Panel Data

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```
library(plm)
```

```
## Warning: package 'plm' was built under R version 3.5.1
```

```
## Loading required package: Formula
```

```
library(prediction)
```

```
## Warning: package 'prediction' was built under R version 3.5.1
```

```
library(Metrics)
```

```
## Warning: package 'Metrics' was built under R version 3.5.1
```

```
library(tseries)
```

```
## Warning: package 'tseries' was built under R version 3.5.1
```

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
train_data <- na.omit(read.csv(file="usersessions-with-genre-train.csv", header=TRUE, row.names = NULL,
```

```
test_data <- na.omit(read.csv(file="usersessions-with-genre-test.csv", header=TRUE, row.names = NULL, s
```

```
panel.data.train <- plm.data(train_data, index = c("userid","session_start"))
```

```
## Warning: use of 'plm.data' is discouraged, better use 'pdata.frame' instead
```

```
panel.data.test <- plm.data(test_data, index = c("userid","session_start"))
```

```
## Warning: use of 'plm.data' is discouraged, better use 'pdata.frame' instead
```

```
mdl_pooled <-plm(session_length~age+session_length_mvavg+previous_duration+is_holiday+absence_time,  da
```

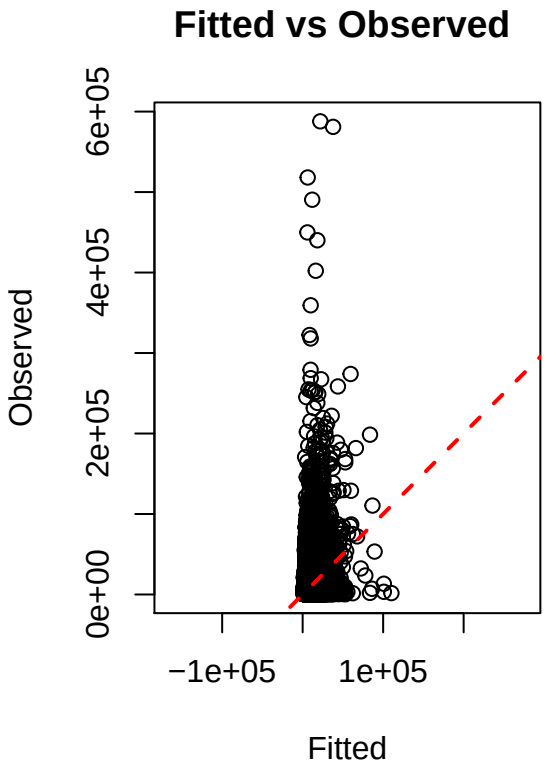
```
##Summaries
```

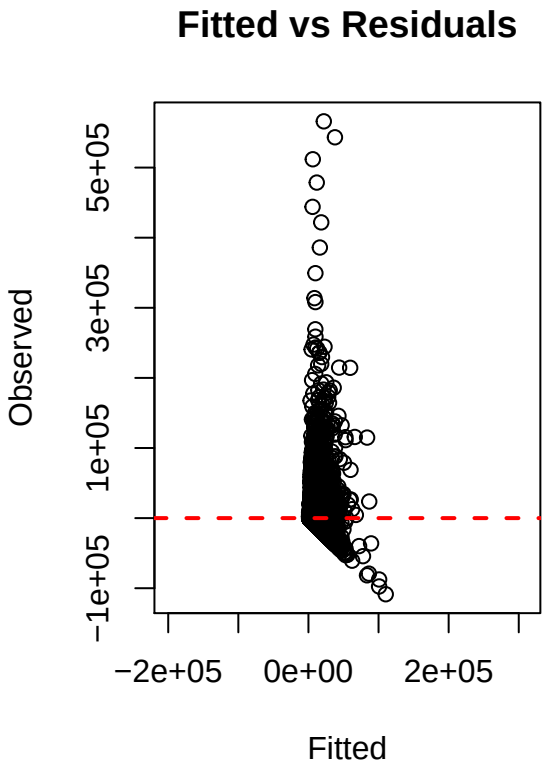
```
summary(mdl_pooled)
```

```
## Pooling Model
##
## Call:
## plm(formula = session_length ~ age + session_length_mvavg + previous_duration +
##     is_holiday + absence_time, data = panel.data.train, model = "pooling")
##
## Unbalanced Panel: n = 174, T = 19-4312, N = 169556
##
## Residuals:
##      Min.   1st Qu.    Median   3rd Qu.      Max.
## -108569.3   -3340.8   -1545.0    1475.2  565949.6
##
## Coefficients:
##                          Estimate  Std. Error  t-value  Pr(>|t|)
## (Intercept)           6.3855e+02  1.0102e+02   6.3208 2.609e-10 ***
## age                   3.0953e-01  3.5901e+00   0.0862    0.9313
## session_length_mvavg  6.9506e-01  6.4212e-03 108.2438 < 2.2e-16 ***
## previous_duration     1.6008e-01  2.3733e-03  67.4502 < 2.2e-16 ***
## is_holiday           -2.6509e+01  5.1160e+01  -0.5182    0.6043
## absence_time         -1.4716e-05  4.6387e-05  -0.3173    0.7511
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Total Sum of Squares:    1.4832e+13
## Residual Sum of Squares: 1.3006e+13
## R-Squared:      0.1231
## Adj. R-Squared: 0.12307
## F-statistic: 4760.3 on 5 and 169550 DF, p-value: < 2.22e-16
```

```
## Fitted vs Observed and Fitted vs Residuals plots
par(mfrow=c(1,2))
plot(panel.data.train$session_length-mdl_pooled$residuals, panel.data.train$session_length, asp=1, ylab
abline(0,1, col='red', lty='dashed', lwd=2)

## Fitted vs Residuals plots
plot(panel.data.train$session_length-mdl_pooled$residuals,mdl_pooled$residuals, asp=1, ylab = "Observed
abline(0,0, col='red', lty='dashed', lwd=2)
```






```
## MAE and RMSE

mae_pooled = mean(abs(mdl_pooled$residuals))
rmse_pooled = sqrt(mean(abs(mdl_pooled$residuals)^2))

cat('MAE = ', mae_pooled, ', RMSE = ', rmse_pooled)
```

```
## MAE =  4355.626 , RMSE =  8758.281
```

```
## Prediction
predval <- prediction(mdl_pooled, data=test_data)
mae_pred = mean(abs(predval$session_length-predval$fitted))
rmse_pred = sqrt(mean(abs(predval$session_length-predval$fitted)^2))
#
cat('MAE = ', mae_pred, ', RMSE = ', rmse_pred)
```

```
## MAE =  3893.95 , RMSE =  7571.409
```