Min     1Q Median     3Q    Max
-5.875 -2.808 -1.090  1.548 20.339

Coefficients:
                       Estimate Std. Error t value Pr(>|t|)
(Intercept)           -4.885e+00  2.634e+00  -1.854   0.0652 .
UnderWritingLimit      1.253e-05  3.118e-06   4.020  8.3e-05 ***
PremiumPercentShifted  4.102e+00  1.648e+00   2.489   0.0136 *
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1   1

Residual standard error: 4.111 on 196 degrees of freedom
Multiple R-squared:  0.1425,Adjusted R-squared:  0.1338
F-statistic: 16.29 on 2 and 196 DF,  p-value: 2.856e-07
```


PremPerDayPinned
0
5
10
15
20
1.0
1.2
1.4
1.6
1.8
PremiumPercentShifted


PremPerDayPinned
0
5
10
15
20
1.0
1.2
1.4
1.6
1.8
PremiumPercentShifted